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THE DAMAGE DONE

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The Damage Done

Chairperson: Dennis Swibold

The water that ran from Helen Ricker's faucet stank of rotten eggs and of chemicals. It ran orange and greasy. It stained her clothes and clung to her skin.

Ricker lives on the Fort Peck Indian Reservation, three miles north of Poplar, Mont. From Ricker's home, the oil wells from the East Poplar oilfields can be seen in the distance. Her water started to change in the early 1970's, twenty years after the first oil well was drilled. It took about that long for the contamination from poorly regulated drilling practices and leaking wells to reach her water supply. Since then, Ricker and her neighbors have struggled for clean water.

Twenty years after the contamination turned Ricker's water undrinkable, it reached Poplar. It went from contaminating the water of 20 homes, to poisoning an entire city water supply.

Poised on the edge of the highly productive Bakken formation, Poplar was caught straddling two eras. As the town scrambled for a solution to their water problems brought on by oil practices from decades ago, the prospect of rapid oil production flickered in the near future. And just as the town's water was saved by way of a new water treatment plant funded by American taxpayers, the Bakken started to boom. If the boom reaches the reservation, it means a way out of economic hardship, but for those still dealing with the consequences of the last boom, it means fresh wounds on an already scarred land.

The Damage Done sheds light on the long-term effects of unharnessed oil and gas production. It also tells the scientific story of oil production and some ways the industry and regulatory agencies have changed to prevent such environmental disasters from happening in the future.

Editors note: This is the first of a two-part series examining a groundwater pollution moving beneath eastern Montana's impoverished Fort Peck Indian Reservation. The source of the contamination? Oil drilling and production from decades ago.

The Damage Done

A groundwater contamination leaves one community without running water

By: Kelly Conde

It started with rust. In the toilet. On the shower stall. Helen Ricker saw the orange stains and wondered what was causing them. Her water came from a well, from an aquifer that had always been good. So she drank the water anyway. Beneath the ground, the diluted edges of a large groundwater contamination were seeping by in a slow, gravity-fed progression. Little by little, Ricker's water got worse.

The water stained her white sheets and turned her white socks orange. Every time she filled the sink to do dishes, the water's surface shimmered with an iridescent sheen. Residual grease covered her plates long after soap washed away the night's meal. Then the water started to stink. A sulfurous stench rose from the toilet in the bathroom and cascaded out of her faucets. Ricker stopped drinking her water.

Helen Ricker lives on the Fort Peck Indian Reservation three miles north of the town of Poplar, Mont., on the empty BIA Road 75. Her home lies two miles southwest of the East Poplar oilfields, a large expanse crisscrossed with rutted dirt roads and spotted with blue, yellow and black oil pumps bobbing up and down like plastic drinking birds from a novelty store. The oilfield is not as productive as it used to be. But that soon may change.

The Fort Peck Indian Reservation is on the western edge of the Williston Basin. Beneath the reservation and expanding east into North Dakota is the shale-rich Bakken formation. In the past, the oil and gas in this particular rock was untappable. But recent advances in oil and gas drilling technology have provided a way to break the Bakken formation's grasp on what is now known as the largest continuous deposit of natural gas and oil in the U.S.

The once humble farming town of Williston, North Dakota, which is at the center of the Bakken reservoir, is now bursting at the seams with oil workers from all over the U.S. The activity around Williston has been called the "black gold rush," a name that reflects the area's unharnessed expansion of oil and gas extraction.

Though Poplar is only 97 miles west of Williston, things are still very quiet there. Hotels have vacancies, and restaurants have empty tables. There is open space and deserted roads. But oil development is on everyone's mind. While it hasn't made it to the reservation yet, many believe it is on its way.

Fort Peck experienced its first oil and gas boom in the 1950s and another in the 1980s. Then, like now in Williston, men and huge machines descended upon the rolling land north of Poplar. Oil wells speckled the fields. Companies drilled relatively unchecked. The East Poplar oilfield was tapped first, and regulated later. On the outskirts of Poplar, groups of thin-walled houses popped up – shantytowns nicknamed after their parent oil company.

Today, the skeleton of “Murphyville” remains as one of many reminders of the booms. A more jarring reminder, however, is below the surface. The black gold rush of the 1950s led to thick plumes of contaminated groundwater, irreparable and wholly unstoppable. Fifty years later, the era still haunts people like Helen Ricker who have been living on bottled water for the past 30 years. So while many on the reservation prepare for a new oil boom, Helen Ricker and her neighbors are still living with the consequences of the last one.

Ricker, 71, lives with her husband, George, in a house perched above the meandering Poplar River. The view from their house is one of overwhelming sky and rolling hills cut by deep ravines. In the distance are the profiles of numerous oil wells – harsh angles and colored metal. Ricker has dark shoulder-length hair streaked lightly with gray. She is small and walks with a cane, the result of an arthritic back. When relaxed, her face sags under the weight of the years, of raising her children and grandchildren, of losing one son to cancer, of surviving breast cancer herself. But then she smiles and time and tension slip away.

Ricker is three-quarters Sioux and an enrolled member of the affiliated Fort Peck tribes. She grew up in the vast country off Road 75, on land held in trust by the federal government for the Sioux and Assiniboine people. Her current residence is only a quarter mile away from her childhood home. A lot has changed since then.

