7.0 INFRASTRUCTURE AND CIVIL WORKS

This section includes descriptions of the transportation and support facilities required by the proposed project. Section 7.1 discusses the temporary road systems (sea-ice and land-based ice roads), as well as a temporary construction camp. Section 7.2 covers permanent facilities such as gravel roads, pads, an airstrip, and dock as well as the gravel sources and gravel stockpile required for construction. Infrastructure facilities such as a permanent camp, warehouse, diesel storage areas, telecommunications, fresh-water sources, and electrical power facilities are presented in Section 7.3.

7.1 CONSTRUCTION-RELATED INFRASTRUCTURE

7.1.1 Sea-Ice Road

Sea-ice roads will be established during the two winter-construction seasons to connect the Point Thomson Unit to the existing permanent road system at Endicott, which is approximately 50 miles to the west. The ice roads will follow the shoreline; the general route for the ice road is shown on Figure 7-1. During the second season, the ice road may tie into the infield gravel road at West Well Pad in order to reduce the length of the ice road. This will depend on activities that may be occurring at the West Well Pad during this period.

The sea-ice roads will support the 2005 and 2006 winter-construction seasons and drilling resupply (as described in Section 10). During the drilling and construction phase of the project, the sea-ice road will be used to transport heavy equipment, materials, and supplies. Depending on special activities and related logistics, a sea-ice road may be constructed on occasion once the facilities are in operation.

The roads will consist primarily of sea-water ice, with an option to cap the road with fresh-water ice. Spur roads probably will be constructed to connect the sea-ice road to onshore fresh-water sources and, if applicable, exploration gravel pads slated for gravel reuse and rehabilitation. Specific routes for the spur ice roads will be defined as project engineering and planning progress. Maintenance may consume 50,000 to 100,000 gallons of fresh water per day.

7.1.2 Land-Based Ice Roads

Ice roads situated on land (typically tundra) will be required during the first two construction seasons. During the first winter, one road approximately 3 mi long will extend south from the general location of the CWP, past the proposed gravel mine site, to the fresh-water source at the former gravel mine (Figure 7-2). Standard North Slope ice road construction from snow and fresh water produces a dock-to-mine-site ice road nominally 40 ft wide and 6 in. thick.

During the second winter, land-based ice roads will be required along the pipeline right-of-way to provide the travel and construction working surface for the export pipeline and gathering lines. Figures 7-3 and 7-4 show the proposed route of pipeline-construction ice roads from the East Well Pad to the CPF (about 6 mi), the CPF to West Well Pad (about 7 mi), and the West Well Pad to Badami (about 16 mi).

The width of an ice road for pipeline construction is generally about 100 ft , although it may be widened in select areas for materials storage or to provide access to other project-related activities. Standard North Slope ice road construction from snow and fresh water produces pipeline right-of-way ice roads which are nominally 100 ft wide and 6 in thick. Maintenance may consume an additional 50,000 to 100,000 gallons of fresh water per day.

Spur ice roads may be constructed to the sea-ice road at appropriate locations to improve access and travel times and, if applicable, connect to exploration gravel pads slated for gravel reuse and rehabilitation. The routes for the spur ice roads will be described as project execution plans are further developed. Standard North Slope ice road construction from snow and fresh water produces spur roads which are approximately 40 ft wide and 6 in thick. Maintenance may consume an additional 50,000 to 100,000 gallons of fresh water per day.

7.1.3 Temporary Camp

The initial “pioneer” stage of the construction camp will be a self-contained unit with its own utility services such as water and wastewater treatment. The camp may be leased from the existing North Slope inventory or purchased and then sold at a later date. The camp will be trucked to the site in stages, as required, on sea-ice roads. The pioneer stage will be used to support the first infrastructure construction and other early activities. The construction workforce is expected to peak during the first quarter of 2006, with simultaneous drilling operations, pipeline construction, and other construction works at the various locations.

The temporary camp will be augmented in stages to support the ultimate projected peak workforce capacity. The utility services required for the increasing construction camp size will be incorporated into the utility modules for the Central Processing Facility. The typical fresh-water requirement for camp operations amounts to 100 gallons per person per day. Should actual workforce requirements exceed the combined capacity of the construction and permanent camp facilities, the Badami construction camp may serve as overflow contingency along with other available facilities in the Deadhorse area.

7.2 CIVIL WORKS

7.2.1 Permanent Gravel Roads

Permanent all-weather gravel roads are required within the Point Thomson Unit to connect the project well pads, airstrip, gravel mine, and fresh-water supply source(s) to the centrally located CPF Pad (Figure 7-3). In addition, a gravel roadway will extend from the dock to the CPF Pad. Gravel roads for vehicle traffic will be nominally about 30 ft to 35 ft wide. However, the road from the dock to the CPF Pad will be about 50 ft wide to facilitate movement of the large, heavy facility modules brought in by a sealift.

