

# **HOW THE OIL SANDS GOT TO THE GREAT LAKES BASIN: PIPELINES, REFINERIES AND EMISSIONS TO AIR AND WATER**

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*DI, October 2008*

“Whatever may be happening on the surface, the hacking and shoveling have got to continue without a pause, or at any rate without pausing for a few weeks at most.”

**George Orwell, Down the Mine**

## 1. Peak Oil and what it means

We live in a time when the world is at or nearing “peak oil” – the moment when petroleum production reaches its maximum output and the amount we can extract and use begins to decline. Whether we are in fact approaching peak oil more quickly or less so, the arithmetic is relentless – there is only so much oil on earth. The consequences for the environment are immense and inescapable, no matter what direction the debate over speed and timing takes. When peak oil is reached, whatever oil is available will be more costly, more difficult to extract, and “dirtier”. Compared to conventional oil reserves, extracting and using this dirty oil will have deeper implications in terms of what happens to the land it lies under, the water that is polluted when it is extracted, the dangers inherent in transporting it, the greenhouse gases it helps produce and the air and water pollution it creates when it is refined. Whether peak oil is here sooner or later – or now – we are already drilling “dirty” oil, and it has immense implications for the environment.

The Great Lakes Basin – the huge, heart shaped area surrounding the Great Lakes – may hardly seem like a focal point for this particular environmental challenge, though it is one of the greatest challenges of the 21<sup>st</sup> century. There are no significant supplies of oil and gas to be found within the lands and shorelines, cities and farmland, rivers, streams and lakes ranging roughly from Wisconsin through Illinois, Indiana, Michigan and Ontario that surround the largest body of freshwater in the world.

What, then, does the Great Lakes region have to do with the price of oil? This heavily populated area is a net consumer of petroleum products, not a producer. Some of the most important energy resources in North America – perhaps *the* most important energy resources in the world, in this century, are concentrated in the Athabasca tar sands in Alberta, some 1,700 miles (2,735 kilometres) to the northwest, in an area roughly the size of Florida. This is the world’s last known large oil field, and it is being liquidated rapidly as demand for oil continues unabated. Because of the tar sands oil, Canada is already the principal supplier of oil to the United States.

The viscous, gooey bitumen that yields fuel from the tar sands is one of the dirtiest hydrocarbon products on earth. The tar sands, also referred to as the oil sands, are attracting a near-unprecedented boom in investment and industrial activity – according to the Canadian Association of Petroleum Producers (CAPP), industry investment in the oil sands in 2006 alone was approximately \$14 billion (Canadian).<sup>1</sup> More than \$100 billion has been spent there so far, and there is no sign of a slowdown.

The ongoing, hasty growth in oil sands production has already created an urgent need to develop the infrastructure downstream to handle the dirty bitumen – upgrading facilities hundreds of kilometres from the tar sands, pipelines stretching thousands of kilometres across North America and massive, multi-billion dollar expansion of refineries in the Great Lakes region to turn the bitumen into gasoline and other petroleum products. While there is increasing understanding – and criticism – of the environmental implications of development *in* the tar sands, the implications air and water quality and greenhouse gas

emissions for the Great Lakes region are less well-understood and less extensively explored. We are already well into the development of a continent-wide industrial supply chain – a pollution delivery system – that could cause irreversible damage to the Great Lakes. Pipeline and refinery expansion applications are being made and approved right now with little general awareness of the potential long-term damage to the Great Lakes environment.

And for all the activity underway, we are only at the beginning of this. As Alberta’s Ministry of Energy notes, “only about 2 per cent of the initial established resource has been produced to date... Output of marketable oil sands production increased to 1.126 million barrels per day (bb/d) in 2006. With anticipated growth, this level of production could reach 3 million barrels per day by 2020 and possibly even 5 million barrels per day by 2030. This degree of activity would support the development of other key industries...”<sup>2</sup> These industries would develop far beyond the tar sands.

Critics of tar sands development contend that the resource extraction activity in northern Alberta is well on track to cause unprecedented pollution, destruction, water shortages and greenhouse gas emissions in that region of the continent. Since the 1987 report by the United Nations Commission on Environment and Development (the Brundtland Commission), the concept of sustainable development has been the predominant ideal for economic activity, but what is happening in the oil sands is fundamentally unsustainable, critics note.<sup>3</sup> They see an environmental disaster that is well under way in Alberta.

But all of this matters – very much – to the Great Lakes too.

Difficult to extract and dirty to process, tar sands oil is coming to the Great Lakes via a planned network of pipelines and refinery expansions. Currently disclosed project costs show that pipeline

companies and U.S. refiners plan to invest more than U.S. \$31 billion between now and 2015 to upgrade, export, and refine tar sands oil. This expansion promises to bring with

### Bitumen

Bitumen is the heaviest, thickest, “dirtiest” form of petroleum. It is costly to produce and has only become economically viable as the price of oil has risen exponentially in the 21<sup>st</sup> century. About 28 per cent of Canada’s total oil production comes from bitumen, as Alberta is one of the world’s two largest sources (Venezuela is the other).

The process to extract bitumen requires digging, heating and water use on a scale that has scarcely been contemplated ever before. About 8 per cent of Alberta’s bitumen can be extracted by surface mining, which involves denuding large forests, draining wetlands and hauling away materials in gigantic trucks. Bitumen at depths greater than 46 metres can also be extracted through *in situ* processes. Once the bitumen is extracted, it needs to be upgraded; this requires heating the material to nearly 500 degrees Celsius – a process that requires either natural gas (a lighter, cleaner fuel than oil sands product) or, as is now being considered, nuclear power.

In order to travel through the continent-wide pipeline network, the upgraded material must be mixed with liquefied natural gas. Although pipeline companies take great efforts to maintain their carriers, pipelines do leak, causing considerable environmental damage.

Turning oil sands bitumen into petroleum products at refineries requires additional massive use of water – and produces air emissions, water pollution discharges and increased greenhouse gas emissions. It’s important to know too: this is before the petroleum products are even used in cars, trucks, factories and heating.

it an exponential increase in pollution – discharges into waterways including the Great Lakes, destruction of wetlands, toxic air emissions, acid rain, and huge increases in greenhouse gas emissions. All of this comes *before* anyone even uses a drop of this oil in their cars and trucks and factories, before the oil is even processed in these expanded refineries. If the great challenge of the 21<sup>st</sup> century is to figure out how to wean society off oil, this is the diametric opposite of the way to go about it.

At one time, bitumen found in Alberta’s tar sands was considered suitable only for paving roads. Extracting oil from bitumen requires vast amounts of water, as well as intense heat that can only be obtained from other fuels such as natural gas, or perhaps nuclear power. To transport bitumen, it must be mixed with a lighter diluent or condensate, because it is too heavy to go through a pipeline on its own. Upgrading and refining bitumen requires extensive and costly processes that emit nitrogen oxides and sulphur dioxides – the compounds that are the ingredients of acid rain – a form of pollution thought to have been brought under control two decades ago.