“We didn’t have an inside bathroom. We didn’t have water in the house at all,” Ricker recalled.

No running water, no electricity, and no creaking metal rigs dipping again and again for buried oil. That would come later.

As a child, Ricker filled buckets with well water from the single pump in her yard to wash clothes or do dishes. She heated water on the wood burning stove for bathing. Ask anyone who lived in or around Poplar at the time and they will say the same thing: the water off Road 75 had a special quality. It was cold, clean and sweet.

That is rare in northeastern Montana. Spend some time in this open, lonely land and know that rivers and streams run slow and muddy. Water from the tap tastes of too many minerals and not enough time out of the sun. The aquifers are shallow, and water from

rain or creek seeps down to the groundwater too quickly. There is not enough space for the soil's natural filtration system to make it sweet.

But the quality of the water off Road 75 was enough to lure people from Poplar and beyond to several bubbling springs or to the well of a family or friend.

"We had good water," Ricker said. "People used to come from town with jars and jugs and ask if they could get our water because it was so nice and cold."

When Ricker and her husband moved back to the country in 1971 after a time in Poplar, the water was still good. But less than two years later it began to change. The oilfields had been around for 20 years at that point, and their presence was beginning to show.

The cool, clear water she was used to was gone. Instead, Ricker's faucets gushed water the color of urine. That sweet taste vanished, replaced with a strong chemical flavor.

"When I poured water to wash dishes you could tell there was oil in it," she said. "Pretty soon after that it started to have a bad odor like rotten eggs."

Ricker reported all of this first to the tribe and then to the Indian Health Service.

"Well, they just passed it off year after year," Ricker said.

She learned to deal with it. She and her family bought jugs and hauled drinking water from town or from relatives' homes. She learned that Dawn dish soap worked best for cutting through the oily film left on her dishes. She stopped buying white clothing, towels or bedding. When her granddaughter was a toddler and started reacting to the water, Ricker began hauling water for bathing as well.

"We noticed if we bathed her in our water she'd get a rash," Ricker said.

This way of life became the norm. Ricker and her family were resigned to it.

"They came in and took the oil and then they left a contamination," she said. "We were told with our treaties, forever we would have good water, but that's not true anymore. It was really hard, but we had no other choice. We just had to deal with it the best we could."

It took nearly 20 years after Ricker first saw the rust in her bathroom before anyone decided to do something more than just live with the water.

Deb Madison was just starting her career as the environmental manager for the Fort Peck tribe's Office of Environmental Protection in 1987 when talk of contamination reached her desk in Poplar. Water tasted salty. It didn't freeze in the wintertime. It had an odd

color. Finally, a resident who lived down the road from Helen Ricker and on the edge of the oilfields brought in a sample from his well. High salt content was not the only issue.

“It was fizzy,” Madison said. “And we were like ‘Wow, what the hell?’”

Madison is tall and blond and has a dominating presence. She has a degree in petroleum engineering and is married to a local cowboy. She speaks with authority, and grit. She isn't prone to hesitation. So when a fizzy, salty sample of drinking water came across her desk, she did something about it.

Madison called the U.S. Geological Survey, which was already in the area assessing water resources for the tribe.

That sample added to mounting evidence obtained by the USGS that pointed to a major problem below the surface and launched a decade-long scientific investigation into the groundwater surrounding the oilfields. What the USGS eventually discovered was a massive groundwater contamination.

It has tainted between nine and 60 billion gallons of drinking water – more than enough to provide each person in Montana with adequate drinking water for life. “That’s a lot of water,” Madison said.

It took years to piece together the magnitude of the contamination. It extends, patchwork-style, under 40 square miles of land surrounding Road 75. There are areas where the contamination is more concentrated and areas where it is diluted. There are point sources, and more diffuse sources, and as water and contaminants migrate, they seep into one another. Because of this, it is all but impossible to pin the contamination on just one oil company or one source. The East Poplar oilfields are old; some of the wells have been around for over 50 years. A lot has happened in that time.

Murphy Oil Corporation first discovered oil beneath the fields east of Road 75 in early 1952. Murphy is now a multi-billion dollar international oil and gas company that is primarily involved in offshore drilling. But it earned its first dollars on the Fort Peck Reservation drilling 35 active wells within the first three years. Soon after the initial discovery of oil, other companies came until the field was spotted with wells.

Oil wells in this area can run anywhere from 3,000 to 10,000 feet deep. When the oil is extracted from this depth, hot, extremely salty water comes with it. At the surface, the water and oil are separated. Beneath the East Poplar fields, oil is highly diluted and contains some of the most saline wastewater in the nation, saltier than ocean water. Spilling a little of it goes a long way. Though the wastewater is referred to as “produced brine,” it has more than salt in it. For millions of years, the water, rock, and oil intermixed underground. As a result, the water has remnants of oil in it and a host of dissolved minerals.

Today's regulations require oil companies to dispose of the wastewater in an environmentally safe way. This usually means re-injecting it deep underground through injection wells. In the 1950s, however, the oil companies had no such requirements.

"In the early days the water produced from the East Poplar oilfield was just dumped into open unlined pits," said Nathan Wisner, an Environmental Protection Agency scientist who worked extensively in the oilfields.

