Pipeline building a choreography of coordinated steps

By Larry Persily lpersily@kpb.us
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(This update, provided by the Kenai Peninsula Borough mayor's office, is part of an ongoing effort to help keep the public informed about the Alaska LNG project.)

The Alaska LNG project is a planning and coordinating effort of immense proportions. Not surprising when you consider that the pipeline construction alone requires piecing together about 115,000 40-foot-long sections in precise order, in rough terrain, in remote locations — and with 446 waterbody crossings.

That's 447 if you count the almost 30 miles across Cook Inlet to reach the proposed liquefaction plant at Nikiski.

The project teams are mapping out every detail of building 870 miles of pipeline to move natural gas from Point Thomson to Prudhoe Bay (about 63 miles of 32-inch-diameter pipe) and on to Nikiski (about 807 miles of 42-inch pipe). The right amount of pipe has to be at the right place at the right time with the right equipment for welding, digging and pipe laying during two years of construction, and that's after two years of prep work to build construction camp and compressor station pads, storage yards, clear rights of way, develop gravel sources and create access roads.

No easy task when you're moving and frequently relocating 9,000 pieces of equipment that would be used to build the mostly buried pipeline. Still more equipment would be used to build the North Slope gas treatment plant and the liquefied natural gas plant and marine terminal at Nikiski. An estimated 5,000 to 7,000 workers would be on the pipeline crews, with all of them living in work camps. Several thousand more are expected on the job at the gas treatment plant and the LNG plant, with the project estimating 15,000 workers total.

Pipe storage yards would be sited about every 18 miles along the route, with the project requiring about 18 million cubic yards of gravel for access roads, pipeline right of way and compressor station pads. The project would use existing pads wherever practical.

Think of it as a choreography of engineers, geologists, biologists, environmental specialists and logistics planners. Everyone has a role and everything has its place. And it's all synchronized for efficiency, cost savings and to limit environmental impact.

"Pipeline construction is a moving assembly line," an Alaska LNG team member said.

INFORMATION SHARING AT WORKSHOPS

Almost two dozen Alaska LNG team members met with nearly three dozen federal and state regulatory agency personnel June 24-25, 2015, in Anchorage to share preliminary plans for pipeline construction and waterbody crossings and to listen to how and where the plans might be improved.

It’s not only construction needs that dictate the planning work. There are operational issues to consider, too. For example, the gas will be cooled for transit through permafrost zones along the proposed route so that it doesn’t melt the ground. That will require cooling units at the first six compressor stations whose job is to keep pushing gas through the line.

But the last two compressor stations on the route southward, including the one before the line enters Cook Inlet, will be built with heating units to warm up the gas in an effort to match the ground temperature in Southcentral Alaska and the water temperature in the inlet. Just as thawing frozen ground is bad, so too is freezing soil in the wrong places.

The gas temperature should mimic the terrain it moves through, not change it. As an Alaska LNG team member said, the idea is to work with Mother Nature, not against her.

If the project stays on schedule, if the marketplace cooperates, if the project sponsors and the state of Alaska successfully negotiate fiscal terms, and if investors sign up for the $45 billion to $65 billion project, site preparations for the pipeline work could occur in 2020-2021, with actual pipeline construction in 2022-2023 and first LNG production in 2024-2025. There are a lot of unknowns to get to that point, but the project teams are doing their part to get ready.

The teams are from project partners ExxonMobil, BP, ConocoPhillips and TransCanada. The state of Alaska is also an investor in the project.

WATERBODY CROSSINGS

Of the 446 waterbody crossings, Alaska LNG’s preliminary plan is to:

- Use open-cut trenching to install the pipe in a little more than half the locations.
- Temporarily restrict or divert the water flow for pipeline installation at fewer than half the crossings — called “flow isolation”.
- Drill and pull the pipe under the river or bridge the waterway in a small number of locations, likely single digits.