The minimum permitted footprint for roads, pads, and the airstrip must have the dimensions of the finished surface plus an approximately 10-ft-wide shoulder per side to account for the side slopes (assuming a 5-ft average pad thickness). An additional buffer area around the entire footprint perimeter (i.e., beyond the traveled surface plus side slopes) will also be included in the permitted area for construction. This buffer area is necessary because, despite maintenance, material will invariably spread beyond the toe over time due to the steepness of the side slopes. Table 7-1 summarizes the design details for the various gravel roads, and Figure 7-5 depicts typical gravel road cross-sections. This information could change as engineering and project execution plans develop.

The gravel roads will cross creeks and small tundra streams, and culverts or bridges will be used at these crossings. The design selected will depend on the width of the stream and discharge flow parameters at the site of each road crossing. For the three streams, bridges will be installed. Figures 7-6 through 7-9 depict round pipe, arch pipe, and bridge configurations that will be used for typical crossings. The specific design will be selected for each water body crossing as engineering design progresses.

TABLE 7-1
SUMMARY OF GRAVEL ROADS

ROAD	DESCRIPTION	APPROXIMATE DIMENSIONS
CPF to AIRSTRIP[1]	Length	1.72 mi
	Width	34 ft
	Gravel Quantity	77,000 cubic yards (cy)
	Year Constructed	First winter
ABANDONED MINE SITE ROAD[1]	Length	0.31 mi
	Width	24 ft
	Gravel Quantity	18,000 cy
	Year Constructed	First winter
CPF to EAST WELL PAD	Length	5.2 mi
	Width	34 ft
	Gravel Quantity	328,000 cy
	Year Constructed	First winter
CPF to WEST WELL PAD	Length	5.64 mi
	Width	34 ft
	Gravel Quantity	405,000 cy
	Year Constructed	First winter
CWP to DOCK	Length	0.1 mi
	Width	50 ft
	Gravel Quantity	Included under Gravel Pad section Table 7-2
	Year Constructed	First winter

[1]Gravel volume includes spur roads to mine site, gravel storage pad, and abandoned mine site.

7.2.2 Airstrip

An airstrip operational on a year-round basis is essential for both the safety of plant operators and emergency response. The airstrip will provide the only year-round access to Point Thomson because the project is remote and isolated from existing facilities and the public and private road systems associated with Prudhoe Bay. Additionally, an airstrip provides a means of transporting people, supplies, equipment, and materials during those periods when access is not possible by either ice road or barge. The proposed location of the airstrip is approximately 2 mi from the coast, and south of the CPF Pad. Factors considered in the location were:

- Proximity to CPF and camp facilities,
- Location sufficiently south of the coast to minimize fog restrictions,
- Alignment with prevailing winds,
- Topography,
- Proximity to a gravel source,
- Avoidance of any creeks or lakes, and
- Proximity to existing access roads.

The location of the airstrip is shown on the facilities layout (see Figure 5-2) and details of its design are provided on Figures 7-10 through 7-12. It is anticipated that the airstrip will become operational by mid- to late-summer following its construction.

During operations, the types of aircraft using the strip most frequently for bringing in crew changes and supplies will be the size of a Beech 1900D. However, for maintenance and servicing of large equipment, the runway will be designed and built to provide landing and take-off capabilities for a fully loaded Hercules C-130. The proposed airstrip will also include the following features:

- An all-weather road to the CPF Pad,
- Runway lighting,
- Airport control building(s),
- Electrical service via cable buried in the road from the CPF power-generating facilities,
- Ramp for personnel and cargo transfer,
- Control and communication links to the CPF using fiber-optic cable, and
- Navigation and communication controls and an instrument approach system that provides 24-hour operation.

As with gravel roads, the minimum permitted footprint for the airstrip must have the dimensions of the finished surface plus an approximately 10-ft-wide shoulder per side to account for the side slopes. An additional buffer area around the entire footprint perimeter (i.e., beyond the traveled surface plus side slopes) will also be included in the permitted area for construction. This buffer area is necessary because, despite maintenance, material will invariably spread beyond the toe over time due to the steepness of the side slopes.

The airstrip will maintain an Instrument Landing System (ILS) to allow for aircraft operations to continue during certain adverse weather conditions. The ILS equipment will be located on small pads near the airstrip. The exact dimensions and locations of the ILS pads will be determined as engineering design progresses.

7.2.3 Dock

Facilities and logistics studies completed to date indicated that the dock is a necessary component of the project, and must be capable of landing barges transporting the CPF modules weighing up to 6,000 tons. This weight specification and the associated barge configuration require approximately a 9-ft water depth.

The design criteria and features of the proposed Point Thomson dock are similar to the 1,100-foot Badami Dock that has proven to be a successful design. The Badami dock head comprises sheet piling on three sides with gravel bag slope protection linking the sheet piling with the roadway. The dock access road is constructed of gravel placed at the natural angle of repose. In 2003, the Badami Dock was subject to two significant summer/fall storm events, which resulted in the need for only minor regrading of the roadway section. Both the Badami Dock and the proposed Point Thomson Dock are located within the barrier islands, which afford some protection from waves. On-going engineering evaluations preliminarily indicate similar oceanographic conditions at both locations but with slightly greater design wave height due to greater fetch at Point Thomson, which may necessitate a slightly higher roadway section.