The seemingly insatiable demand for tar sands oil requires an expansion of the continent-wide network of pipelines and the oil refineries in and around the Great Lakes Basin. In some cases, these refinery expansions are being fast-tracked right now, with limited community consultation and impact studies. There is little being done, for example, to determine the cumulative impact a massive refinery expansion would have on climate change-affecting carbon emissions, water quality, wetlands and other habitats, the additional water or energy use that would be required or how continued reliance on oil might inhibit the development of alternative energy sources such as wind or solar power. Refining (and upgrading crude) oil requires almost unimaginable amounts of water – water to move the crude, dilute it, mix and process it. Much of the water used is either never returned to its source or returned, but severely degraded by pollutants.

The use of Great Lakes water as a cheap supply for refineries and the watershed and the airshed as a pollution dump is alarming the neighbours.

“Accelerated energy development in Canada and the United States and cleaner air - can we have both?” the International Joint Commission asks.<sup>4</sup> The U.S. Congress and the presidential campaign of Barack Obama have taken notice of the threat. And in June 2008, the United States Conference of Mayors noted that “the production of tar sands oil from Canada emits approximately three times the carbon dioxide pollution per barrel as does conventional oil production and significantly damages Canada’s boreal forest ecosystem – the world’s largest carbon storehouse; and... the continued production and purchase of these higher-carbon unconventional or synthetic fuels slows the United States’ transition to clean, renewable energy sources. The mayors called for “the use of life cycle analyses that evaluate the greenhouse gas emissions from the production – including extraction, refining, and transportation – of fuels, including unconventional and synthetic fuels; and... clear federal and state guidelines for tracking the origin of various types of fuel in order to facilitate life cycle analysis.”<sup>5</sup>

For Canada, as the source of tar sands oil, there is an added dilemma: exporting raw bitumen to refineries on the U.S. side of the Great Lakes also exports jobs and opportunities to add value in Canada, while it nevertheless locks Canadians more tightly into a dirty oil supply chain. On the other hand, to not export tar sands oil for refining (but still produce the bitumen) means that Canadian refineries would themselves need to expand; the pollutants would then come out of Canadian stacks and pipes, rather than American.

The reason for wanting to produce more oil from dirty bitumen is obvious: it would mean more oil for markets in North America and, if additional pipelines are built, for overseas markets. But when this oil runs out – and it will – the consequences and leftover effects will be far more damaging than the economic benefits that could be derived from extracting and refining this oil.

The pipeline from the tar sands to the Great Lakes promises to lead to a reversal of the tentative pollution control gains that have been made in the Great Lakes Basin since the 1970s. Water quality will be affected. Acid rain will make a comeback. And producing dirty oil will do little, if anything, to moderate the rising price of oil – bitumen is costly to extract and process and doing so does not mean prices would go down. It increases environmental risk all along the thousand-plus kilometre pipelines that would carry the oil, and it can devastate valuable agricultural land, boreal forests and wetlands. Advocates of tar sands exploitation like to point to promising new technologies that will mitigate or prevent the damage, but the problems already overwhelm the technological solutions which, at best, will still be in their infancy when the pollution is already out of control.

## **2. North America's Pollution Delivery System: the pipelines**

**C**arlisle Kelly, who lives in central Illinois, doesn't think what's happening in Athabasca is far away enough. Kelly, 54, has been engaged in a legal battle with Enbridge Inc., one of Canada's major players in energy and oil transport. Enbridge has been seeking a 120-foot wide easement through some 500 privately-held parcels of land, including Kelly's. Enbridge requires this easement to build a 175-mile pipeline, costing \$350 million, through Illinois to carry synthetic crude oil from the Alberta tar sands. Kelly wants to protect a stand of ancient oaks on land he bought near LeRoy, Illinois. "They can say all they want that this is for the good of America, but it's really just a big-money foreign oil company trying to make money," Kelly says.<sup>6</sup>

One of hundreds of pipeline sections proposed to traverse thousands of miles, this Enbridge section would link the oil to refineries on the Texas Gulf Coast. Obviously the tar sands oil is landlocked, but "if you can move crude from Western Canada to the Gulf Coast for something less than \$13 a barrel, and we sure think we can, there's a significant arbitrage to be captured there and shared between Western Canada producers and Gulf Coast refiners," said Enbridge's Executive Vice President and CFO Richard Bird.<sup>7</sup>

Enbridge already owns and operates a lucrative and extensive pipeline network running from Fort McMurray in the tar sands through Saskatchewan and Manitoba and into Minnesota, Wisconsin, Illinois, Michigan and several other states (see Figure 2). Enbridge's proposed new network of pipelines is part of an ambitious expansion plan. Getting the oil from the dirty tar sands to the Midwest and beyond is only part of the expansion program. It also means significantly expanding the refineries in Indiana, next to Chicago, as well as in other states and possibly in Sarnia, Ontario (though this latter project has recently been put on hold).

The size and scale of pipeline development should not be underestimated. The Canadian Association of Petroleum Producers (CAPP) lists 36 pipeline expansions and proposals.<sup>8</sup> The U.S. Congressional Research Service (CRS) notes that "an estimated \$31.7 billion (U.S.) has been invested in pipeline projects for oil sands in western Canada."<sup>9</sup>

TransCanada Pipelines' Keystone project, a 2,148 mile (3,456 kilometre) pipeline from Hardisty, Alberta to Wood River and Patoka, Illinois and Cushing, Oklahoma will carry up to 590,000 barrels per day by late 2010 (construction was scheduled to begin in mid-2008). But it is Enbridge's network that is expected to carry the bulk of tar sands product to the Great Lakes for refining.

"Enbridge is proposing a number of expansion projects to help address current and future increases in refinery demand as supply from Western Canada's vast oil sands increases," the company's website says.<sup>10</sup> It considers this expansion program as "a North American solution to energy reliability and security of crude petroleum supply." The most significant of the pipeline expansion projects is Enbridge's Alberta Clipper pipeline. In Enbridge's own words:

The Alberta Clipper Project is an integral part of Enbridge's expansion program to meet North America's needs for reliable and secure energy supplies.

Alberta Clipper is a crude oil pipeline providing service between Hardisty, Alberta, and Superior, Wis. This 1,000-mile/1,607-km segment is designed to resolve expected capacity constraints and is expected to be in service by mid-2010, after the Southern Access program is completed and as crude oil supplies from Western Canada continue to increase. Initial capacity will be 450,000 barrels per day (bpd), with ultimate capacity of up to 800,000 bpd available.