While still preliminary, the plan is to dig trenches and lay pipe across approximately half the open-cut water crossings during the winter, when the flow is frozen or minimal. The others would be crossed during the summer, when crews would work fast and, in some small crossings, the pipe could be in place in a matter of hours.

Temporary diversions would be used for the flow-isolation crossings, which could include water-filled “aqua dams,” sand bags, concrete blocks, steel flumes or pipes — it just depends on the water flow, soil and site conditions, team members explained.

Alaska LNG will decide on the most appropriate water-crossing methods in consultation with the Alaska Department of Fish and Game, U.S. Army Corps of Engineers and other state and federal agencies. Pipe specifications will be under the jurisdiction of the U.S. Pipeline and Hazardous Materials Safety Administration.

The “trenchless” crossings will use horizontal directional drilling to run pipe under the river bottom. The process involves drilling an initial pilot hole beneath the river, about 5¼ inches in diameter, then using successively larger drill heads to ream out the hole, making it bigger until it is maybe a foot larger in diameter than the 42-inch steel pipe, team leaders told federal and state regulators. The full length of the pipeline, all welded together and laid out in a large staging area at the entrance to the hole, is then pulled through to the other side.

An Alaska LNG pipeline team member said the process is so accurate that crews can drill the pilot hole and hit a stake on the other side of a river.

But sometimes the river is too deep, the ground too full of boulders or the geology just not right to go through or under the waterway. In those cases, the Alaska LNG teams are looking at building pipeline bridges, especially in areas of steep terrain.

A particularly steep area along the route is in the Nenana Canyon, just south of the community of Healy and east of Denali National Park, in a tight area of the Parks Highway, Nenana River and Alaska Railroad. Project teams are working to find the best way through that congestion.

The bridge proposals are still preliminary, as are all of the water crossings, team members told state and federal regulators. The teams and their consultants have a lot of work to do this summer to firm up their plans, with more information and a lot of details to come in the next round of environmental reports the project expects to file in February 2016 with the Federal Energy Regulatory Commission.

In addition to consulting with state and federal wildlife, lands and water managers, Alaska LNG will be working with a visual-impact consultant regarding the bridges, which likely would be within eyesight of travelers on the Parks Highway, a National Scenic Byway.

PIPELINE CONSTRUCTION PLANS

Much of this summer’s field work and office analysis is aimed at better identifying soil conditions, terrain, hillsides, vegetation, geology, safety and environmental concerns as Alaska LNG continues to make decisions not only on waterbody crossings but also pipeline specifications to match different ground conditions such as discontinuous permafrost that would put additional stress on sections of pipe.

Highway and road crossings will be underground, generally at least four feet below the road base, the teams reported, with heavier steel pipe for additional protection.

Current plans, subject to change, show about 45 percent of the Prudhoe-to-Nikiski pipeline built in the winter season and 55 percent in the summer, over two years. Depending on the weather — freeze-up, break-up, road restrictions and terrain — some of the pipe laying could be done in shoulder months, the teams said.

All 63 miles of the Point Thomson line would be built above ground and during the winter.

The mainline would likely be divided into four “spreads” of about equal mileage, with four contractors all working at the same time on their spread. Crews would move around, laying pipe in areas best suited for the season. Frost heaves, permafrost, thaw settlement, steep terrain and fish and wildlife would be among the considerations in deciding summer and winter work.

Some areas will be more easily accessible to work crews than others. Reaching the pipeline work on the West Side of Cook Inlet will be challenging, the teams reported. Contractors would move some equipment and pipe by barge from Anchorage, and the current proposal is to move much of the equipment across the frozen Yenta River in the winter, then park it there until construction work resumes with warmer weather for the final southerly push toward tidewater.

For those last miles on the West Side of Cook Inlet, the pipeline route would be in the uplands, away from the wetlands and the ENSTAR gas line and behind the Beluga power plant before turning toward the inlet.

The Cook Inlet crossing would be a separate contract; that work will be covered in an Alaska LNG workshop for state and federal regulators in August.

Pipe laying on the Kenai Peninsula, for the last miles to the LNG plant site, would be scheduled for the second construction summer, 2023, according to preliminary schedules.

