

# Shell News

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ARCTIC DRILLING PAGE 1

Lapsley



# BABY, IT'S COLD OUTSIDE

In the search for Alaskan oil, Shell has ventured past the Arctic Circle, into the frozen Beaufort Sea. To drill in this inhospitable location, Shell had to build what nature inconveniently did not provide — islands in the ice

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**W**hiteout. Anywhere else it would be just a blizzard, but here in the Arctic, a snowstorm creates a treacherous optical illusion. Flat snow-covered terrain blends in with an overcast sky, blotting out the horizon, and with it, all sense of depth, direction or distance. There are no shadows, no clouds, no nothing, just engulfing whiteness. Disoriented pilots have been known to fly their aircraft into the ground during whiteouts. And if it weren't for the road markers guiding his way, a disoriented Bill Smith would probably be piloting his Blazer halfway to Norway across the frozen Beaufort Sea.

Instead, he's driving, or rather, creeping down an ice road toward Goose Island, one of three gravel islands Shell has built off the north coast of Alaska to drill for oil. As he attempts to dodge virtually invisible snow drifts, Smith, Shell's North Slope construction foreman, remarks that conditions actually have improved since yesterday when the entire Prudhoe Bay area was shut down. Today planes finally can fly into the town of Deadhorse, carrying badly needed crew changes. Work can resume, evidenced by busy snow plows and other large machines that loom through the flakes, like hulking inhabitants of some strange white planet.

There's not much to do during a whiteout, and after being shut in for a day, Smith jokes, "I'm caught up on all my paper work — even some that was three months old." At least he has paper work and an office. Other less fortunate souls are confined to their quarters at makeshift hotels like the Happy Horse, an ingenious structure of

hooked-together trailers that can accommodate 450 people. They sleep, read, play cards and watch movies over and over. "My worst experience at being shut in happened about a year and a half ago. We were under a whiteout condition and we had about 70 people shut in at a camp for seven days. At the end of it, the whole place was completely buried. If you didn't know where the camp was, you would have thought it was just a big white pile of snow. After a week in there, things got pretty rowdy, but fortunately it didn't get out of hand," he says.

Cabin fever can be a real trial at the North Slope. So can the long winter days of 24-hour darkness and the interminable sunlit summer nights; they can be depressing, to say the least. Then there are the physical dangers like frostbite, not to mention hypothermia — more Alaskans perish from exposure than any other type of accidental death. Before Shell personnel can even set foot on a plane to Prudhoe, they must undergo survival training. And they must be equipped with special clothing like enormous fur-trimmed parkas, insulated space pants and moon boots, oversized rubber footwear that bears a ridiculous resemblance to clown shoes.

Yep, the Arctic must be a pretty awful place to work. But no, says ex-Californian Smith. "I love it up here. I enjoy my work. It's a new experience, and there are a lot of challenges in doing things that haven't been done before. It's a new frontier — I guess that's why they call us the Frontier Division. It's great fun," he declares.

With that, the Blazer plunges into a waist-deep drift that Smith simply could not see, the old opti-

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*Bill Smith supervised the construction of Shell's gravel islands and the ice roads leading to them. Drilling is underway on Goose gravel island in the background.*



*A tractor equipped with pontoons and a ditch witch slices trenches in the ice to form a giant checkerboard composed of five-foot cubes.*

cal illusion, and stalls out. Deciding that's enough fun for one day, he manages to extricate the vehicle from the snow, radios for a "blade and a blower" to clear the impassable road, and heads back to his office at the Happy Horse to wait out the whiteout.

Patience is rewarded, for the next day dawns clear and blindingly bright — sunglasses are a must in the Arctic. Along the same strip of road, the surrounding ter-

rain today looks like a vast white desert, which technically it is, as the area has an annual rainfall of only five to six inches. "It even has sand dunes," says Smith, pointing out a few mounds of snow. In summer, the region is swampy, with hordes of tormenting mosquitoes and temperatures in the balmy seventies. Right now, though, it's about 20 below which, according to Smith, is just the right temperature for building ice roads. And by

that he doesn't mean roads built on icy ground, he means roads constructed on the Beaufort Sea, the surface of which is frozen solid six feet deep.