With supply from Western Canada oil sands developments expected to grow by as much as 1.8 million barrels per day by 2015, the industry has asked for more capacity out of the oil sands and into the U.S. Midwest markets. The request is driven by oil sands producers and refiners that have long development timelines and need assurance that adequate pipeline infrastructure will be put in place in time to serve their projects. Alberta Clipper is a direct response to this request.<sup>11</sup>

It is important to understand the significance of this description. *“The industry has asked for more capacity out of the oil sands and into the U.S. Midwest markets. The request is driven by oil sand producers and refiners...Alberta Clipper is a direct response.”*

A typical pipeline is only 36 inches in diameter. As Carlisle Kelly knows, the pipeline’s footprint across the landscape is roughly the distance from the goal line on a football field to the 30-yard line. But what is far more significant is to look at the crude oil that is to go through these Enbridge pipelines, what needs to be done to send it through, what could happen along the way and ultimately, what must then happen at the other end of this 1,000-mile pipeline. If more of the dirty-to-extract Athabasca Tar sands oil is transported eastward to the Midwest (and Ontario), there will need to be more capacity to refine this oil in these destinations.

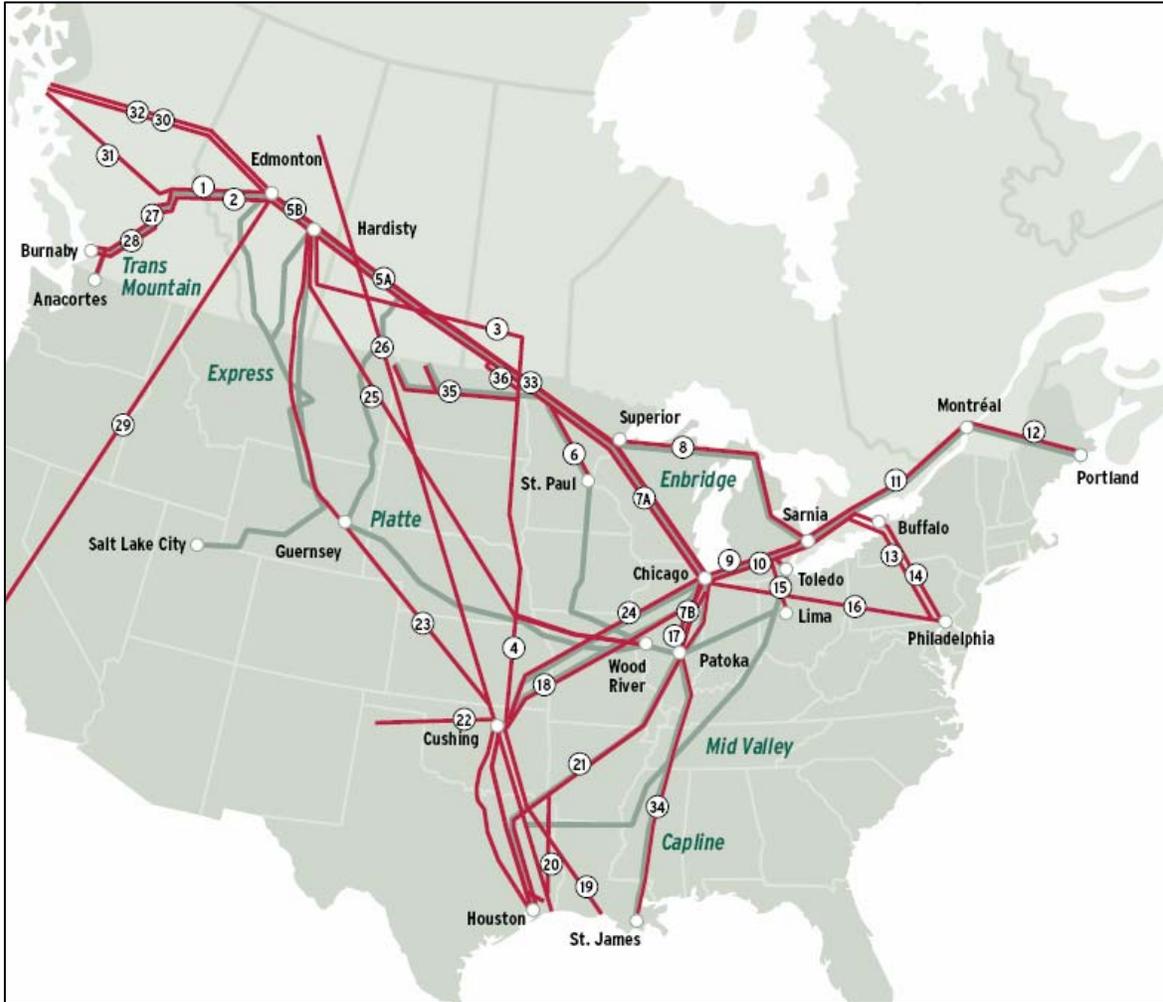
This means that refineries in the Great Lakes region will have to expand. And the effort to get this done as quickly as possible is exactly what is underway now.

In fact, as many as 17 major refinery expansions are now either being considered, planned, applied for, approved or developed in and around the Great Lakes. (The number varies as companies revise and amend their plans according to market conditions and financing considerations.) These include:

- **Illinois** (Conoco Phillips in Wood River, Exxon-Mobil in Joliet, and Marathon Robinson in Robinson)
- **Indiana** (BP Products North America Inc. in Whiting)
- **Kentucky** (Marathon Petroleum Co. LLC in Cattletsburg)
- **Michigan** (Marathon Petroleum Co. LLC in Detroit)
- **Minnesota** (Marathon Petroleum Co. LLC in St. Paul Park)
- **Ohio** (BP Products North America Inc/Husky Energy Inc. in Toledo)
- **Wisconsin** (Murphy Oil USA Inc. in Superior)
- **Ontario** (Suncor in Sarnia).<sup>12</sup>

(See Figure 3; also see details in Appendix A – Welcome to PADD II).<sup>13</sup> As mentioned above, some of these expansions are underway; some are approved, others are still being contemplated by the refining companies. Some have been shelved for the time being (e.g., Shell in Sarnia), but not permanently or categorically. All of these expansions are problematic, for a number of environmental, economic, political – and often contradictory – reasons.