Cook Inlet pipeline crossing is about making the best choices

By Larry Persily lpersily@kpb.us
Aug. 26, 2015

(This update, provided by the Kenai Peninsula Borough mayor's office, is part of an ongoing effort to help keep the public informed about the Alaska LNG project.)

Crossing Cook Inlet is about deciding the best route and the best construction methods, while acknowledging that although the shortest distance between two points is a straight line, it's not necessarily the best line.

Beluga whale critical habitat, salmon fisheries, 40-foot boulders, 15-foot-tall sand waves along the ocean bottom, strong currents, shallow water close to shore, ice scouring that could expose or damage a pipeline — each one presenting its own problems best avoided as much as possible as Alaska LNG teams continue refining the preferred route for the natural gas pipeline to cross Cook Inlet on its way to shore in Nikiski, site of the proposed liquefied natural gas plant.

That route, which covers almost 30 miles across Cook Inlet to reach Nikiski, on the Kenai Peninsula, was the subject of a workshop Aug. 19 in Anchorage presented by Alaska LNG project teams and attended by more than 20 federal and state regulatory agency staff.

Other workshops have been held or are planned regarding the project's gas treatment plant that would be built on the North Slope and the 765-mile pipeline route and construction methods from Prudhoe Bay to reach the shore of Cook Inlet.

"Cook Inlet is a very, very unique place in the world," a project team member said. "There is a lot going on here." That includes currents that move at 4 to 6 knots and a tidal range that can vary up to 25 feet between high and low water in the main body of the inlet.

Not that a pipeline can't be safely built in Cook Inlet. The first was built more than 50 years ago, and many oil and gas lines have been added since. But this one would be bigger and heavier and carry more natural gas than any other pipeline sitting on the ocean floor in the extensively developed area.

The 40-foot-long sections of 42-inch-diameter, inch-thick steel pipe for the Alaska LNG project's Cook Inlet crossing would be coated with as much as 6 inches of concrete to protect the pipe and weight it down on the seafloor against the currents. Each section would weigh as much as 33 tons, the equivalent of 15 pickup trucks, a team member told the workshop audience.

FIELD WORK CONTINUES

Summer field work for the project continues, with crews sampling soils, measuring currents and judging the options for where best to enter the water on the west side of Cook Inlet, how to install the pipe across the inlet, and where to come up at Nikiski for the final miles to the plant site.

Alaska LNG currently plans to submit more detailed maps and environmental data to the Federal Energy Regulatory Commission in perhaps February, producing the second draft of the project's "resource reports" — 13 volumes of engineering, construction, environmental and other data that will go into the environmental impact statement. The project teams told regulatory agency personnel Aug. 19 that their comments would be considered and addressed in that second round of draft reports.

The project sponsors currently plan to submit final reports to FERC next fall, along with their full application for federal authority to construct and operate the pipeline and LNG plant — assuming commercial negotiations between the partners and the state of Alaska proceed on schedule, and that the marketplace cooperates for the investment estimated at $45 billion to $65 billion.

The FERC-led EIS process could take two years. Construction, if all goes well, could start late 2018 or early 2019, and last five years.

WEST ROUTE PREFERRED

The project teams have looked at multiple options for crossing Cook Inlet and are now focused on what they call the West Route. That comes down the west side of the inlet and enters the water just south of the small community of Beluga, an area of gas wells, a few industry-support jobs, some retirees and beach setnet fisheries, some rudimentary roads, a modest collection of homes surrounded by public lands — and a gas-fired power station serving Southcentral Alaska.

The teams earlier this year dropped active consideration of the East Route, which would have steered the pipeline at the southern end of its trek from Prudhoe Bay on an eastward course toward Point MacKenzie (across Knik Arm from Anchorage) and then into the inlet for its undersea run to the Kenai Peninsula. At the Aug. 19 workshop, project teams repeated many of the same disadvantages with the East Route that Alaska LNG Project Manager Steve Butt described for Alaska state legislators at a hearing in June.