Ice that thick is fine for driving on, but it's not so fine for drilling in, particularly when it starts to break up. In springtime, the sea becomes a mass of floating, shifting ice sheets. A conventional drilling platform could never withstand the force of the ice floes, so a more



*Backhoes are used to remove the individual ice blocks, some of which weigh more than 8,000 pounds, from the checkerboard.*

stable base of operations was needed. Natural islands could make perfect drilling platforms, but there were none in the right spots. As a result, Shell decided to build its own using gravel blasted loose from quarries a few miles inland. Called Seal, Tern and Goose, the islands sit in water respectively 40, 20 and five feet deep. In the summer, they can be reached by boat or helicopter, but during freezeup, they're linked by about 50 miles of ice roads.

The sea ice can support light vehicles like the Blazer, but for loaded gravel trucks and other machinery the thickness must be artificially increased. According to Smith, the process is relatively simple. Augers and pumps mounted on machines called Rol-ligons are used to bore holes through the ice and then pump water up onto the surface where it quickly freezes, adding a new layer to the road. The ice is built up about an inch a day until the desired thickness is reached. During the construction of Seal Island, the road thickness was increased to nine feet to accommodate heavy duty trucks hauling 50 cubic yards of gravel each. As somewhat smaller trucks, carting 34-cubic-yard loads, were used for Tern, the thickness was increased to only seven feet. The Goose Island road, which hugs the coastline for about 30 miles, is built on grounded ice about five feet thick.

Just like any well-traveled route, ice roads eventually need resurfacing and even develop potholes, but repair is a snap. Just fill the holes with water, wait a few hours and voilà — a fresh new roadway. Smith says the only really tricky aspect to road building is laying down that first layer of ice. "It's a little spooky driving out onto the ice for the first time each winter, because you don't know what's under the snow."

The Goose Island road, now clear of snow, seems as solid and much smoother than any freeway, so smooth that Smith admits speeding is a constant temptation. Perhaps the dearth of scenery also is an incentive for fast driving. The infinite white today is broken by a flock of ravens, their blackness like smudges on the pristine snow. The



*The ice blocks are loaded into gravel trucks and then are hauled off to a dumping site.*



*Water is pumped onto the ice surface where it freezes, building up the road thickness.*

region abounds with wildlife — moose, wolves, musk ox, rabbits, seals and walruses — but Smith claims there aren't many animals to be seen during the winter, just a few arctic foxes and caribou. Polar bears, among the world's most savage predators, are fortunately rarely spotted, but one did pay a visit to Seal Island last fall. Shell was conducting a study on bow-head whales which some people fear may be disturbed by drilling in the Beaufort Sea. A lone whale watcher was out on the island one day in a trailer monitoring some electronic equipment. "After awhile, he stepped outside and found himself eyeball to eyeball with a polar bear. He could have provided a very tasty hors d'oeuvre, but apparently the bear wasn't hungry," says Smith, laughing. "I haven't run into any polar bears, but at Seal Island I did have the interesting experience last year of rescuing two baby walruses that had been abandoned by their mothers. After working with the Fish and Wildlife people on it, and learning the walruses couldn't survive alone, we ended up donating them to a zoo."

## WHY ALASKA?

Since the giant Prudhoe Bay oil discovery 15 years ago, Alaska has beckoned as a petroleum Promised Land. With good reason. The Prudhoe field alone is estimated to contain an average of 9.4 billion barrels of proved oil reserves. That's nearly three billion barrels more oil than is estimated to be in the prolific Gulf of Mexico. The state is estimated to contain about 20 billion barrels of producible oil.