According to the EPA, at least 42 million gallons of wastewater were dumped into unlined pits in or around the East Poplar oilfield between 1952 and 1955.

"It seems incredible that this was allowed, but it was," Wisner said.

What is now the Montana Board of Oil and Gas Conservation began requiring responsible wastewater disposal in 1955, but it was all but ignored. Some companies went so far as to defend their right to dump wastewater onto the ground. In a public hearing held in Helena in 1961, a representative for the oil company C.C. Thomas testified that the 42,000 gallons of wastewater his company was dumping daily onto the ground "was not hurting anyone." Richfield Oil Company similarly insisted that its use of earthen pits was not harmful.

Today's groundwater contamination proves otherwise. The potency of the wastewater extracted and dumped in the 1950s and 1960s was enough to render any groundwater transporting contamination completely undrinkable today. Irresponsible wastewater disposal is only one of many contributing factors to the contamination. Another source is leaking injection wells.

When companies disposed of their wastewater properly, they did so by pumping it deep underground, using what are called injection wells. The main problem with injection wells is that when something breaks, it is not obvious. Breaks in the tubing or casing of production wells is easily spotted: the oil being pumped up either slows or stops. These breaks are fixed immediately so as not to lose precious oil and money. A break in an injection well is recognized by a change in pressure. It takes diligent monitoring to notice these breaks. In the 1950s and 1960s, injection well monitoring was sporadic at best, and breaks went undiscovered for a long time.

In the early 1970s, injection wells became a popular way to dispose of wastewater nationwide. With this came an increase in the number of incidents in which injection wells themselves led to contamination. Surface water and groundwater alike were affected by leaks. Responding to the growing number of incidents, in 1974 Congress granted the EPA regulatory power over injection wells through the Safe Drinking Water Act. With this, the EPA constructed strict nationwide regulations for injection well construction and monitoring.

On the Fort Peck Reservation, this new regulatory action helped reduce groundwater contamination in the oilfields, but it wasn't just the working wells that were causing problems; it was also the abandoned ones.

One well in particular, inherited by Pioneer Natural Resources, significantly contributed to the contamination of the shallow groundwater supply. The well was plugged in 1984, but the cement sealing between the pipe and the earth loosened. Subsurface pressure forced oil and water back up the plugged well bore and through the gaps between cement and pipe and into the shallow groundwater. The leaks formed a concentrated plume of hot, salty, oil-stained water. This well is located a half mile away from the residents of Road 75.

It was this plume that caused the most problems for the residents, though, it was not the only source of their contamination. In the old East Poplar fields, it is unknown how many more of the innumerable abandoned wells are leaking.

The list of oil companies responsible for the mess has whittled down to three: Murphy Exploration and Production Company, a subsidiary to the original Murphy Oil Corporation; Pioneer Natural Resources; and Samson Hydrocarbons. But even after the contamination was discovered and the sources identified, the companies were not held responsible for years.

On a sunny mid-February day, Charlie Four Bear leaned against a metal gate that keeps his 60 horses in their pen. Four Bear moved out to the country in 1990 with dreams of creating a beautiful horse ranch. But 20 years later, his ranch is run down and cluttered. Four Bear has too many horses and too little money to care for them. Four Bear reached to the bottom of a blue plastic barrel and scooped up the last of the grain to feed his horses. He entered the corral and gently poured the feed into a trough. Though the USGS and the Fort Peck Office of Environmental Protection knew of the contamination, no one told Four Bear that the water on his new land was bad. But he found out quickly on his own. The water was salty and tasted of chemicals.

“The first day I moved in I made a pot of coffee,” Four Bear said. “That was a big mistake because it gave us the shits for a week and it tasted terrible.”

Four Bear is the father of 10 children. He is a big man, with long dark hair he keeps tied back in a ponytail. Still, Four Bear has a diminutive manner, especially around his horses. After that first morning, he and his family stopped drinking the water. But he still gave it to his horses.

“They didn't want to drink it either, but when you are standing there in 100-degree weather and that's your only source of water, they drank it,” Four Bear said, “I didn't realize I was killing their babies.”

All of Four Bear's mares aborted that first year though there is nothing confirming that this was the result of the contamination. It was at the close of that year when the USGS, attempting to discover the extent of the plume, tested everyone's well water.

"When they were done they said whatever you do don't drink this water, don't bathe in it, don't give it to your animals," Four Bear said.

Four Bear bought a big plastic tank that he placed on a wooden trailer behind his truck. He outfitted his small ranch with hoses, and began hauling water daily for everything from bathing his children to watering his horses. Four Bear said that his water situation put everything else in his life on hold, and he has never been able to catch up. His now decrepit property, cluttered with old broken down cars, rusting farm tools and horses kept inside rotting wooden fences, is all a result of the water, he said.

"All my free time was just hauling water," Four Bear said, "It put me behind. I mean look at my place. I never thought I'd own a junky place like this. I always wanted a really good place for my horses. But I spent all my money buying stuff to haul water with, and I spent all my time hauling water."

Four Bear used to work as a cop for the tribe. That job and the contamination cost him his faith in people, he said.

"Murphy Oil made their billions, and their families reaped the benefits of it but this land is dead," he said. "We were nothing to them. They came in here and pushed us around."