The dock will be a gravel-fill structure 750 ft long by 100 ft wide (Figure 7-13). The dockhead will be 150 ft by 100 ft, complete with sheet piling, cell walls, fenders, bollards, and face beams (Figures 7-14 and 7-15). Gravel bag slope protection, if necessary, will be placed at the dock intersection with the roadway and the remainder of the structure will be gravel fill with 1:7 side slopes (horizontal to vertical). It is anticipated that approximately 63,000 cy of gravel will be required to construct the dock. During the summer of 2005 the water depth at the dock will be adequate for coastal barges operating between Prudhoe Bay West Dock and Point Thomson which will transport the drilling rig and various construction materials and supplies. During 2006, a sealift to ship the CPF modules to the project area will require larger barges with 9-ft draft. A dredged channel is planned to be excavated during the prior winter from the dockhead to the 9-ft isobath during the previous winter. The channel area, as depicted in Figure 7-14, is estimated to be approximately 1,000 ft by 400 ft. A small launch ramp for Alaska Clean Seas (ACS) spill response boats and equipment will be established on the dock road.

7.2.4 Pads

The Point Thomson Gas Cycling Project will require gravel pads to support production and gas injection wells, process facilities, a permanent camp, and gravel storage (Figure 5-2). The location of the pads in the Point Thomson Unit is based on a combination of environmental considerations and the need to reach bottom-hole targets in the Thomson Sand reservoir. Production wells will be situated on two pads: the East Well Pad and the West Well Pad. The CWP will support gas injection and waste disposal wells, and another pad will serve as a location for the CPF and all related infrastructure, support equipment, and required services. Surface drainage and impoundment basins on these pads will be designed to control storm-water runoff. A fifth pad will be located next to the gravel mine where gravel will be stockpiled for future maintenance needs. Table 7-2 provides a summary of the dimensions, gravel requirements, and features of each gravel pad; however, the final design is likely to change as engineering design matures.

TABLE 7-2
SUMMARY OF GRAVEL PADS

PAD	DESCRIPTION	APPROXIMATE SIZES
EAST WELL PAD	Size (L x W)	535 ft x 445 ft
	No. of Wells	7 production and space for 2 future
	Gravel Volume	70,000 cy
	Year of Construction	First winter
WEST WELL PAD	Size (L x W)	500 ft x 450 ft
	No. of Wells	6 production and space for 2 future
	Gravel Volume	67,000 cy
	Year of Construction	First winter
CENTRAL WELL PAD (includes portions of the 50-ft Dock Road)	Size (L x W)	1000 ft x 727 ft
	No. of Wells	8 injection and space for 2 future; 1 disposal, and space for 2 future
	Gravel Volume	147,000 cy
	Year of Construction	First winter
CPF PAD (includes portions of the 50-ft Dock Road)	Size (L x W)	1600 ft x 659 ft
	No. of Wells	N/A
	Gravel Volume	330,000 cy
	Year of Construction	First winter
GRAVEL STORAGE PAD / MAINTENANCE STOCKPILE	Size (L x W)	700 ft x 700 ft
	Gravel Volume	287,000 cy
	Year of Construction	First winter
CPF DOCK AND ACCESS ROAD	Size (L x W)	See Figure 7-14
	Gravel Volume	79,000 cy
	Year of Construction	First winter
CPF LP/HP FLARE AREAS	Size (L x W)	990 ft. x 24 ft.
	Gravel Volume	14,000 cy
	Year of Construction	First winter
CWP TEMPORARY FLARE AREA	Size (L x W)	310 ft. x24 ft.
	Gravel Volume	7,000 cy
	Year of Construction	First winter
CPF/CWP IMPOUNDMENT BASINS	Size (L x W)	Figures 5-6 and 5-8
	Gravel Volume	11,000
	Year of Construction	First winter

7.2.5 Gravel Sources

The majority of permanent infrastructure will be constructed using gravel mined within the Point Thomson Unit. The gravel uses for the permanent infrastructure will include:

- A gravel mine with stockpiles;
- Gravel pads for drilling, wellheads, and process facilities;
- Gravel infield roads;
- Gravel-filled dock with sheet-pile facing; and
- Gravel year-round airstrip.

The primary gravel source for the Point Thomson Gas Cycling Project will be a new gravel mine located approximately 2 mi south of the CPF. The centrally located site has been selected to minimize both the impact on seasonal lakes and the haul distance from the mine to the major gravel fill locations. Geotechnical surveys at this mine site have identified gravel of sufficient quantity and quality for construction use.

It is anticipated that approximately 2,600,000 cy of gravel and 586,000 cy of overburden will be removed from the 46.5-acre mine site. The site will be located just north and east of the airstrip. Figures 7-16 and 7-17 show the plan view and cross-section of the proposed gravel mine site, respectively. A mining and rehabilitation plan is presented in Appendix B.