The East Route has significantly more hazards, hurdles and handicaps, including undersea power cables, an onshore military gunnery range, Area 1 critical habitat for endangered beluga whales, additional ice load close to shore, an actively dredged shipping channel, and a much longer run from shore to reach water deep enough for a pipe-laying barge to gain access. "We're trying to stay out of other people's way," a team member said at the workshop.

For example, the teams explained, entering the water near Point MacKenzie would require burying the pipe in shallow water as much as 2 miles out to reach 20 feet of water, more than 3

miles to reach water 35-feet deep and more than 5 miles to get out to 40 feet of water. Distances to deep water with the preferred West Route are half as far.

The shorter the pipeline run to deep water, the sooner a pipe-laying barge can start its work, saving money and environmental impact to the shore and seabed.

SEAFLOOR, CURRENTS and SAND WAVES

The East Route would pass through an area of upper Cook Inlet with a "migrating seabed," the team reported, noting that the height of some areas of the seafloor have changed 40 feet in a seven-year period. "Those are massive changes … not a good thing when you're looking for a stable seafloor to put pipe on." The West Route crosses a more stable seabed.

The East Route would measure about the same distance beneath Cook Inlet waters as the West Route but would come to shore on the Kenai Peninsula farther away from the proposed LNG plant site, adding 13 more miles to onshore pipeline construction at a significant cost to the project.

The West Route also presents the advantage that the pipe-laying barge would run closer to parallel to Cook Inlet's strong currents for more of the crossing, while the East Route finds itself more perpendicular to the currents much of the time — not impossible, but increasing the difficulty on the job.

And there are the sand waves in the path of the East Route. "Some of the biggest ones we saw were 15 feet tall trough to peak, with a wave length of 100 to 200 feet," an LNG project team member said. Undersea sand waves and strong currents could risk exposing or even moving the pipe, despite all the concrete to hold it in place.

BLUFFS and BOULDERS

The West Route is not without its problems, too. The project teams are looking at two possible entry points on the West Side of the inlet: Beluga Landing (just north of Viapan Lake), and Shorty Creek just a little south of there. The shortest distance to deep water is one of the considerations as the teams work to decide the best option. The height of shoreline bluffs is another consideration; the 100-foot bluffs at Shorty Creek are steeper than the shoreline at Beluga Landing.

The teams are looking at two options for landfall on the Kenai Peninsula: Boulder Point, aptly named for its cabin-sized boulders; and a couple of miles northeast near Suneva Lake. In addition to big rocks, Boulder Point has a steep bluff — 200 feet, at some points. The boulders and bluffs are not ideal.

Both sites would require about 12 miles of buried onshore pipeline to reach the LNG plant site.

Alaska LNG will address all of its route options in its second round of draft resource reports early in 2016.

The onshore entrance and exit in Cook Inlet would involve either trenching and covering the pipe, tunneling the line to reach deep water, or a combination, team members said.

Burying the pipe close to shore protects against damage from ice scouring and keeps the line out of harm's way from fishing vessels and other marine traffic in shallow water. That's less of a problem in the deeper waters, where the pipe would sit on the bottom.

Tunneling to reach deeper water could involve one or both of two options:

- "Direct pipe," similar to horizontal directional drilling — but different. A boring machine head is attached to the front end of the pipe and pushed through the earth as it grinds and churns its way to its deep-water destination. The speed and direction of the boring head is controlled by cables running through the pipe. The cuttings are pumped through hoses strung inside the pipeline for proper disposal at the back end. Sections of pipe are added to the string as it is pushed through the soils behind the drill head.

- In horizontal directional drilling, the crew would drill a pilot hole the length of the pipeline route to deep water, then use successively larger drill heads in multiple runs to ream out the tunnel to accommodate the 42-inch pipe. For the Cook Inlet job, a small jack-up rig likely would be positioned at the water end of the pipeline from shore to aid in pulling the heavy pipe through the hole.