By the time Four Bear moved onto his property, it was well known at the Office of Environmental Protection that the drinking water was polluted. But other than monitoring, nothing was being done about it. Residents were simply learning to live with it.

Finally someone decided to act. Rene Martell lives just down the road from Four Bear and is married to Helen Ricker's sister Josi Youpee. Like Ricker and Four Bear, Martell and Youpee struggled for years with their water. They did all their laundry in town. They bought bottled water to drink. But they still used faucet water for showering. Martell found that the orange tint of the water clung to his skin long after he got out.

"You'd start seeing it on your fingernails and your legs from taking a shower," Martell said.

Martell works as an attorney for the tribe. He is a quiet man with shaggy hair and big glasses. Through his job, Martell knew of a Bozeman law firm that might take on a water contamination case. After contacting the Goetz law firm, Martell went door-to-door, talking to every family on Road 75.

"I contacted the families on the road and asked if they would be interested in doing something about the water. It kind of took off from there," Martell said.

Fourteen families agreed to join the lawsuit and in 1998, they filed a federal suit against four oil companies: Murphy Exploration and Production company, Pioneer Natural Resources, Samson Hydrocarbons, and Marathon Oil Corporation, though after extensive scientific proof, Marathon Oil Corporation was dropped from the suit. The plaintiffs alleged that the oil companies had destroyed the value of the families' property and requested an alternative source of drinking water.

"You always have to put the money part in," Martell said. "This was a contingency lawsuit so the attorneys would get paid if we won. But what we wanted was a (water) pipeline."

Over the next four years, life for the families was stressful. Neighbors who worked for the oil companies constantly assured them that they wouldn't get a dime. Lawyers flew in on private planes to say the same thing.

"They just have a lot of high-priced lawyers and that's their job is to make this go away," Martell said. "And they had a lot of money to tell us that we were wrong. It was an extra amount of tension in your life."

As the lawsuit dragged on, Deb Madison of the tribes' Office of Environmental Protection made a discovery that upped the ante. She and Nathan Wiser of EPA brought out a toxicologist who found something worse than salt in the water.

"We found benzene," Madison said. "Well, benzene kind of changed everything because now we definitely had a human health effect."

Significant exposure to benzene has been linked to various types of cancer including Hodgkin's lymphoma and leukemia. Someone with benzene in their tap water can be exposed to it in many different ways because it exists as both a liquid and a gas. They can ingest it or inhale it. Or it can soak through their skin when they shower or wash their hands.

Most of those living off of Road 75 had quit drinking their well water long before EPA found benzene. Yet they had little choice but to use it for washing clothes and themselves. They were still exposed to it daily. For how long, no one is sure.

It is difficult for the families to connect any health issues they have to the contamination. Though the incidents of cancer seem abnormally high – Helen Ricker suffered from breast cancer, as did her sister, and three of her neighbors – so many environmental factors can cause cancer that there is no way to prove it was from the contamination. But neither has there been an investigation in the area to look specifically for health problems related to benzene exposure.

The discovery of benzene in the groundwater changed everything. A year after the suit was filed, the EPA administered an emergency order under the federal Safe Drinking

Water Act. The same oil companies that were being sued were now required to provide a gallon of drinking water per person, per day to 23 families living off of Road 75.

According to Martell, the EPA's involvement bolstered the families' lawsuit.

"It gave us a big hammer," Martell said. "Oil companies had to deal with our lawsuit and had to deal with EPA's federal action. It just emphasized that the EPA wasn't going away and neither were we."

It took another two years, but in 2002, the families finally reached a settlement with the oil companies.

The companies agreed to continue to provide the families with bottled water, but more importantly they agreed to build a pipeline connecting the affected homes to the City of Poplar's water supply. The companies also agreed to pay each family around \$63,000 in damages plus another \$5,000 to replace the pipes in their houses, which were corroded by the excessively salty water.

Water would continue to be delivered to all the families for 10 years or until they had safe, reliable drinking water running from their faucets.

At the time of the settlement, the oil companies were also in litigation with EPA after appealing the emergency order. Shortly after the private settlement, the EPA and the oil companies reached a similar agreement that extended to all the affected families, not just those involved in the private suit. In all, 23 homes were to be included on the pipeline and in the water delivery.

After more than 20 years of stress, the residents of Road 75 could do their laundry, wash their dishes, stand under hot running water without the worry of side effects. Their water problems seemed to be over.

On a cold morning in early January, Shane Halverson, the Public Works director for the City of Poplar, received a call from someone living off Road 75. Their faucets were dry. They had no running water. Again. Halverson left his office for the fields to check the pipeline. That morning's problem had a simple fix: a switch needed to be turned on. Other days, the fix wasn't so easy.

Construction of the 10-mile water pipeline was completed in 2005. But the relief felt by those living off Road 75, those who had been living on bottled water for so long, was short-lived. Within a year of its completion, the line started breaking regularly. Some say there were 28 breaks, others say 30. The second year was no better.

The problem was different every time. The plastic line would freeze and break, or pressure from the water pump would force a leak. With each break, all the families on

the line went without running water. Some breaks took days to fix, others took weeks. Eight years later, the pipeline still has problems. The country residents now live with a nagging uncertainty. They are never sure when they will have water and when they will not.