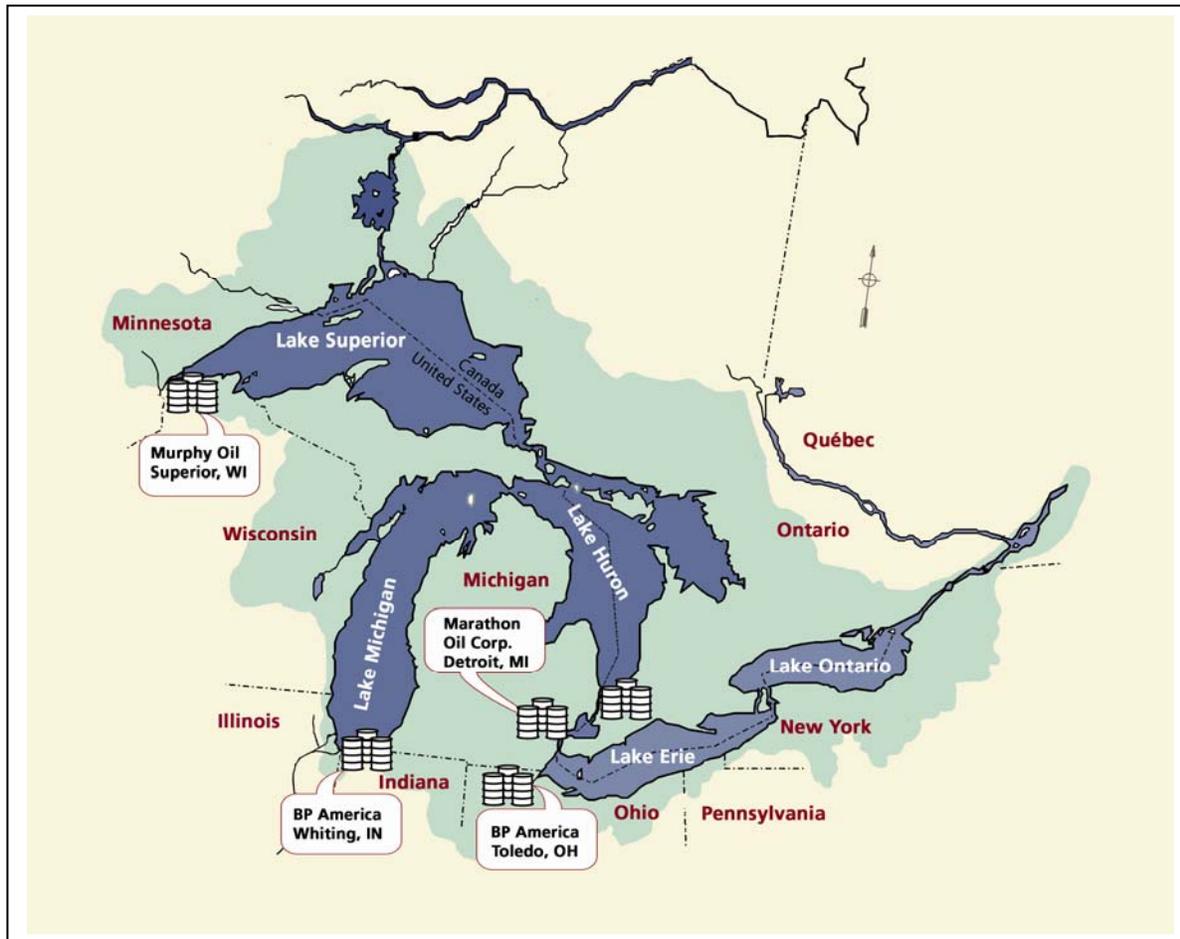
Figure 1: Pipeline Expansions and Proposals



Source: CAPP Royalty Review Status and Update, June 2008



Figure 3: Selected Refinery Expansion in the Great Lakes



Source: Janice Enloe, copyright Alliance for the Great Lakes

The refinery expansion that has attracted the most attention and notoriety to date is the plan by British Petroleum (BP) to grow its facility in Whiting, Indiana, near Chicago, to process Canada's oil sands. This is a \$3.8 billion (U.S.) project, which would create 2,000 temporary construction jobs, 80 permanent jobs and, logically, would increase gasoline supplies in a heavily populated region that is chronically prone to price spikes and threatened by seasonal shortages. BP has already invested more than \$100 million in the project.<sup>14</sup>

BP says that "the project benefits U.S. energy security and fuel supply reliability for the Midwest U.S., including jobs for thousands of BP employees and contractors in Northwest Indiana. [It] enables the facility to increase motor fuels production by about 1.7 million gallons each day and to refine more oil from Canada, tapping into growing oil production in the Alberta province. The project also provides a significant increase to the tax base of northwest Indiana. An important aspect of the project is to design and integrate improvements that protect the environment."<sup>15</sup>

On May 30, 2008, the *Chicago Tribune* reported that more than 26,000 jobs have been lost in Northwest Indiana since 1979, a 71 per cent decline. The labour market in this region “is vanishing,” the newspaper said.<sup>16</sup> So the economics of the Whiting refinery expansion are compelling – millions of extra gallons of gasoline, roughly a 15 per cent increase, thousands of short-term jobs, and even some longer term ones.

The environmental implications of the expansion are somewhat less compelling.

In 2007, BP applied to the Indiana Department of Environmental Management for a permit that would allow its refinery to increase discharges of suspended solids in Whiting – tiny particles of sludge – from 3,646 pounds per day to 4,925 pounds per day. The refinery would also be permitted to increase daily discharges of ammonia to 1,584 pounds, up from 1,034 pounds. Both sludge and ammonia are toxic byproducts that come from turning unrefined oil into gasoline. The Indiana Department of Environmental Management did not consider this pollution increase to be excessive, and the U.S. Environmental Protection Agency also reviewed the permit and offered no objection. Peter Swenson, in charge of wastewater permits in the Great Lakes region for the EPA, said: “The actual limits in the permit are protective of water quality. Water quality limits are designed to protect all the uses of the lake, including drinking water, aquatic life and recreation. I believe it’s safe.”<sup>17</sup> At a time when climate change is an increasing concern around the world, the refinery will also emit an estimated volume of carbon dioxide into the atmosphere equivalent to that of 340,000 vehicles.<sup>18</sup>

Not everyone agreed though, and an outcry followed in July, 2008 when the *Chicago Tribune* reported these increases represent a rise of 35 per cent more sludge and 54 per cent more ammonia.<sup>19</sup> Tens of thousands of signatures were gathered in Indiana and the Chicago area opposing the permit, and Rep. Rahm Emmanuel, an influential Illinois Democrat, sponsored a resolution with Michigan Republican Vernon Ehlers urging Indiana to reconsider the permit. The resolution passed in the U.S. House of Representatives by 387 to 26.<sup>20</sup> Faced with this opposition, BP agreed to look for technology that would let it keep discharges into Lake Michigan from Whiting at current levels – technology that unfortunately doesn’t yet exist.<sup>21</sup>

BP’s partial withdrawal could perhaps be chalked up as a minor environmental victory if the story ended here, and the company now was to devote its efforts to seeking as-yet undeveloped technology rather than continuing its refinery expansion plan. But nothing is as simple as that in the volatile world of North American energy security, with producers and consumers at all jurisdictional levels struggling to determine how to cope with the unslaked demand for oil, and few, if any, meaningful, discernable energy conservation policies.