The direct-pipe method requires less drilling but is limited in how far it can reach. An LNG team member reported the method has been used as far as 4,000 feet in "benign soils," but probably would not go that far in Cook Inlet's conditions. Directional drilling can reach farther.

Horizontal directional drilling has been used by the industry almost 40 years, while the direct-pipe method is about 5 years old, a team member explained, and both methods would avoid or limit open-cut trenching along the shorelines. Team members told agency officials that Alaska LNG is still reviewing the benefits — and the disadvantages and costs — of all the options, and would provide more information in next year's reports.

HOLD THAT BARGE STEADY

Once the route is into deeper water, a pipe-laying barge would handle the work. Team members explained the 40-foot sections of pipe would be welded together aboard the vessel and then lowered off the stern of the barge in a continuous stream — gently and precisely — for positioning on the seabed.

The size of the barge will be determined by several factors, but it could be 400- to 500-feet long, up to 200-feet wide, with a draft of 20 to 35 feet — perhaps twice the size of any pipe-laying barge that's ever been used in the inlet, a team member said.

The crew onboard could total as many 400 workers.

Anchor-handling tugs, perhaps three, would assist in positioning the pipe-laying barge. Keeping the barge in position will require multiple, massive anchors and chains, each extending as much as a mile from the barge.

Safety and exclusion zones would be established around the barge, with the project coordinating with the U.S. Coast Guard and local authorities.

Alaska LNG is planning on two construction seasons for the Cook Inlet water crossing, working April through September, or thereabouts, to avoid any ice. The West Route runs generally due south cross Cook Inlet to Nikiski, staying east of offshore oil and gas platforms.

LNG plant construction a huge undertaking

By Larry Persily lpersily@kpb.us
Sept. 16, 2015

(This update, provided by the Kenai Peninsula Borough mayor's office, is part of an ongoing effort to help keep the public informed about the Alaska LNG project.)

Alaska LNG project teams played it by the numbers — really big numbers — in a presentation on construction plans to federal, state and municipal officials:

- Site preparations for the proposed liquefied natural gas plant and massive LNG storage tanks in Nikiski would require stripping up to 4 million cubic yards of loose soil, soft peat moss and other vegetation. That's more than enough to cover a rough trail 10 feet wide, a foot deep from New York City to Houston.
- Crews would then need to excavate as much as 6 million cubic yards of frost-susceptible material — up to 6 feet deep in some areas — to prepare the site for construction. Some of the material could be reused as fill, while other material would need to be trucked in to complete the base.
- The two domed LNG storage tanks would each measure 305 feet in diameter, more than large enough for a Boeing 747 to spin around inside without scraping its wings.

All of the numbers are approximate and subject to change as the project teams refine the design, they reminded participants at workshops held Sept. 2 and 3 in Anchorage. More than 20 Alaska LNG project team members were at the workshops to brief government agency officials and answer questions.

Add in the jetty, the twin loading berths for LNG carriers, and other offshore and onshore components of the Nikiski project, and the preliminary numbers continue adding up:

- The project would use 800,000 cubic yards of gravel, 300,000 cubic yards of concrete, 300,000 cubic yards of armor rock, 100,000 tons of structural steel, 6,500 pilings, 7 miles of electrical wiring, almost 200 miles of aboveground piping, and 20 miles of buried pipe.
- The trestle to reach the loading berths could be as much as 3,200 feet long — more than half a mile — to reach water deep enough for the LNG carriers to safely maneuver.
- Though no substantial dredging would be needed for the jetty and loading berths, an estimated 1 million to 2 million cubic yards of dredging would be required at the temporary dock that would be built for offloading materials from barges and heavy-lift vessels during construction.
- The 250-megawatt, gas-fired power plant at the site would generate enough electricity to run a city of several tens of thousands of homes.
- Peak construction workforce at the Nikiski site would be 4,000 to 6,000 workers.

PLANNING WORK CONTINUES

The LNG team reported that ongoing engineering and construction planning includes several goals: Limit truck traffic in the area as much as possible, limit dredging as much as possible, and maintain public access throughout the area as much as possible.