The same morning Halverson was out fixing the line again, Helen Ricker was readjusting her morning schedule to the whim of her faucet. The oil companies still deliver bottled water to all the 23 houses – a sign that nothing is completely fixed. On this morning, Ricker took water from one of the delivered five-gallon jugs and heated it on the stove. It would be enough for her granddaughter to take a sponge bath before high school.

Hazel Lockman, who lives across the road from Ricker, had running water that morning, but only because her son, Michael, took matters into his own hands. Lockman is 93 years old. And though she has six children, she lives alone. Her husband died several years ago from non-Hodgkin's lymphoma, and her children have long since moved on to lives of their own.

Lockman is different from many of the other residents of Road 75 in several ways. She and her family have money. They are not enrolled members of the affiliated tribes, and they do not feel the injustice of their situation the way others do. One of her sons and a son-in-law work in the oil industry. She says she is OK with the consequences of the business. Even in her 90s, she was willing to deal with never knowing when she would have running water and when she would be taking water from one of her stockpiled jugs to flush her toilet. Her son, Michael, however, was not so patient.

“Mike said, ‘I’m so sick of this. You go through this again and again,’” Lockman said.

Michael spent his own money on a 60,000-gallon water cistern that he buried in the front yard. To fill it, he trucks water in from a clean source using a stainless steel tanker that he hauls behind his semi-truck.

“For her age, when you have no water for an extended period of time it really creates an inconvenience,” Michael said. “There were different proposals made (to deal with the line) but nobody ever followed through so to cut through all the bureaucracy I pretty much went on my own.”

Many who live on Road 75 cannot afford to install personal cisterns. The Lockmans did not participate in the private suit. Michael said his father did not believe in lawsuits. For those who did, the hard-won solution – the breaking pipeline – remains a frustration.

Public Works director Shane Halverson blames the pipeline problems on its construction. Before working for the city, Halverson worked as a quality-assurance engineer and in pipeline construction. He knew of the issues with the pipeline so when he was hired, he went back through the records.

“The quality assurance was poor to say the least,” Halverson said.

According to Halverson, the 89-page quality assurance report noted various problems in construction, but they were never addressed. Mistakes were made, but never corrected. The pipeline was haphazardly put into the ground. It wasn't bedded properly. It wasn't tested for weaknesses properly.

"There's places out there that they put damaged pipe in the ground. It was noted in the quality report that the pipe was damaged and they put it in anyway," Halverson said.

There is no one group on which to place the blame. According to Halverson, the company hired by the oil companies to construct the pipeline, Franz Construction, didn't have the experience for the job. The city public works director at the time did not check to make sure the engineer, Interstate Engineering was following proper protocol. And Interstate Engineering never held Franz Construction accountable for mistakes.

"Everybody was asleep at the switch in my opinion," Halverson said. "And it's never going to be right. That's the thing about putting pipe in the ground. If you don't do it right the first time, you are always going to have trouble with it. Always, always, always."

A 10-year warranty on the settlement made with the oil companies paid for those affected to stay in hotels while the line was repaired. It paid for the residents' water bills and paid for the repairs. But those ten years have passed.

The companies are still bringing bottled water to the families on Road 75, but only because the settlement required them to do so until the residents had reliable drinking water from the faucet, and that has yet to happen.

The residents have yet to pay for their sporadic running water, but that's only because, after all they've been through, Poplar's public works director can't bring himself to bill them.

This situation raises the question: Why not just build a new pipeline? The original line cost \$1.2 million to complete and on this impoverished reservation, there just isn't that kind of extra money. And all efforts to force the oil companies to rebuild the line failed.

A search continues for federal funds to rebuild that pipeline. Maybe within two years, or three, reconstruction can begin. But for now, the people on Road 75 are stuck. They have used up all their options.

Helen Ricker feels duped.

"The non-Indians came in here, drilled for the oil and we were told that it would be taken care of correctly and cleaned up correctly and we believed that," she said.

Ricker's trust is gone. No matter what benefits another oil boom would bring to the reservation, no matter what new regulations and technology exist to ensure that the land remains unscarred, Ricker still hopes that the oil boom that is swarming North Dakota won't make its way west.

"All this talk on the oil boom, as far as I'm concerned they can lock our highways up," Ricker said, "I don't want that coming in on my land. Not after what we've seen historically."

Ricker is one of few who feel this way. Many in the area see the oil boom as a way out of economic hardship.

Three miles south in Poplar, residents look hopefully to the east for signs of the boom, but they too have had to deal with the underground contamination that continues to seep from the north. In time, the pollution began to taint the city's groundwater wells.

For them, the solution did not come from oil companies or the EPA. It came from American taxpayers, who paid for a water treatment plant that was built just in the nick of time.

This ends the first of this two-part series

Editor's note: This is the second of a two-part series examining a groundwater contamination from decades of oil activity beneath northeastern Montana's Fort Peck Indian Reservation. While residents living close to the oilfields struggle with their water, the contamination makes its way to the town of Poplar, Montana. As the pollution is discovered in Poplar, many scramble to find a different water source for the town of 3,000 people. In the end, American taxpayers came to their aid.

The Damage Done
The struggle to save Poplar's drinking water
By: Kelly Conde

No one knows exactly when the city drinking water of Poplar, Montana, started to change, but Gayle Kittelson-Kirn was the first to notice.