As it happens, the Whiting expansion is but one of a number of refinery development projects in the Great Lakes region that are either proposed, planned or in progress. In Canada, in Sarnia – part of Ontario’s “Chemical Valley” – Shell Canada recently shelved plans to build a new heavy oil refinery that would be capable of producing between 150,000 and 250,000 barrels per day of light oil products. As author Andrew Nikiforuk

notes in his book *Tar Sands*, the Chemical Valley “boasts more than 65 petrochemical facilities including a Suncor refinery which has been upgrading bitumen for 55 years. Shell wants to add a bitumen upgrader to the mix [*a project now put on hold by Shell*] while Suncor just completed a billion dollar addition to handle more dirty oil.”

But the region already endures some of the worst pollution in Canada or 131,000 tonnes of air pollution a year. Industrial waste from Chemical Valley has feminized male snapping turtles in the St Clair River, turned 45 per cent of the whitefish in Lake St Clair “intersexual” and exposed 2,000 members of the Aamjiwnaang First Nation to a daily cocktail of 105 carcinogens and gender benders. The Ojibway [members of a First Nation who live in the area] are not faring much better than the snapping turtles or whitefish. In fact the number of newborn girls outnumbers boys by two to one on the reserve. Two thirds of the children have asthma while 40 percent of the women experience miscarriages. Calls for a thorough federal investigation have gone largely unheeded. Environment Canada never bothered to do a cumulative impact study and probably no responsible authority ever will.<sup>22</sup>

In Wood River, Illinois, near St. Louis, Missouri, ConocoPhillips seeks to process Alberta Tar sands oil from EnCana Corporation as part of a \$15 billion expansion that would also send processing to Texas. This project has been challenged by the U.S. Natural Resources Defense Council; in June, 2008, the U.S. EPA determined that its Illinois counterpart didn’t adequately address air pollution questions raised during the permit process and reopened the project to further public comment.<sup>23</sup>

In Superior, Wisconsin, Murphy Oil is studying an oil sands-related expansion that citizens fear could damage 300 to 500 acres of wetlands. The project will consume 5 million gallons of water per day from Lake Michigan and boost the refinery’s energy demand 12-fold; the filling of the wetlands, according to one environmentalist, will be “the largest wetlands filling in Wisconsin since the passage of the U.S. *Clean Water Act* of 1972.”<sup>24</sup>

In Detroit, a Marathon refinery is awaiting its final expansion permits; unlike other projects, this refinery does not discharge directly into the Great Lakes, but pre-treats its waste and then sends it to Detroit’s municipal treatment system before discharge. However, Detroit is already among the worst 10 (ranked ninth) U.S. cities for short-term particle pollution (the microscopic solids and liquid droplets that are often linked directly with health problems). In Toledo, Ohio, BP has an agreement with a Canadian company to expand its refinery and split the profits from processing oil sands, although no official permit applications have been filed yet.<sup>25</sup>

Although these refinery expansion projects are at various stages of development and planning, and even though in many cases they have encountered setbacks and delays from opponents, it is important to consider the expansions as a whole. The combination of tar sands oil, new pipelines and increased refining capacity might be thought of as a

**new pollution delivery system for North America.** The cumulative effect of this pollution delivery system may bring to the centre of North America an additional 2.3 million tonnes of greenhouse gas emissions per year – and this is a conservative estimate. It will also bring new, large-scale sulphur dioxide and nitrogen oxide emissions – the building blocks of acid rain – as well as fine particulate matter, which is responsible for premature deaths. In addition, refineries use millions of litres of water per day. It is also worth noting that these would be refinery expansions, not replacements – in many, if not most cases, the old refineries with increasingly antiquated abatement equipment would be running side by side with the new expansion facilities.

The whole pollution delivery system – extraction in the tar sands, upgrading, transporting and refining – is worse than the sum of its parts. Sending tar sands oil to the Great Lakes Basin and the U.S. Midwest and refining it there will drive more rapid development in the tar sands. The pressure to feed the system makes it ever more difficult to heed the advice of distinguished Albertans such as former premier Peter Lougheed, who says “We should have more orderly development. That means, do one plant, finish it, do another plant instead of having four of them go on at the same time.”<sup>26</sup>

This pressure to develop is not a case of one company seeking market advantage over another; the scale, cost and timelines for planning are too large for that. This is a sector-wide expansion, based on the economics of ever-increasing oil prices (at the time of writing the price of crude was between \$100-\$140 U.S. per barrel), ever-increasing demand, little apparent political will to curb petroleum use...and the development of the infrastructure in Canada to drill, extract and ship the oil to the Great Lakes and beyond. It is a massive upgrading of the petro-infrastructure of North America, transcending the imperatives of one particular company and either the support or resistance of any particular jurisdiction. Simply put, it has become economically viable to extract the dirty, sticky oil from the Athabasca tar sands. The short- and medium-term economic prospects for undertaking this massive infrastructure change are compelling. The long-term implications for the world’s largest supply of freshwater – and the planet’s atmosphere – are more important.

The tar sands to refinery, Fort McMurray to Great Lakes trail is the next phase of a supply chain that has already made Canada the world’s fifth largest exporter of oil and the number one supplier to the U.S. The oil from the tar sands supplies 50 per cent of the gasoline for Canadian vehicles and 10 per cent of U.S. demand. It is often referred to as “dirty” oil, even by proponents who advocate exploitation of the resource. One doesn’t need to be an engineer to recognize the inarguable fact that upgrading bitumen from the tar sands into a marketable petroleum product is one of the most energy-intensive, dirtiest industrial activities in existence.

The Pembina Institute, an Alberta-based environmental research organization, explains what is involved in processing the oil sands:

Oil sands deposits are composed of sand, silt and clay, water and about 10-12 per cent bitumen. Oil sands are either surface mined from open pits or

heated so the bitumen can flow to a well and be pumped to the surface (in situ extraction). Approximately 93 per cent of Alberta's oil sands can only be developed using in situ recovery. Special recovery methods, most commonly the injection of high-pressure steam, are needed to separate the bitumen from the sand. After being separated from the sand, the bitumen must be upgraded through the addition of hydrogen to convert it into synthetic crude oil that can be sent to refineries.<sup>27</sup>

Through the addition of naphtha or light oil, bitumen can be transported via pipeline for upgrading elsewhere, for example near Edmonton more than five hours south of the tar sands, or even Sarnia, thousands of miles away. But the upgrading process itself is environmentally problematic.

Because of the extra energy needed to melt the bitumen and separate it from the sand – obtained by burning natural gas – and because of emissions from the upgrading process, production of a barrel of synthetic crude oil from oil sands generates, on average, more than three times more GHG (greenhouse gas) emissions than production of a barrel of conventional light or medium crude oil. GHG emissions from the oil sands are therefore rising rapidly as production of synthetic crude oil from the oil sands more than offsets the steady decline in Alberta's production of conventional oil and, more importantly, *supplies rapidly increasing oil exports* [emphasis mine].<sup>28</sup>

To produce one million barrels of tar sands oil a day, the industry needs to withdraw water from the Athabasca River in amounts that would sustain a city of 2 million people – just smaller than Toronto – for a year. Most of this water is never returned to the river; it is pumped into huge dykes containing toxic waste.<sup>29</sup>

Efforts to contain and control the discharges and pollution from the digging and processing of the tar sands are extensive, but not necessarily effective. In late April, 2008 approximately 500 migrating ducks landed in a pond in the Athabasca region at a Syncrude Canada site. The pond contains tailings – water used to separate and process the oil-containing bitumen in tar sands deposits. The water is a poisonous sludge, and the 500 ducks died. The company said it normally operated noisemakers to frighten the birds away from the pond, but they were not operational due to bad weather. Further, Syncrude did not notify Alberta environmental authorities until after the officials had been alerted by an anonymous tip.