The mine site will be used as a fresh-water reservoir once mining activities are completed. An inlet structure will be constructed to divert water from peak discharges which occur in an adjacent stream during spring breakup (Figures 7-18 and 7-19). The inlet structure consists of a concrete-lined channel with a fish exclusion device and an adjustable weir. The height of the weir can be increased or decreased to match the actual stream channel elevation during breakup. The weir can be left in its highest configuration to prevent diversion during low-level summer stream flows.

7.2.6 Maintenance Gravel Stockpile

A gravel stockpile will be required for maintenance of gravel roads and pads (Figure 7-16). This stockpile will be created during the gravel mining operation using gravel mined prior to the flooding of the mine site. The stockpile is anticipated to be approximately 274,000 cy, which should be enough to maintain the project road and pad system. Based on past North Slope projects experience, it is estimated that 15% of the total gravel requirement for the project is required for maintenance throughout the project operations.

A secondary use of the large gravel surface provided by the stockpile is to serve as a storage area, particularly during the drilling phase of the project. The gravel storage pad will be immediately adjacent to and north of the proposed mine site, with the west side of the pad adjoining the CPF/airstrip infield road. The gravel storage pad will cover approximately 11 acres.

7.2.7 Channel Dredging and Spoils Disposal

The dock will require an additional 2 ft of water depth (9 ft of water) to accept ocean-going barges carrying process modules with weights up to 6,000 tons. A channel with a bottom elevation of -9 ft mean lower low water (MLLW) will be dredged from the dock to the -9 ft MLLW isobath approximately 1,000 ft offshore of the dock (Figure 7-14). Approximately 70,000 to 90,000 cy of dredge spoil will be generated based on a channel 400 ft wide and 1,000 ft long with a bottom depth of -11 ft MLLW. The additional 2 feet of over-dredging (-9 ft to -11 ft) are required to compensate for potential channel refilling during the winter, spring, and summer between dredging and module arrival.

The channel will be dredged from the sea-ice during the winter prior to the sealift of process modules. Sea ice over the channel location will be removed in blocks and stockpiled on grounded sea-ice near the shoreline. Excavation will be performed using either a backhoe or a cutter/suction dredge. Spoil excavated by backhoe will be placed in trucks and hauled to permitted disposal areas. Spoil excavated by a dredge will be discharged into bermed areas atop the ice and allowed to freeze, after which it will be excavated and trucked as solid material to permitted disposal areas. Current areas proposed for spoil disposal include the Point Thomson spit, the grounded sea-ice offshore of the Point Thomson spit, the grounded sea ice adjacent to the dock road, and the lagoon coast adjacent to the east side of the CWP.

Additional dredging may be required during the summer the process modules are delivered. Depending on the degree of channel infilling between dredging and module arrival, maintenance dredging or screeding may be required to provide a sufficiently smooth and deep channel for grounding barges prior to unloading. Summer maintenance dredging could be performed using either a backhoe on a barge or a cutter/suction dredge. Spoil excavated by backhoe would be loaded onto a barge and towed to a permitted disposal location. Spoil excavated by dredge would be pumped to a permitted disposal location. Screeding would consist of smoothing the channel bottom without removing material from the water, and thus, no excavation or disposal would be required.

Ocean-going barges delivering process modules will approach the Point Thomson Unit through Mary Sachs Entrance or use Challenge Entrance. Summer screeding may be required prior to barge arrival to ensure that either route is deep enough to allow passage of ocean-going barges with a 9-ft draft. If sufficiently stiff and consolidated seafloor sediments are encountered, a backhoe may be necessary to loosen the material. While the available bathymetry is dated or incomplete at this time, the volume of screed material is anticipated to be approximately 10,000 to 13,000 cy. Additional engineering and logistics evaluations are going to identify the optimal approach for the sealift.

7.3 INFRASTRUCTURE AND SUPPORT FACILITIES

7.3.1 Permanent Camp

The permanent camp, located south of the process facilities, will be designed and built to accommodate 88 people at various times throughout the construction and operation phases. The camp will include a kitchen, laundry, recreational facilities, and sleeping quarters. Water supply and sewage treatment for the camp will be provided through a separate utility module.

A utility module supporting camp operations is planned to contain the potable-water treatment system, the sewage treatment system, the firewater pumps, and an incinerator used for some disposal of facility wastes. This utility module will also contain a potable-water storage tank for camp use. The typical fresh-water requirement for camp operations amounts to 100 gallons per person per day. Gray water from the plant sewage treatment system will be disposed of in the disposal well once that well is operational.

A raw-water storage tank will accompany the camp utility module and serve as the source for the camp potable water and firewater. This tank and associated instrumentation will be heat-traced and insulated to avoid damage during freezing weather. Water tanks will be refilled with local surface water collected either by truck or via a water-supply pipe from two area gravel-mine sites (i.e., an existing mine site and the new mine site, both located about 2 mi south of the CPF).

7.3.2 Warehouse

The warehouse will provide a dry and warm storage area, a rig maintenance area, a vehicle maintenance area, and individual maintenance areas for electrical, instrumentation, and mechanical support. Presently, the warehouse is planned as an insulated rigid-frame metal building. The warehouse floor will be a cast-in-place concrete slab at grade.