She works at the Verne E. Gibbs dialysis center in the remote and dusty town on the southeastern border of the Fort Peck Reservation. It is her job to make sure that the water coming from the city line is purified before it is run through the veins of people suffering from kidney disease.

In the summer of 2009, she saw that something was wrong. Like the polluted blood of her patients, the city water ran dirty. The center's high-tech purification system began

failing. It clogged easily, and Kittleston-Kirn had to change the filters every couple of days rather than monthly. The filters came out greasy and black.

“It was like oil,” she said. “It was like it was dipped in chocolate pudding.”

She couldn't know that the culprit was a massive and moving groundwater contamination from decades of oil activity north of town. It would take years of scientific detective work to link the contamination to the city's water pollution, and even more time to find a solution.

While nobody knew the source then, some had their suspicions.

Deb Madison sped north along a paved road that runs parallel to the East Poplar oilfields. It was mid-February and, ahead, the pale winter sky pushed against cracked grey asphalt. To the west, snow-covered fields were dotted with the dark profiles of oil wells. Madison slowed and turned down an unsigned dirt road that led into the heart of the oilfield.

Madison has been working as manager for the Sioux and Assiniboine tribes' Office of Environmental Protection since 1987. Shortly after getting the job, complaints of hot, salty drinking water reached her desk, and she has been studying the contamination ever since. Madison is the perfect person for this job. She has a degree in petroleum engineering and a home on a quiet rolling, creek-fed ranch west of Poplar. She knows the values of oil development and unadulterated land and spends her days trying to find a healthy balance between the two for the tribe.

Madison knows her way around the rutted roads that crisscross the oilfield three miles north of Poplar. Along with representing the tribe through the years of scientific investigation and mitigation surrounding the pollution, Madison oversees all injection well permits and monitoring on the reservation. There wasn't much about the issue that Madison wasn't involved in. Even so, she said as she navigated the car past a cluster of nodding well pumps, the call from the dialysis center four years ago came as a surprise.

The source of the center's problems can be traced back to the oilfield's inception. Drilling started in the East Poplar fields in the 1950s, in a time of few restrictions on oil and gas development. Billions of gallons of oil-stained wastewater were dumped into shallow, unlined pits. Spills tattooed the ground. Wells leaked and pipes broke. Though this happened less frequently as time went on, it was enough to contaminate 5 billion gallons of groundwater.

Beneath Madison's car wheels were unseen miles of polluted water. Madison stopped at what resembled a tall, thin, multi-spouted hydrant and what was a new injection well.

Though the actual contamination could have happened anywhere -- it was a result of poor regulations nationwide -- its magnitude was partially due to confusion over regulatory

authority. On a reservation, federal government, the state, or individuals can own land. Because of this, the EPA, the BLM, the Montana Board of Oil and Gas conservation all had some regulatory authority. Out in the remote, lonely East Poplar fields, there was a breakdown in communication between the different agencies and in monitoring.

“It’s kind of hard to say who was in charge.” Madison said, “That is a problem.”

So Madison and the tribe took steps to take control of the oilfield. In 2009, they gained a regulatory foothold by becoming the first tribe in the nation to assume jurisdiction over all injection wells on the reservation. Madison is responsible for 27 injection wells in all. Monitoring them requires careful inspection.

“If you have problems with your (production well) tubing and casing you can tell right away,” Madison said.

It is easy to tell if a production well is leaking because there is no oil coming up. With injection wells, which re-inject wastewater back into the ground, it’s all about whether the pump is maintaining steady pressure. That morning, Madison circled the silver well, checking valves and gages, looking for clues of a leak. The well rumbled as a huge pump forced gallons of wastewater trucked from various production wells deep beneath the ground.

About the time that the tribe gained control over injection well monitoring, the dialysis center started having problems. When the contamination was first discovered, it was obvious that it would eventually seep the three miles to Poplar. All water paths, above and below ground, ran towards the three municipal wells that supplied Poplar with drinking water. But the polluted waters reached the town sooner than expected.

Though the terrain around Poplar is a monotony of rolling hills and lazy rivers, the earth beneath the surface is extremely complex. There are layers of different types of soil and rocks, and water has to navigate through it all in a sinuous, halting or sometimes racing progression. As soil composition changes, the rate at which the water moves changes. It is nearly impossible to know the rate the contamination was moving with complete accuracy.

Predictions of when the contamination would reach Poplar were optimistically far in the future and so, initially, Madison did not suspect it as the source of the unit’s problems.

The city was supposed to be monitoring its drinking water to prevent any surprises. But when Madison tested the water from the dialysis center and found it contained high levels of chloride, a contamination fingerprint, she looked through the city’s documented water samples and discovered that monitoring was sparse.

“We think at that point, the chloride contamination had probably been around for a while, and that’s why we were seeing it so heavily with the dialysis center,” Madison said.

The high chloride hinted that the contamination, which spread beneath 40 square miles of earth, had arrived. That Poplar's drinking water was slowly being poisoned. To be sure, Madison turned to someone who was as involved in the contamination as she.