The implications of all-out tar sands production on climate change are immense. In a recent report, the World Wildlife Fund and Co-operative Bank Insurance Investments noted that Canada's greenhouse gas emissions were already 26 per cent above its 1990 levels by 2006, compared with its Kyoto target of a 6 per cent reduction. (Since 2006, Canada has indicated that it has no intention of honouring its 2012 Kyoto targets). The report says: "If Canadian oil sands development continues to expand at the pace currently desired by the industry, the production and use of the fuel would account for 87 per cent

of the maximum emissions from OECD countries in 2050 under a 450ppm stabilization pathway”.<sup>30</sup> (450 parts per million is the level of carbon emissions scientists believe the world must stabilize to in order to avoid catastrophic consequences, although currently scientific thinking suggest that much lower concentrations are necessary to avoid calamity.)

Yet “operators have huge oil sands expansion plans, having announced over US\$125 billion of projects to be developed by 2015. The larger operators, including Shell, ExxonMobil, BP and ConocoPhillips, are looking to each produce several hundred thousand barrels per day from the oil sands by 2020. Companies are currently looking to build multi-billion dollar trans-continental pipelines to supply the gas to extract more tar from Canada’s sands.”<sup>31</sup>

### **3. Why the tar sands are coming East: filling the US gas tank**

**D**espite unfortunate and embarrassing occurrences such as the 500 dead birds, economic pressure within Canada to continue to develop and expand tar sands production is relentless and seemingly inescapable. Tar sands oil has become one of the driving forces of the Canadian economy, insulating much of, if not the entire, country from the downturn that has affected the United States and much of the rest of the world.

Oil sands production also has Canada in an economic bind. If Canada builds the infrastructure to refine the oil sands bitumen, Canadians will have to contend with the massive pollution, environmental degradation and greenhouse gas emissions that the industry brings. If Canada doesn’t provide this infrastructure, refineries such as BP’s Whiting facility will do so in the U.S. (assuming that the bitumen continues to flow). The jobs and profits from a Canadian resource will be enjoyed by Americans – and the pollution will still damage the Great Lakes.

“Successful upgrading to finished product could add billions to the Alberta and Canadian economy and broaden Alberta’s markets for value-added products,” Houston analyst David Netzer wrote in his 2006 report to Alberta government.<sup>32</sup> If upgraders are concentrated in one place, their environmental footprint will be smaller and lead to “operational synergies and lower costs” as well, and the whole enterprise can be sustainable. One problem though: industry admits that “air quality and climate change issues have yet to be resolved.”<sup>33</sup>

Further integration of Alberta tar sands crude oil into the North American energy system is consistent with current thinking in both Canada and the U.S. about energy security. Article 607.1 of the North American Free Trade Agreement states that, “no Party shall maintain or introduce a measure restricting imports of an energy or basic petrochemical good to, another Party...” In the past, when oil prices were low, Canada sought to ensure guaranteed access to U.S. markets for Canadian oil. Now, Canada is bound to share the tar sands (for a reasonable, market-based price) with the United States (Mexico likely

does not require Canadian energy as it is also an energy producer). Under the “proportionality” terms of NAFTA, if Canada seeks to reduce exports to the U.S., it is bound to cut its *own* consumption by an equivalent amount. (While this arguably may be a good conservation move, it could also be an ineffective one if Canada’s larger neighbour declines to embrace conservation with similar vigor.) There are also concerns that the shadowy Security and Prosperity Partnership<sup>34</sup> – a “discussion framework” involving Canada, Mexico and the United States at the highest official levels – is already strongly in favour of strengthening the tar sands conveyor belt, no matter what the environmental consequences.

It *is* unmistakably a conveyor belt, almost literally an integrated system that moves raw materials from their source in Athabasca, transports them long distances toward their most favoured markets, improves and adds value to them and has already attracted massive investment. Its downside – the degradation of the environment at *both* ends of the conveyor belt – has not been factored in just yet.

In geopolitical terms, Canada, which does not face war on its soil or incipient revolution or large-scale corruption or nationalized industry, is considered one of the safest places on earth to invest in energy infrastructure. Indeed, the greatest threat the tar sands companies have faced in Canada within this decade has come from a rather meek review of royalty rates by the Alberta government. During the royalty review hearings in 2007, one former executive testified that, all available information indicates that the Alberta royalty rate is one of the lowest in the developed world.<sup>35</sup>

Canada and the oil sands are also a strategically desirable source for U.S. energy. Basic geography is a factor; while Athabasca may be thousands of miles from the U.S., it is still closer than the Middle East or former Soviet republics in central Asia. Canada’s desirability has hardly gone unrecognized; the tar sands have been visited with interest by U.S. Vice President Dick Cheney. President George W. Bush, in his 2006 State of the Union Address, set a goal to drastically reduce oil imports from the Middle East and make American dependence on Middle Eastern oil “a thing of the past.” The Canadian Broadcasting Corporation reported at that time that Paul Michael Wihbey, a Washington insider and an expert on the geo-strategic aspect of the oil industry, said Bush is counting on Canada. The president’s goal is that Canada could help wean the United States off Middle Eastern oil — a national security objective. “He wanted to have a reduction of 1.5 million barrels a day by 2015 from the Middle East. Although he did not mention Canada, that is in fact where the replacement supply will come from,” Wihbey said.<sup>36</sup>

The Bush administration, of course, will be replaced in January, 2009, and its successor will have a different energy policy and different priorities. But this may have minimal implications for the development of the pipeline/refinery system extracting oil from the tar sands. U.S. demand for petroleum remains high despite ever-rising prices, and perhaps more importantly, there is too much already invested in projects such as the Enbridge pipeline network and the Great Lakes refinery expansions to simply allow them to go by the wayside – unless other factors intervene.

At the moment, the unwillingness of governments to stand in the way of tar sands development is palpable. A case in point is the decision in spring, 2008, by Prime Minister Stephen Harper's government to approve development by Imperial Oil of its Kearl oil sands mine in Athabasca. In May, 2008, a court had ruled that the mine's environmental assessment was not properly completed, because it gave no reasons why the inevitable huge amounts of greenhouse gas emissions could be deemed "insignificant". This was of absolutely no consequence to the Harper government. A new U.S. administration – whether Democratic or Republican, no matter how forward-thinking it may be on climate change – is unlikely to allow Canadian environmental concerns to trump its own domestic economic and energy needs...again, unless other factors intervene.