Long before the Prudhoe strike started the oil rush, however, Shell had pursued an active exploration and production program in Alaska. In the early 1960s, it participated in the discovery and development of the Middle Ground Shoal field in Cook Inlet, as well as the nearby Beluga River gas field. The company presently has two production platforms at Middle Ground Shoal, one of which was the first ice-resistant production platform ever built. Together the two platforms account for more than 7,000 barrels of oil per day, making Shell the top producer at Middle Ground Shoal and one of the top producers in Cook Inlet.

Within the last three years, Shell's exploration spending in Alaska has more than doubled as federal and state lease offerings have increased. Today the company has a very strong lease position, controlling more than 1.5 million acres onshore and offshore. In the southern part of the state, Shell has 99,000 acres onshore at Upper Cook Inlet and 28,000 acres in the eastern Gulf of Alaska. To the west in the Bering Sea, it has about 16,000 acres in Norton Sound and 107,000 acres in St. George's Basin. Onshore in central Alaska, Shell controls 103,000 acres in Healy Basin and to the north, one million acres of Arctic Slope Regional Corporation Land, plus 100,000 acres in NPRA and Prudhoe uplands. It also has 7,000 acres onshore and offshore at West Mikkelson near the Beaufort Sea, and, most significantly, 103,000 acres in the sea itself.

— T.H.



*A mountain of gravel — 20,000 truck loads of it — rises from the sea as construction workers complete the construction of Seal Island.*



STEVE HUDSON

*The sun barely rises in the winter, but construction goes on all the same to beat the deadline of spring and the breakup of the ice.*

Although Seal was the first island to be constructed, it was the last to receive a drilling permit and is just now being readied for the arrival of a rig. Two exploratory wells have been completed on Tern and another is underway on Goose, which eventually appears on the horizon as a brown patch topped by a tiny derrick. Up close, the island is more impressive, about 450 feet in diameter and rising some 15 feet above sea level. In addition to the tall blue drilling rig, there's room on top for the two-story crew's quarters, storage buildings, a dock and a heliport. With people scurrying about and construction equipment rumbling to and fro, the island appears to be a small self-contained community.

Hard to believe Goose, like the other two islands, started out simply as a 20-by-20-foot hole in the ice into which gravel was dumped, 150,000 cubic yards of it, to be exact. At deeper locations like Tern and Seal, dumping continued until the pile gradually broke the surface. The hole's diameter then was

expanded by ditch digging machines which cut the surrounding ice into a checkerboard of five-foot cubes, some weighing as much as 9,000 pounds. The blocks of ice were removed by backhoes and then hauled off in trucks to a dumping site. About 300,000 cubic yards of gravel were required to complete Tern, and 700,000 cubic yards — about 20,000 truck loads — for Seal, making it the largest human-made island in Alaskan waters.

To prevent erosion caused by waves and ice, a layer of gravel-filled bags was added to the slopes, from the tops of the islands to the sea floor. Two-cubic-yard bags weighing about 6,000 pounds each were used on Tern and Goose. As Seal is in deeper, rougher water, four-cubic-yard bags weighing 12,000 pounds each were used.

The islands and surrounding ice also are equipped with electronic sensor systems that are used to monitor such factors as soil settlement, wave run-up, ice pressure and movement. The data will be

used to monitor the environment and the structural performance of the islands, and will be incorporated in future island designs.

Since Beaufort Sea planning included the unexpected as well as the expected, operations were only temporarily disrupted last fall when winds up to 90 miles per hour ripped out of the southwest, causing a massive ice movement. "The sea was frozen about eight inches thick at the time. The wind broke the ice up and moved it out until we had completely open water. Ice moving past the islands piled up 25 feet high in some places," says Smith, pointing out the remains. "Of course, we knocked some of it down, and it's all covered with snow and worn down a bit now. It doesn't look as dramatic as it did when it was all sharp and fresh."

Surveying the glittering, glacial landscape, he adds thoughtfully, "You know, a lot of people consider this place a barren wasteland, but I think it has a unique beauty." All in the eye of the beholder. *SN*