

5.0 PROCESS FACILITIES

5.1 PROCESS OVERVIEW

The Thomson Sand reservoir is being developed as a gas cycling project. Under this development plan, three-phase full-well-stream production gathered from remote well pads (East and West Well Pads) will be sent to a Central Processing Facility (CPF) where the condensate will be separated and stabilized to meet export (sales) pipeline specifications. The residue gas will then be reinjected at the Central Well Pad (CWP) located adjacent to the CPF. A small amount of gas will be used to fuel the facility. These facilities are described in detail in the following sections. Figure 5-1 is a simplified flow diagram showing the basic conceptual CPF process, while Figure 5-2 is a map showing the overall layout of the well pads, CPF, and related pipelines and infrastructure (roads, dock, airstrip, etc.).

The development basis consists of a “three-train case” in which production rates are dictated by the capacities of the three injection compressor trains. The term “train” is used to define a collection of facility components which together perform a basic process function. This term is typically used when referring to the number of similar groupings of components that are parts of an overall plant or facility. Therefore, “three trains” of injection compression indicates that there are three sets of equipment of similar design and capacity (Figure 5-3). Each train is discrete and does not share components with the other trains. For the three-train cycling case, there are three trains of injection compression and a single train of flash gas compression.

5.2 PRODUCTION WELL PADS

Both the East and West Well Pads will be production well pads. The West Well Pad will be located approximately 7 mi west of the CPF Pad; the East Well Pad will be approximately 6 mi southeast of the CPF. Figures 5-4 and 5-5 show plan views for the East Well Pad and West Well Pad, respectively. The exact shape, dimensions, and layout of the pads will change as engineering design matures. Significant features and approximate dimensions of the East and West Well Pads include the following:

- East Well Pad, which can accommodate up to nine production wells (base case = 7), will cover about 6 acres.
- West Well Pad, which can accommodate up to eight production wells (base case = 6), will cover approximately 6 acres.
- Both pads will be surface-graded to allow for effective spill collection.

The East Well Pad will have seven production wells initially, with space provided for up to two additional wells, if needed. During the drilling phase, much of the pad area will be taken up with facilities and services to support drilling, including a temporary early-fuel-gas conditioning skid. When production begins, the facilities located on this pad will include a production manifold,

well metering and control facilities, an electrical building, methanol tank and injection system, and a gathering-line pig launcher. Production wells will be aligned in a row and spaced 40 ft apart. Production from each well will be measured using three-phase meters, and thus a permanent test separator is not envisioned at this time.

The West Well Pad will have six production wells initially, with space provided for up to two additional wells, if needed. The facilities provided on the West Well Pad will be similar to those on the East Well Pad. Differences arise due to the number of wells planned.

5.3 PRODUCTION GATHERING LINES

Production fluids from both the East and West Well Pads will be piped from the well manifolds to the gathering lines and then to the CPF. Construction material for the gathering lines is 22 Chrome duplex stainless steel. The gathering lines will be configured with a pig launcher on the well pad end and a pig receiver at the CPF end. The lines will be placed on vertical support members (VSMs) sized to maintain a minimum 5 ft height above the tundra. The gathering lines will be routed on the inland side of the access roads so that the road will act as a containment barrier in the event of a line leak. Pressure monitoring is planned as the primary means of leak detection for gathering lines, which will also be visually monitored from the infield roads during the course of routine operations. This is a typical means of monitoring in-field gas gathering lines on the North Slope of Alaska.

The well flow rate and inlet pressure to the gathering lines will be controlled so that the normal minimum delivery pressure at the plant will be approximately 3,040 psi atmosphere (psia). Normal flowing temperatures in the gathering lines will be over 170° Fahrenheit (°F), with normal temperature drops of 10°F or less. Because the estimated hydrate point of the produced gas at flowing pressure is ~80°F, the gathering lines will be insulated to delay cooling of the piping to ambient conditions when the flow is stopped or restricted. This will delay hydrate formation in the gathering line and the associated problems.

5.4 CENTRAL PROCESSING FACILITY

The CPF Pad is the largest of the gravel pads and the location for the Central Production Facility including the main process and utility modules, and related support and infrastructure facilities. Figure 5-6 provides the plan view, while Figure 5-7 shows the cross-section of the preliminary CPF Pad. While the exact shape, dimensions, and layout of the pad will change as engineering design matures, the total area of the pad is not expected to change significantly. Some of the significant features of this pad are follows:

- The pad will have an approximate area of 35 acres, and
- The pad will be surface-graded to allow runoff to be efficiently collected and routed away from the CPF and camp infrastructure.

The CPF Pad layout will be as required to accommodate the CPF modules and equipment, the permanent camp (including the central control room), the construction/drilling camp, the camp utility modules, the warehouse or Operations Support Center, the power generation modules, the communications tower and building, the diesel and methanol storage tanks, a cold storage area, and all associated pipe racks, cable racks, and storage equipment. In addition, there will be a short

road to accommodate maintenance access to the CPF high- and low-pressure flares. The final layout of the equipment will accommodate the best arrangement for construction, operation, safety, and fire protection.

5.5 INJECTION LINES AND CENTRAL WELL PAD

The CWP will be located adjacent to and directly north of the CPF Pad. During the early construction phase of the project, the CWP will be used primarily to support drilling operations. It will contain a Class I disposal well, a mobile grind-and-inject (G&I) facility with the rig, drilling equipment and supplies, a mud plant, an electrical building, an early-fuel-gas treating facility, and storage areas for drilling activities. Approximately eight gas injection wells will be drilled initially from the CWP. Space is available for two additional gas injection wells on the CWP in the event that one or more wells not currently planned are needed for the project. High-pressure gas piping will transport the gas from the CPF Pad to the injection wells located at the CWP. Space is also provided on the CWP for two additional disposal wells. The current UIC application provides for two Class I disposal wells; the third disposal well is not being permitted at this time.

Figures 5-8 and 5-9 provide the plan view and cross section, respectively, of the conceptual CWP. While the exact shape, dimensions, and layout of the pad will change as engineering design matures, the overall area is not expected to change significantly. Important features of the CWP include the following:

- The pad will have an approximate area of 15 acres.
- The pad will incorporate the existing Point Thomson Unit #3 exploratory gravel pad.
- The pad will be surface-graded to allow runoff to be efficiently collected and routed away from the wells, well-pad facilities, and adjacent CPF.
- Carbon steel will be used for the injection lines.

Wells on the CWP will be aligned in a row and spaced up to 40 ft apart. Flow meters will be installed on each gas injection well to measure the volume of gas injected. Separate piping will transport treated camp gray water and produced water from facilities on the CPF to the UIC Class I waste disposal well.

The well pad area and design will be adequate to accommodate the initial drilling operations and drilling storage requirements to support work at the satellite pads as well. The pad will also be suitable for ongoing well maintenance and service rig access, and future drilling activities, as well as for the equipment and facilities needed for gas injection.

Permanent facilities to be located on the CWP include a separator and fuel-gas-treating skid for providing early fuel gas and fuel gas for a plant black-start.

Gas discharged from the gas injection compressors will be piped directly to the CWP and injected down the designated injection wells. Because of the proximity of the CWP to the CPF, all injection lines will be run on VSMs or a pipe rack from the compressor area to the injection manifold.