So far, in the view of current leaders, the economy and security are dwarfing the environmental threat that this petro-delivery system poses to North America. On May 8, Canadian Industry Minister Jim Prentice spoke tellingly to the Council of the Americas in Washington.

In the years ahead, energy will be a major source of competitive advantage for many of us. World energy demand will not decrease any time soon. In fact, it will continue to grow. And energy will be a North American advantage because we have such abundance. We also have the infrastructure, the technology and the will to find innovative ways to use energy to build competitive strength.

The oil sands of northern Alberta provide a good lesson in how these resources are developed. Early fur traders used tar sands to patch their canoes. In the 1920s, a university researcher discovered how to use steam to remove the sand from the bitumen. And in the 1970s, the Government of Alberta invested \$700 million to try to find an economical way to do this on a business scale — a huge investment at the time. Government worked with industry and together we went down many blind alleys.

Gradually, researchers found ways to bring production costs down and the price of oil continued to rise. Today, the oil sands development drives a significant portion of the Canadian economy, and it is a very important part of a secure energy supply for North America. Largely on the strength of the 173 billion barrels in the oil sands, Canada has 14 percent of the global oil reserves, second only to Saudi Arabia.

In fairness, the minister did speak about environmental concerns:

Forty years ago, the scientific and technological challenge was to produce oil from tar sands. Today, the challenge is to do it in a way that reduces our impact on the environment. There are many environmental challenges in the development of the oil sands. Environmental challenges are always

the flip side of producing or consuming hydrocarbons.

The answer, ladies and gentlemen, is technology. Once again, we need full government and industry pressure on technological innovation. I have every confidence we will be just as successful meeting the environmental challenge as we were the cost of oil sands production. The challenge, however, is a race against time.<sup>37</sup>

The problem is that Prentice is relying on still-undeveloped technology to solve the *current* environmental mess. In this respect he is no different than virtually everyone else who has any sort of say in the development of the tar sands and the system to transport and refine the oil from there.

#### **4. What could happen? Security and tar sands oil**

**R**ight now about 5 per cent of the total oil refined in the United States is from Canada's tar sands, and this percentage will only rise. As the CRS (Congressional Research Service) notes, "private sector/government partnership in R&D, equity ownership, and public policy initiatives over the last 100 years has opened the way for the current expansion of the oil sands industry in Alberta. Ongoing R&D efforts by the public and private sectors, sustained high oil prices, and favorable tax and royalty treatment are likely to continue to attract the increasing capital expenditures needed for growth in Canada's oil sands industry. Planned pipeline and refinery expansions and new upgrading capacity are underway to accommodate the increased volumes of oil sands production in Canada. U.S. markets will continue to be a major growth area for oil production from Canadian oil sands."<sup>38</sup>

Perhaps the only variable is the speed. "Even though prospects for Canadian oil sands appear favorable, factors such as water availability, waste water disposal, air emissions, high natural gas costs, insufficient skilled labour, and infrastructure demands may slow the pace of expansion."<sup>39</sup>

Whether this development goes on in a semi-orderly fashion or turns into an all-out race toward petro-tyranny depends on the growing realization of the environmental consequences. We need to know more about the consequences all along the conveyor – particularly the consequences to the Great Lakes.

In August, 2006, BP, the same company that proposes to expand its Whiting, Indiana refinery, shut down 73 per cent of a 22-mile transit pipeline in Prudhoe Bay, Alaska because the line was leaking. By the time this spill was contained, it had caused the worst U.S. refinery accident in more than 10 years and the worst oil spill in the history of Alaska's North Slope. The previous year, a BP refinery in Texas exploded, killing 15 people.

Eventually, the Alaska mishap contributed to the resignation of BP's CEO John Browne, who previously had developed a reputation as a visionary for acknowledging the threat posed by climate change, an unusual position for an oil executive. At first, the company said it did not know why the pipeline had leaked. Then the story became more complicated.

"The catchword was 'managed risk,' a North Slope worker and union leader named Kristjan Dye told *Fortune* magazine senior writer Nelson Schwartz. "If you pointed out problems, you weren't told to shut up – you could bring it up, but it might not get fixed."<sup>40</sup>

The *Fortune* writer reported that "BP's internal culture was characterized by intense pressure to keep costs down, and budgeting often took precedence over routine maintenance and occasionally safety...by the time BP shut down the pipes...more than 70 per cent of the wall of the tube had corroded in 12 places. At another 187 spots, wall loss exceeded 50 per cent."<sup>41</sup>

The pipeline section that BP shut down in Alaska after causing such damage was 16 miles long. Enbridge's proposed line from the tar sands to the U.S. is 1,000 miles long.

In fairness, pipeline leaks along Enbridge's existing line are relatively rare. There was a leak discovered in Saskatchewan in April, 2007, and Canada's National Energy Board reported that there were four spills, leaks or ruptures on pipelines the Board regulated between 2002 and 2005, spilling about 1,700 barrels of oil. In 2001, Enbridge's line ruptured in Alberta, spilling 20,000 barrels.<sup>42</sup> (This is under 10 per cent of the 240,000 barrels spilled in the 1989 Exxon Valdez disaster, which caused lasting damage for decades.)

In November, 2007, an Enbridge pipeline in Minnesota exploded, causing a fire and killing two workers. The cause was traced back to a pinhole leak in an 11-foot section that had previously been repaired.<sup>43</sup>

In May, 2008, the Wisconsin Department of Natural Resources asked the state's Justice Department to prosecute Enbridge for damaging waterways and wetlands while building 321 miles of pipeline. There were no spills this time, although Enbridge was responsible for major spills along a companion route the year before. But the Department alleges that in construction, Enbridge workers illegally cleared and disrupted wooded wetlands and were lax in practices that resulted in sediment discharged into waterways.

"The project has been sloppy," said a spokesperson for the Wisconsin Wetlands Association, which had urged the state to take on the case. The *Milwaukee Journal Sentinel* reported that "documents show scores of incidents in which workers failed to protect wetlands and waterways."<sup>44</sup>

No one seriously believes that pipeline and refinery builders and operators are deliberately sloppy. But questions about environmental practices continually arise. In

November 2007, the U.S. Environmental Protection Agency's regional office in Chicago alleged that BP's Whiting, Indiana refinery violated a number of *Clean Air Act* provisions by making unapproved changes to the plant that boosted its pollution significantly. The EPA alleged that these changes caused "significant increases" in the refinery's emissions of sulphur dioxide, nitrogen oxide, particulates and carbon monoxide, and that BP also modified its flares, which burn off waste substances, without complying with air standards.