Other temporary structures may be erected onsite for maintenance and storage functions. Currently, two temporary 15,000-square-foot construction warehouses will be erected on the central pad. Additionally, one temporary 10,000-square-foot drilling warehouse will be installed on the central pad.

7.3.3 Water Sources

Sea water for 2005 and 2006 sea-ice roads will be withdrawn from locations along the road alignment. Sea water can be obtained by drilling through floating sea ice and then pumping the sea water across the surface of the ice. This technique is used for grounding sea ice and increasing sea-ice thickness in order to provide load-bearing capacity for vehicle travel.

Ice chips for the 2005 and 2006 ice roads are likely to be milled from the surface of the sea ice and the surface of frozen fresh-water lakes. Ice chips provide a solid aggregate to be used in place of liquid water. Ice chips are placed where required and coated with liquid water which provides a binder as it freezes in place. Figure 7-20 shows potential water-source lakes for ice road construction and other activities.

Fresh-water requirements during the first half of 2005 will be supplied from existing year-round water sources located between Endicott and the Point Thomson Unit, including the closed Point Thomson Area Material Site (i.e., Old Mine Site). Sources in the vicinity of the Pt. Thomson CPF include permitted Unnamed Lake and Pt. Thomson Old Mine Site as well as possible future permitted sources. Sources in the vicinity of Badami CPU include permitted Shaviovik Pit, Turkey Lake, and Badami Reservoir as well as possible future permitted sources. Sources in the vicinity of the Endicott causeway landfall include Duck Island Mine Site and Sag Mine Site C (Vern Lake) as well as possible future permitted sources.

Fresh water for construction is typically transported by truck, while fresh water for permanent use is typically transported by an above-grade force-main. Table 7-4 provides previously permitted volumes for water sources used for earlier activities in the Point Thomson area and developments to the west. The Point Thomson Area Material Site, located roughly 2.5 mi south of the CPF, was used as a gravel mine during exploration activities within the Point Thomson Unit. Fresh-water requirements after the 2005 breakup will also be supplied from existing year-round water sources located between Endicott and the Point Thomson Unit. The significantly greater water demand will require that a large portion of the water be drawn from the new fresh-water reservoir created by filling the new gravel mine. The new reservoir will be created by flooding the mine site. An intake structure and associated water line will supply the facility with fresh water from the reservoir (Figure 7-21 through 7-24).

Tables 7-3A through 7-3D summarize conceptual estimates of annual anticipated fresh-water demand during the Point Thomson Gas Cycling project construction and operation. Additional work is presently being completed to refine information on recharge of water sources.

7.3.4 Tankage

Table 7-5 illustrates the tanks and storage areas required for the project. Because the information provided in this table may change as engineering design develops, results of ongoing studies will be used to better define the actual tank sizes, contents, and locations. If required, tanks and associated instrumentation will be heat-traced and insulated to avoid damage during freezing weather.

Diesel fuel is required at the beginning of the project to support initial drilling and construction activities. Later, when the permanent gas-fired power plant is in operation, the diesel tanks will be used to store fuel for vehicles and to support the diesel-powered essential power generators consumption. Four 12,500-bbl tanks will be installed to meet these purposes. This capacity provides sufficient fuel, with resupply by either tanker trucks or barge, to support the various phases of the project through the first two years of construction and operations. The diesel tanks will be designed to applicable American Petroleum Institute (API) standards. The tanks will be double-walled and double-bottomed, with a leak detection system and instrumentation/controls system adequate to safeguard the tank storage, loading, and dispensing operations.

Methanol is required for hydrate and freeze protection for the wells, production and injection lines as well as the process facilities during startup and shutdowns (Table 7-5). Provision will also be made for the storage of several other chemicals to support ongoing operations.

7.3.5 Telecommunications

A private microwave connection (CPF-Badami-Deadhorse) will be the CPF's local/wide area network and PBX telephone network tie-in point to the public switched telephone network, Company wide-area network (WAN), Alaska Clean Seas (ACS, the oil spill response contractor) radio network, distributed control system (DCS) local-area network (LAN) extension to Badami, and CPF Company radio system extension to Badami. Intra-module cabling (horizontal cabling) will be installed to support voice and business LAN data systems within designated modules located on the CPF pad. Redundant fiber optic and multi-pair copper cable runs (backbone) will be used to provide voice, data, DCS signals, and basic process control system signals between modules/locations at the CPF and to/from the East, Central, and West Well Pads.