In a brightly lit conference room in the U.S. Geological Survey building in Helena, Montana, Joanna Thamke flipped through maps of the contamination on her laptop. Thamke is short and blond. She wears thin-wired glasses and speaks with a slow, careful rhythm. Within the borders of her multicolored maps lay answers: where exactly the contamination was, who it affected, who was responsible. Like Madison, Thamke has been working on the contamination since its discovery in the late 1980s. It was she who found the funds to fly electromagnetic detectors from a helicopter over the fields to map the extent of the pollution. Thamke's reports linked benzene found in some residents' drinking water to a nearby leaking abandoned well. Her research is at the heart of every subsequent legal argument related to the contamination.

Based on her research, in December of 2010, shortly after the contamination reached Poplar, the EPA issued an order naming Murphy Exploration and Production Company, Samson Hydrocarbons, and Pioneer Natural Resources responsible for the mess. They were required to collect monthly samples of the City of Poplar's water supply for analysis, submit an aquifer remediation plan, and, depending on the level of contamination, provide treated or bottled water to the residents of Poplar.

The companies immediately appealed the order, stating that the EPA exceeded its regulatory authority. They claimed there was no evidence to prove that the contamination had reached Poplar or that the companies were responsible.

Science was not on the oil companies' side. Thamke had been looking for a new way to monitor the movement of the contamination, and she found it the year before EPA issued its order. With any kind of contamination, scientists look to identify constituents that are unique to it. In this case, the contaminated wastewater contains an abnormally high concentration of chloride ion, which is what makes the water so salty. The wastewater also has a high concentration of total dissolved solids. Up to this point, Thamke had been tracking the contamination through chloride levels and total dissolved solid levels.

But in 2009, Thamke with USGS geochemist Zell Peterman, found another, more precise way to trace the contamination. The wastewater that caused the pollution came from a formation over 5,000 feet below the surface that was created more than 300 million years ago. This ancient rock formed at the bottom of an ancient ocean. And within its chemical makeup are signatures of a different place and time.

When the waters of this formation are pulled to the surface, their chemistry is utterly unique to the surrounding environment. Thamke and Peterman discovered that the unique strontium isotopic ratios of the wastewater could be used to trace the contamination. Isotopic ratios serve as a sort of nametag for the different forms of a chemical. Strontium

has four stable, naturally occurring isotopes, and within the ancient, salty, oily waters of the East Poplar oilfield there exists a combination of strontium isotopes and strontium concentrations that occur nowhere else in the area's groundwater. Like a fingerprint at a crime scene, the presence of this unique isotopic combination indicates the source of the contamination.

"It's perhaps one of the more sensitive tools that can detect small changes in contamination," Thamke said.

Thamke explained that while the strontium isotopes were helpful in determining the contamination source, it was a combination of factors that led her to be sure of it.

"You have to have several of these things to say that the produced water is getting to the city of Poplar wells," she said. "You can't just have strontium isotopes by themselves. If we didn't have the high chloride it would be really hard to say that it really was getting there."

The collection of clues – the high chloride levels, high total dissolved solids concentration and the presence of the particular strontium isotope – led Thamke to conclude that the contamination had finally reached Poplar.

EPA scientist Nathan Wisner agreed that the data was indisputable.

"The most compelling information that EPA received was strontium isotopes," Wisner said. "An initial concern was elevated chloride values showing up in the City of Poplar's water wells. But because chloride can come from a lot of different sources, strontium isotopes was the compelling evidence."

Despite the science, Michael Jacobs, geologist for Pioneer Natural Resources, insisted that there was no contamination in Poplar. Murphy Exploration and Production and Samson Hydrocarbons declined to comment for this story.

In an email, Jacobs said, "There is no evidence to date to show the city wells have or will ever be impacted by the contamination. The contamination has not found its way to Poplar's water supply wells."

Pioneer also insisted that, even if the contamination had made it to Poplar, it wasn't from their operation. Pioneer owns one old abandoned oil well on the reservation, something they inherited when they merged with Mesa Petroleum. For years, the well leaked water laced with benzene, toluene and other constituents of oil, into the groundwater aquifer. The concentrated plume was discovered when a nearby home's water turned salty and fizzy. When the plume was linked to the abandoned well, Pioneer voluntarily sank \$6 million into building a remediation system.

Due to these remediation efforts and the geology of the land, Pioneer claimed there was no way the old production well contributed to the larger contamination.

Joanna Thamke acknowledges that the plume from Pioneer's well is geologically disconnected from the rest of the patchwork contamination, but not entirely so.

"I know there are some very thick clays in this area, but it's just really hard to make something entirely impermeable in unconsolidated deposits," Thamke said, "They have a lot of great data that shows how a lot of this contamination plume has been captured a bit with their remediation system. I just don't think you can say that it's 100 percent disconnected from the rest of the area. That would be really hard to prove."

Thamke referred to a map on her laptop to make her point. It displayed the contamination the way a handprint is displayed on those heat-sensitive T-shirts from the early 1990s. Bright pink indicated areas where the contamination was most concentrated. Then red. Then orange. Then green. She pointed to the plume from the Pioneer well, a lone, bright pink and red patch. It did seem disconnected, but then...

"You can see sort of these fingers coming out," Thamke said, pointing to small strings of red breaking the borders of the patch on one side. "When I look at this it appears to me that there are probably some minor gravel channels where contamination in this higher terrace has had the opportunity to move to the west."