The informational workshops were part of a series provided by Alaska LNG for regulatory agencies. The project partners — ExxonMobil, BP, ConocoPhillips, TransCanada and the state of Alaska — plan to submit their second draft of environmental and engineering reports to the Federal Energy Regulatory Commission in first-quarter 2016. The final reports and complete project application could come third-quarter 2016 as the partners work through regulatory and permit issues for the $45 billion to $65 billion project to move Alaska North Slope gas to market.

In addition to the LNG plant at Nikiski, the project includes 806 miles of pipeline to reach the plant site from North Slope gas fields and a gas treatment plant to remove carbon dioxide and other impurities before the gas enters the pipeline.

Alaska LNG has been buying up property around the proposed plant site in Nikiski, accumulating ownership or options on about 600 acres of the 800 to 900 acres needed for the operation. Team members reported that demolition could start later this month on some structures. They also are doubling their security patrols in the area in response to community concerns.

The actual footprint for the LNG plant, storage tanks, power plant and other support buildings would total approximately 200 to 300 acres. The teams explained that the rest of the land is to provide a safety, noise and light buffer for neighboring property owners, plus work space to support the construction effort.

If the partners give the go-ahead to start construction after completing their regulatory work, commercial negotiations and financing, the mobilization, fabrication of modules, site work and construction would take several years, with the first LNG production coming in the seventh year after a final investment decision to proceed, the teams explained. If the project proceeds under the current schedule, the first LNG carriers would load up in 2025.

OFFLOADING FACILITY COMES FIRST

There is a lot of work to get to that first cargo.

Before significant construction could begin, the material offloading facility would need to be built. The current plan, subject to change, has it just north of the LNG carrier jetty. With a 1,500-foot-wide frontage for offloading from heavy-lift vessels (called lift-on, lift-off) and a side facility with a 500-foot face for roll-on, roll-off deliveries, the freight dock could see 250 LNG

plant modules delivered by 60 ships over a three-year period. Riprap — heavy rocks stacked atop each other — would be installed on either side of the facility to protect the shoreline.

Each prebuilt module could weigh as much as 6,000 tons. Self-propelled modular trailers would haul the huge pieces to the plant site.

The freight dock would be dismantled at the end of the project.

Water depth at the proposed site for the offloading facility is only about 15 feet and would need to be dredged to 30 feet, the teams said. Estimates are that would require moving 1 million to 2 million cubic yards from the seabed. “We are continuing to study how we can minimize that,” a team leader said. The dredged area would measure about 3,200 feet by 1,500 feet, depending on the final design and seabed slope.

The project continues to collect data on currents, waves, sediment, sea floor bathymetry and other conditions in the area. There are plans to excavate a sample pit in the seabed in the second quarter 2016 to measure how much and how quickly it fills in.

Disposal sites for any dredging material are still being considered, including upland and at sea. Upland disposal could be used to protect the shoreline from erosion or for fill at the project site. Any decisions on disposal sites will be based on the composition of the dredged spoils and in close consultation with government agencies.

In an effort to limit truck traffic on heavily traveled Kenai Peninsula highways, the teams reported that as much as possible construction materials arriving in Anchorage or Seward would be barged to Nikiski.

CONSTRUCTION SITE SERVICES

Even before the material offloading facility is under full construction, Alaska LNG would build “pioneer camps” at the plant site, the first housing for the first work crews. During construction, until the project builds its own power generating plant, Alaska LNG may buy electricity from a local provider — that’s one of the issues still undecided.

Currently, Alaska LNG plans to drill its own water wells, estimating its maximum needs during peak construction at almost 400,000 gallons a day, or enough for 4,000 to 5,000 people, according to U.S. government water-use estimates.

Current plans indicate no water would be withdrawn from Cook Inlet for plant operations, the teams said. The liquefaction equipment will be air-cooled, not water-cooled.