TABLE 7-3A
POINT THOMSON 2005 FRESH-WATER USE

ACTIVITY	ITEM	ESTIMATED WATER QTY (GALLONS)	POTENTIAL SOURCE(S)
Ice Roads	2005 sea-ice road cap	16,421,100 (7,390,000 gallons fresh water and 44,720 cubic yards [cy] ice chip)	Source(s) in the vicinity of the Point Thomson CPF and West Well Pad; Source(s) in the vicinity of the Badami CPU; and Source(s) in the vicinity of the Endicott causeway landfall.
	Point Thomson dock-to-mine site ice road construction. Spur ice roads to water sources	6,270,000 (2,822,000 gal fresh water and 17,080 cy ice chip)	Existing Point Thomson gravel mine site and shallow lakes between the Point Thomson dock and mine site. Source(s) in the vicinity of the CPF and production well pads; and Source(s) in the vicinity of the Badami CPU.
	Shoreline to Shaviovik Pit ice road	1,425,000 (641,000 gal fresh water and 3,880 cy ice chip)	Source(s) in the vicinity of the Badami and Shaviovik pits.
	Ice road to existing exploratory well sites	11,400,000 (5,130,000 gal fresh water and 31,050 cy ice chip)	Source(s) in the vicinity of the Point Thomson CPF and West Well Pad; Source(s) in the vicinity of the Badami CPU; and Source(s) in the vicinity of the Endicott causeway landfall.
	2005 staging areas	2,700,000 (1,215,000 gal fresh water and 7,350 cy ice chip)	Source(s) in the vicinity of the Point Thomson CPF and West Well Pad; and Source(s) in the vicinity of the Badami CPU.
	2005 maintenance	5,050,000	Source(s) in the vicinity of the CPF and production well pads; Source(s) in the vicinity of the Badami CPU; and Source(s) in the vicinity of the Endicott causeway landfall.
Drilling & Construction	2005 drilling 2 wells @ 3,167,000 gallons per well	6,334,800	Source(s) in the vicinity of the CPF and production well pads.
	2005 temporary construction camp weekly manloading varies from min. 10 people to max. 225 people	2,320,500	Source(s) in the vicinity of the CPF.
2005 Totals	Water use	51,921,400	Source(s) in the vicinity of the CPF and production well pads; Sources in the vicinity of the Badami CPU; and Source(s) in the vicinity of the Endicott causeway landfall.
	20% contingency volume	10,348,000	Same as above.
	Total	62,305,400	

NOTES FOR TABLE 7-3A , 7-3B, 7-3C, 7-3D

1. Sources in the vicinity of the Pt. Thomson CPF include permitted Unnamed Lake and Pt. Thomson Old Mine Site as well as possible future permitted sources. Sources in the vicinity of Badami CPU include permitted Shaviovik Pit, Turkey Lake, and Badami Reservoir as well as possible future permitted sources. Sources in the vicinity of the Endicott causeway landfall include Duck Island Mine Site and Sag Mine Site C (Vern Lake) as well as possible future permitted sources.
2. Sea-ice road cap is nominally 40 ft wide, 6 in. thick and made from pure fresh water (790,000 gallons per mile [gal/mi] by 42 mi long).
3. Dock-to-mine-site ice road is nominally 40 ft wide and 6 in. thick, standard North Slope ice road construction from snow and fresh water (569,100 gal/mi by 2.6 mi long).
4. Spur roads to water sources will be nominally 40 ft wide and 6 in. thick, standard North Slope ice road construction from snow and fresh water (569,100 gal/mi by 20 mi total length).
5. 90-day maintenance period, 42,000 gal applied per day.
6. Pipeline right-of-way ice roads are nominally 100 ft wide and 6 in. thick, standard North Slope ice road construction from snow and fresh water (1,430,000 gal/mi by 28.2 mi total length).
7. 90-day maintenance period, 84,000 gal applied per day.
8. Water quantity for drilling includes sufficient water for the water-based drilling fluid, casing cement and operation of the G&I system for cuttings and drilling fluid disposal. Estimate is based on 3,167,400 gallons per well.
9. 2 wells in 2005.
10. 11 wells in 2006.
11. 7 wells in 2007 and 1 well in 2008.
12. 100 gal per day per person, average camp occupancy: per the table.
13. Hydrostatic testing could be conducted in the summer and fall following construction in which case access to the pipeline will not exist except at the trap and valve sites (i.e., located on pads). Pure fresh water would be used for testing and would be discharged onto the tundra following appropriate filtration and diffusion. Alternatively, the testing program could proceed in March and April, immediately after the pipelines are constructed in which case the ice roads would still be in place and ambient temperature would still be sub-freezing. A 60:40 water/glycol mixture would be used for testing and would be recovered and hauled to an approved facility for disposal or reuse upon completion of testing.
14. 100 gal per day per person, for domestic water use in camp.
15. May construct ice road in winter 2007 and/or 2008 for drilling demobilization.