West, toward Poplar.

Thamke's conclusion: all three oil companies had contributed to Poplar's water issues.

Knowing who was responsible did not resolve to overarching problem. As litigation continued with the oil companies, one thing remained clear: Even if the companies agreed to pay the city to find a new water source, all the clean groundwater was directly in the path of the moving contamination.

Poplar needed to extend far beyond the reach of the contamination for a water source. An endeavor that would take more money than the oil companies would pay and more time than the contamination was going to give it.

To Tom Escarcega, the waters of the Fort Peck reservation are sick -- not only those touched by the East Poplar oil activity, but all water running beneath the northeastern corner of Montana.

"The groundwater is pretty much contaminated in this area," said Escarcega who used to work as the tribe's water resources administrator. "You can't drink it, and some of the time you can't even cook with it. It's pretty bad."

The area's groundwater is extremely shallow. It is so close to the surface that even without the oil activity the water is tainted by agricultural practices. Eighty percent of

private water supplies on the reservation have nitrate levels above safe drinking water standards. Escarcega saw the polluted waters of the reservation as a source for the poor spiritual and physical health of his people. In 1992, he sought to change this by flying with the tribal chairman to Billings to speak with the Bureau of Reclamation about attaining funds to build a water treatment plant to provide clean water for the reservation.

Then U.S. Senator Conrad Burns of Montana heard about the proposal and decided to make the project regional, and in 1994 the project secured its first funds. The ultimate goal of the project, dubbed the Fort Peck Reservation Rural Water System, is to provide treated water from the Missouri River to the entire northeast corner of Montana. For Escarcega, who is now the Rural Water System's project manager, it is a way to cleanse the sick waters of the reservation.

“With the treatment plant we are trying to re-purify, almost like a dialysis,” Escarcega said.

Year after year, Escarcega flew to Washington, D.C., to ask Congress for more money for the project. And slowly it came. To date, Congress has provided the Rural Water System with more than \$300 million and in August of 2012 the large pumps in the Missouri River were switched on and the first drops ran the two miles to the newly built Rural Water treatment plant, a huge, twinkling box rooted on the side of the road between Poplar and the nearby town of Wolf Point.

The plant stands alone, the sharp dark edges of the building contrasting with the soft yellow curves of the surrounding land. Inside, layers of filtration systems and cleansing processes, all gravity fed, turn the muddy waters of the Missouri into something clean and sweet. The bubbling water speaks of new prospects.

To Nathan Wiser of EPA it was a way out. As science was moving litigation between the EPA and the oil companies toward mediation, the Rural Water System project flickered as a solution.

In March of 2012, the companies came to an agreement. They would pay \$320,000 to connect the city of Poplar to the Rural Water system. Until then, they would continue to monitor the wells to ensure that the chloride levels weren't rising and that other contaminants such as benzene were not showing up. The companies were no longer required to submit a clean up plan. The Rural Water system, it seems, would do more than save Poplar's water supply, it would set the oil companies free of any obligation for remediation.

Wiser contacted the Bureau of Reclamation, which has a role in administering the project.

“We had requested that they consider bringing water to Poplar first,” Wiser said. “I think they listened.”

Escarcega said that Poplar was already on the federal agency's radar as a town to outfit with the new water.

"One of our main goals was to get Poplar hooked up as soon as possible," Escarcega said.

In September of 2012, just one month after the water treatment plant opened and at least three years after the fingers of the contamination first touched Poplar's water supply, the entire city was connected to the Rural Water line. Clean water ran from faucets again. Poplar's water was saved.

Gayle Kittleson-Kirn of the Poplar dialysis center can attest to that. The center's purification system is running clean again, she says. But beyond the center's walls, the water line couldn't fix everything.

Because of the contamination, there is an embargo on new water well permits in the area. Much of the land north of Poplar is held in trust by the federal government for the Fort Peck affiliated tribes. Without water, this land is all but uninhabitable. Also, there is concern that the contamination will seep under the Poplar River. Right now, it is going directly into the river where it is diluted and swept downstream. If it were to go under the riverbed, it would contaminate the wells of many more country residents beyond.

For these reasons, the Fort Peck tribal council believes that the \$320,000 settlement was not nearly enough to pay for the damage the oil companies caused.

"We still have the water plume there," Fort Peck Tribal Chairman Floyd Azure said, "It has destroyed our groundwater; \$320,000 isn't going to cover that."

Wiser said that EPA's authority under the Safe Drinking Water Act is limited.

"It's this little authority within the Safe Drinking Water Act that EPA has utilized to do this," Wiser said, "We don't have the authority to make sure that fairness was achieved."

It is unclear whether the tribe is going to sue the oil companies. The city of Poplar, however, does intend to. Poplar mayor Greg Norgaard said that after everything, the oil companies should still be willing to take care of the town.

Meanwhile, on the horizon to the east is another oil boom. The Bakken oil reserve brings the prospect of new jobs to a land where there are few. Though many in the area welcome that, those still dealing with the scars of the last boom remain wary.

"It's a kind of a two edged sword," Deb Madison said. "It will be great to have the funds and folks to have money flowing and jobs, but it's going to be a challenge to stay ahead of it. Because it's fast and furious and it doesn't wait for anybody."

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