Alaska LNG plans to build a secondary-level treatment plant on site for domestic sewage, and is still looking at options for proper disposal of industrial waste.

The mission statement for handling construction waste is “reduce, reuse and recycle,” with the teams reporting there could be an estimated 7,500 tons of wood waste in addition to the 4 million cubic yards of vegetation from site clearing. The teams are working to determine “what can be handled locally, what can be handled on site, what has to be hauled away.”

JETTY DESIGN CONTINUES

The jetty stretching out to the loading berths would be built in an area suffering from coastal erosion. The teams gathered geotechnical data this summer and plan to include “positive erosion control” in the project design, such as rock armor. “It needs engineering attention,” they said.

By going out 3,200 feet with the jetty, the project can avoid dredging at the loading berths. The 15 to 20 LNG carriers that would call at Nikiski each month could range up to 1,100 feet long, with a width of 165 feet and a 39-foot draft. Because sea ice moves through the area, Alaska LNG has ice experts looking at building “ice mitigation structures” — large concrete caissons — in the water that would break up the ice as it flows by. The teams are still evaluating the options and running models on ice build-up and currents.

A service vessel facility may be built off to the side of the loading jetty to accommodate the four tugs the project anticipates would be needed for docking the LNG carriers, along with other smaller service vessels.

AIR QUALITY, SAFETY CONSIDERATIONS

On land, the project continues gathering data on air quality levels, noting that the LNG plant will need to stay within emissions limits for the industrial area that already includes a refinery (Tesoro), a fertilizer manufacturing plant (Agrium, which is considering reopening the closed plant), and a small LNG plant (ConocoPhillips) that has operated since 1969.

The LNG plant will require safety flares for pressure release or other emergency use. The teams reported the current plan is to avoid a single tall flare tower, and instead install a ground flare system behind 30-foot-high barriers to help block the noise and light.

The liquefaction process itself “is a giant refrigeration system,” a team leader explained, “not much different from an air conditioner.” In addition to supercooling the methane down to minus 260 degrees Fahrenheit to reduce it to a liquid 1/600th the volume of its gaseous state, the plant will remove any remaining water in the gas stream that made it through the North Slope treatment plant.

The LNG plant will take down the water to 0.1 parts per million. Water in the gas stream turns into ice in the liquefaction equipment — not a good thing.

PRUDOE BAY DOCK EXPANSION

Though Nikiski-area residents are certainly focused on their end of the project, similar dredging, dock and delivery planning is underway at the north end of the project — at Prudhoe Bay.

The current plan is to expand what is called West Dock No. 2 at Prudhoe Bay to accommodate the larger production modules that would be delivered there for the gas treatment plant, along with other construction materials. The heaviest of those modules could weigh 9,000 tons and measure 300 feet by 90 feet.