TABLE 7-3B
POINT THOMSON 2006 FRESH-WATER USE

ACTIVITY	ITEM	ESTIMATED WATER QTY (GALLONS)	POTENTIAL SOURCE(S)
Ice Roads	2006 sea-ice road cap	13,721,100 (6,175,000 gal fresh water and 37,370 cy ice chip)	Source(s) in the vicinity of the CPF and West Well Pad; Source(s) in the vicinity of the Badami CPU; and Source(s) in the vicinity of the Endicott cause-way landfall.
	Pipeline right-of-way ice road construction Spur ice roads to water sources	139,233,600 (62,655,000 gal fresh water and 379,180 cy ice chip)	Source(s) in the vicinity of the CPF and the East and West Well Pads; Source(s) in the vicinity of the Badami CPU; and Sources in the Old PTU and New PTU Pit.
	2006 maintenance	6,900,000	Source(s) in the vicinity of the CPF and pro-duction well pads; Source(s) in the vicinity of the Badami CPU; and Source(s) in the vicinity of the Endicott cause-way landfall.
Drilling & Construc-tion	2006 drilling	34,841,400	Source(s) in the vicinity of the CPF and pro-duction well pads.
Domestic	2006 construction camp and permanent camp, weekly manloading varies from min. 185 people to max. 409 people	10,298,400	Source(s) in the vicinity of the CPF.
Hydrostatic Testing	Gathering pipeline hydro-static testing, summer/fall program	550,000	Source(s) in the vicinity of the CPF and pro-duction well pads, accessible from the pads or access roads.
	Condensate export pipe-line hydrostatic testing, summer/fall program	720,000	Source(s) in the vicinity of the Badami CPU pad, accessible from the pads or access roads.
	Well pad and CPF piping and vessel testing	30,000	Source(s) in the vicinity of the CPF and pro-duction well pads, water will be blended with glycol to form a 60:40 mixture.
2006 Totals	Water use	206,294,500	Source(s) in the vicinity of the CPF and pro-duction well pads; Sources in the vicinity of the Badami CPU; Source(s) in the vicinity of the Endicott cause-way landfall; and Sources from the New PTU Pit.
	20% contingency volume	41,258,900	Same as above.
	Total	247,553,400	

TABLE 7-3C
POINT THOMSON 2007 FRESH-WATER USE

ACTIVITY	ITEM	ESTIMATED WATER QTY (GALLONS)	POTENTIAL SOURCE(S)
Ice Roads	None	N/A	
Drilling & Construction	2007 drilling	22,171,800	Source(s) from the New PTU Pit and Old PTU Pit.
Domestic	2007 construction camp and permanent camp, weekly manloading varies from min. 264 people to max. 394 people	11,146,100	Source(s) from the New PTU Pit and Old PTU Pit.
2007 Totals	Water use	33,317,900	Source(s) from the New PTU Pit and Old PTU Pit.
	20% contingency volume	6,663,580	Same as above.
	Total	39,981,480	

TABLE 7-3D
POINT THOMSON 2008 FRESH-WATER USE

ACTIVITY	ITEM	ESTIMATED WATER QTY (GALLONS)	POTENTIAL SOURCE(S)
Ice Roads	None	N/A	
Drilling & Construction	2008 drilling 1 well @ 3,167,400 gal-lons	3,167,400	Source(s) from the New PTU Pit and Old PTU Pit.
Domestic	2008 construction camp and permanent camp, weekly manloading varies from min. 150 people to max. 200 people	5,657,900	Source(s) from the New PTU Pit and Old PTU Pit.
2007 Totals	Water use	8,825,300	Source(s) from the New PTU Pit and Old PTU Pit.
	20% contingency volume	1,765,060	Same as above.
	Total	10,590,360	

TABLE 7-4
EXAMPLE PERMITTED VOLUMES FOR FRESH WATER SOURCES IN THE POINT THOMSON AREA AND TO THE WEST

WATER SOURCE	GENERAL LOCATION	CURRENT/ PAST BPXA PERMIT #	PERMITTED VOLUME TOTAL FOR ALL SOURCES (CURRENT OR PAST)	ESTIMATED VOLUME (GAL)	ADF&G RESTRIC-TIONS?	COMMENTS
Duck Island Mine Site	Endicott Road	LAS 13290	221 acre-ft per year (72,000,000 gal)	600,000,000	No	Past permitted volumes based on need rather than availability
Sag Mine Site C (Vern Lake)	Endicott Road	LAS 13629		792,000,000	Yes	
Badami Reservoir	Badami Devel-opment	LAS 19045	12.27 acre-ft (Oct 1 to Jun 1) (20,000,000 gal) 6.14 acre-ft (Jun 2 to Sep 30) (10,000,000 gal)	86,000,000	Yes	Drinking water source
Turkey Lake	South of Badami CPU			730,000	No	Relatively shal-low lake
Shaviovik Pit	Shaviovik River Delta, west of Badami CPU	LAS 14042 (due to expire May 2003)	1125.27 acre-ft per year (370,000,000 gal)	125,000,000	No	Typically used in ice roads to Badami
Point Thomson Old Mine Site	Point Thomson Unit develop-ment area			104,000,000	Unknown	--
Point Thomson New Mine Site	Point Thomson Unit develop-ment area	--	--	527,318,230	Unknown	--
Unnamed Lake	Point Thomson Unit develop-ment area (Sec. 22 & 23, south of airstrip)	--	--	923,000	No	Used for Yukon Gold and Sour-dough ice roads

TABLE 7-5
PROPOSED TANKS AND STORAGE AREAS

LOCATION	DESCRIPTION	APPROXIMATE SIZE	NOTES
CPF PAD	Potable and Fire-Fighting Water Tank	2 tanks at 2,000 bbl/each	Located adjacent to the utility module building
	Fine-Water Mist System Fire-Fighting-Water Tank	1,400 bbl	Located within a module
	Cold Storage Area (chemical, lube oil, etc., drums and containers)	50 ft by 150 ft This is approximate size and may be adjusted once quantities better defined	Located outdoors, lined with high-density polyethylene attached to a 1-ft-high retention curb
	Diesel Fuel Tank	4 tanks @ 12,500 bbl each (One tank may be converted to produced water and the other to condensate storage)	Located outdoors, with double-walls and double-bottoms
	Drag Reducing Agent Tank (future)	500 to 800 bbl	Located outdoors, insulated and heated (may be a tanker)
	Methanol Tank	1 tank @ 2,500 bbl (CPF) 1 tank @ 30 bbl (CWP)	Located outdoors
	Produced Water Tank	2,000 bbl	Located outdoors; may be double-walled
	Raw Water Tank	240 bbl	Outdoor or utility module
	Other Production Chemicals (corrosion inhibitor, emulsion breaker, etc.)	Various	In totes or small tanks at locations where required (CPF, CWP, East and West Well Pads)
	G&I System Storage Pit (cuttings storage)	20,000 bbl (115 ft by 265 ft)	Open area with perimeter berms and synthetic liner
EAST & WEST WELL PADS	Methanol Tank	2,000 bbl	Located outdoors, each pad
	Diesel Tank	2,000 bbl	Located outdoors, each pad
	G&I System Storage Pit (cuttings storage)	16,000 bbl	Located outdoors, each pad

A PBX telephone switch will provide local telephony/fax services for Company personnel at the CPF. A multi-channel, conventional digital repeater system will provide Company personnel within the CPF and personnel traveling along the pipeline with continuous radio communications. A multi-channel, conventional analog repeater system will be dedicated to supporting emergency response activities at the CPF and along the pipeline route, and will be used for spill response. Miscellaneous radio and navigation systems will be installed in each ACS vessel at the CPF to support emergency response activities.

A color closed-circuit television system (CCTV) will be installed to visually monitor select areas at the CPF and wellpad locations. An entertainment system will be provided for the CPF living quarters and other communal areas.

A new communication tower and associated equipment will be installed on the Point Thomson CPF Pad. The existing communication tower at Badami will act as a repeater system enabling the exchange of voice and data signals between Point Thomson and Prudhoe Bay (Deadhorse), existing systems on the North Slope (e.g., ACS), and the outside world. The CPF tower is presently planned to be approximately 300 ft tall, and will be the facility's tallest structure. Depending on structural design of the existing Deadhorse tower, a new communications tower (approximately 175 ft) may be required at the existing ExxonMobil pad at Deadhorse.

A separate communication building will, for reasons of radio frequency (RF) efficiency, house all RF equipment at the CPF. This building will be located in a manner that minimizes RF cable runs between the tower and the communications building, as well as the direct impact of ice falling from the tower onto the building. The building will be connected to the main Telecommunications Equipment Room via fiber optic cable in order to provide communications continuity.

7.3.6 Electrical Power Facilities

Fuel gas prior to startup of the facility is necessary to provide power to the drilling rigs and construction activities on each pad. The initial two wells on each pad will be drilled using diesel for rig fuel. In order to minimize onsite diesel storage requirements, subsequent wells on each pad will be drilled using natural gas produced from the Thomson Sand through the first well. The condensate associated with this gas will be separated at the surface and reinjected into the Thompson Sand through the second well. Alternative methods under consideration for disposing of the condensate include injection into the tubing by casing annulus, injection into the top of the Pre-Mississippian formation, and disposal down the Class I disposal well. Condensate produced during well testing activities will be reinjected in a similar manner.

Diesel-powered electrical generators will be used to meet early electrical demand for construction infrastructure and life support. Early power requirements at Point Thompson are estimated to be about 5,700 kilowatts (kW). Three 33% units each sized at 2,150 kW will be used to meet these requirements. The drilling rigs will generate their own power requirements, initially from diesel and later from gas produced from the initial well at each pad and treated by an early fuel gas system. Having the drilling rigs provide their own power reduces the size of the central power generation facility. Gas-fired turbines will become the primary power source for the electrical generators once fuel gas is available. The diesel generators will then become available to provide backup power for essential and emergency loads in the facility.

The power requirements currently identified for Point Thomson peak at about 18,000 kW with normal loads expected to be about 16,000 kW. Four 33% gas-fired electrical generators each sized at 7,000 kW will meet these requirements. These generators will be located at the CPF. Power feeds to the permanent facilities at the East Pad, West Pad, airstrip, and mine/water reservoir will be provided using power cables fed from the 13.8-kilovolt (kV) switchgear at the CPF module. The permanent power cables will be buried in the gravel roads. Transformers will be provided at each location to provide the required voltage.