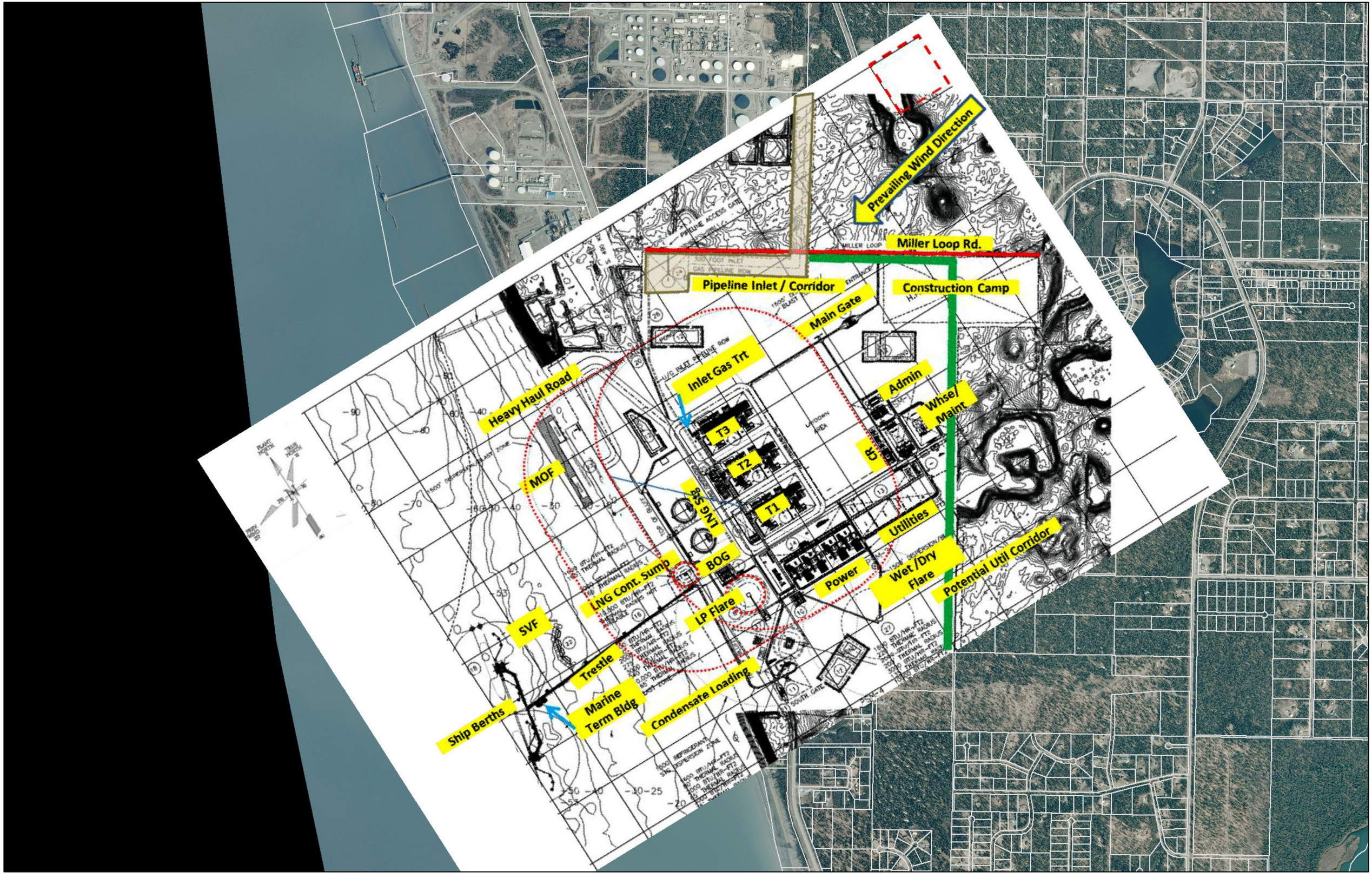
The sealift could take four years, delivering a total of 300,000 tons of modules and equipment.

Dredging would be required to accommodate the delivery barges, looking to clear a 14,000-foot-long channel, 280 feet wide at a 16-foot depth to reach the dock, with an 800-foot by 1,000-foot turning basin at the front of the dock, Alaska LNG teams explained. Dredging volume could total 2 million to 2.5 million cubic yards.

Dredging could be done in the winter by cutting, excavating and removing sea ice and then staging excavators on the ice to reach out and dredge below.

Alaska LNG continues sedimentation and seabed studies in the area.

In addition to dredging, work would include expanding West Dock No. 2 an additional 14 acres, adding three berths to the two already at the dock, and widening the road and causeway between the dockhead and land. Plans also could include an onshore staging area of 20 to 60 acres to move equipment to clear the dock as fast as possible.


Prevailing Wind Direction
Miller Loop Rd.
Pipeline Inlet / Corridor
Construction Camp
Main Gate
Heavy Haul Road
Inlet Gas Trt
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MOF
LNG Sys
Utilities
BOG
Power
Wet /Dry Flare
Potential Util Corridor
LNG Cont. Sump
LP Flare
SVF
Trestle
Marine Term Bldg
Condensate Loading
Ship Berths