These allegations in November came after BP's controversial June 2007 application to permit it to increase its water pollution discharges in contemplation of expanding the refinery. In addition, just days before the allegations, on October 31, 2007, BP filed an application with the Indiana Department of Environmental Management to seek a new air emissions permit in support of the Whiting expansion.

Howard Learner, executive director of a Chicago-based organization called the Environmental Law and Policy Center, noted that the higher emissions from an expanded Whiting refinery all add to greenhouse gas emissions, ground level ozone, acid rain and fine particulate matter – this from a company that promotes itself as "Beyond Petroleum".

"BP can and should be an environmental business leader, but if they're going to talk the talk, they're going to have to walk the walk when it comes to reducing air and water pollution," Learner said.<sup>45</sup>

## 5. Who cares about this?

For some time, organizations such as Chicago's Environmental Law and Policy Center and the Natural Resources Defense Council have been asking questions and raising concerns about pipeline and refinery expansion for tar sands oil. In March, 2008, lawyers Ann Alexander of the NRDC and Meleah Geerstma of the Center jointly filed a 35-page critique of the Whiting expansion application to the Indiana Department of Environmental Management. (Their application was endorsed by several other organizations, including the Alliance for the Great Lakes, Environment Illinois, Environmental Integrity Project, Legal Environmental Aid Foundation, Save the Dunes Council and the Hoosier Chapter of the Sierra Club.) By their own admission, their 35-page analysis of the expansion proposition only scratches the surface of the damage the project may do to the environment.<sup>46</sup>

We are deeply concerned with both the substance of the draft Permits and the process by which public comment concerning them is being solicited," the submission says. Substantively, the Permits are riddled with critical omissions that result in far less stringent control measures than are required by the Clean Air Act. The draft source modification permit [BP's air emission permit application]... claims a decrease in emissions across the board, thus not triggering the stringent pollution control requirements of [Clean Air Act] New Source Review. However, this purported decrease

is grounded in a significantly flawed analysis, and depends on permit conditions that are not enforceable as a practical matter. Among other things, the analysis outright fails to count the enormous pollutant emissions that are almost certain to result from use of the three new flares that BP is constructing in connection with the Canadian Extra Heavy Crude Oil (CXHO) refinery expansion project (the Project), emissions from increases in releases to existing flares, and emissions from depressurizing the new coker. Moreover, the Permits fail to address at all the large increase in greenhouse gas emissions that will result from the Project, which the CAA requires be evaluated and controlled... Finally, the Permits and supporting materials fail to provide adequate information to determine whether the emission calculations adequately accounted for the higher levels of pollutants in tar sands crude oil.

Given time, we could undoubtedly identify many more significant problems with these Permits.<sup>47</sup>

Yet, as the lawyers point out, there is no time. And remarkably, the opposition and questioning of the pipeline and refinery expansion program is diffuse in the United States and almost nonexistent in Canada, even though the proposals would dramatically increase pollution and greenhouse gas emissions in the Great Lakes region.

Indeed, to the extent that there is opposition, it appears to be focused on aspects of the project as opposed to the entire program – a section of pipeline that may damage a farm, an outcry after a spill, concerns about discharge or emissions from a particular plant or facility. The environmental organizations' March 2008 submission remains the most concerted – perhaps the only – effort to date to draw together the threads proposed pipeline and refinery expansion for tar sands oil and question its overall effect on the Great Lakes Basin environment.

On the Canadian side, citizens have been particularly muted. True, there was an outcry after the ducks were killed in the Syncrude pond. But after some polite questioning of the company, it appears that conservation and environmental groups accepted the company's explanation that this was a tragic accident triggered by the failure to deploy noisemaking guns to scare the birds away from the polluted mess. Even wildlife-based non-governmental organizations hesitated to take Syncrude to task. Reaction was similarly muted after the federal government's quick approval of Imperial's Kearl project just after the regulators had halted it for lack of consideration of its GHG emissions impacts.

There seems to be a lack of information on and an inability to grasp the enormity of the changes that expansion of pipelines and refineries for tar sands oil will bring to the Great Lakes. This is understandable; it is not the responsibility of the publicly traded companies that develop this system to draw attention to contingencies that fall outside of their own investments, plans and legal obligations. Despite the advent of new corporate social responsibility expectations, public companies remain accountable to their shareholders above all. Even in our supposedly enlightened 21<sup>st</sup> century, often there is no legal

obligation even to look beyond the short term to cumulative impacts. And for prospective critics, these matters are complicated – looking comprehensively at an industrial program of this magnitude is comparable to the story of the blind person examining an elephant for the first time. Is it a long, narrow creature? A soft, floppy beast? A thick, giant stalk? Or all of the above?

Even the experts can be stymied and mystified by a development of this size, cost and timeline. In 2003 the U.S. General Accounting Office assessed the extent of progress in restoring the ecological integrity of the Great Lakes Basin (the GAO undertakes such reports at the request of members of Congress). “With available information, it is not possible to comprehensively assess restoration progress in the Great Lakes,” it concluded. “Current indicators rely on limited quantitative data and subjective judgments to determine whether conditions are improving, such as whether fish are safe to eat. The ultimate success of an ongoing binational effort to develop a set of overall indicators for the Great Lakes is uncertain because it relies on the resources voluntarily provided by several organizations. Further, no date for completing a final list of indicators has been established.”<sup>48</sup>

The situation does not appear to have changed since 2003, when the GAO found that:

There are 148 federal and 51 state programs funding environmental restoration activities in the Great Lakes Basin. Most of these programs involve the localized application of national or state environmental initiatives and do not specifically focus on unique basin concerns. However, several programs specifically address environmental conditions in the Great Lakes. GAO identified 33 federal Great Lakes specific programs, and states funded 17 additional unique Great Lakes specific programs. Other governmental, binational, and nongovernmental organizations also fund restoration activities within the basin.

GAO identified several Great Lakes environmental strategies being used at the binational, federal, and state levels. These strategies are not coordinated or unified in a fashion comparable to other large restoration projects such as the South Florida Ecosystem. In an effort to improve coordination, federal and state officials recently published *Great Lakes Strategy 2002*, but this document is largely a description of existing and planned program activities rather than an overarching plan. EPA’s Great Lakes National Program Office has coordination authority over many activities but has not fully exercised it to this point.

In Canada, the situation is no better. The federal government has jurisdiction over fisheries and some responsibility for the environment; the provinces are more directly responsible for air and water quality. Mention “federal-provincial jurisdictional questions” to a Canadian and one is likely to be answered with a litany of examples of responsibility falling through the cracks, dating back at least to the *British North America Act* of 1867 that founded the country.

## 6. Is pollution delivery inevitable?

Throughout the summer of 2008, the price of oil flirted with \$150 per barrel, declined to below \$130 but is expected to fluctuate upward more or less continually; a decade or so ago it was in the \$10 range. Hundreds of millions of dollars have been invested by Enbridge, BP, ConocoPhillips and other developers of pipeline and refinery expansion to ensure that there is a smoothly operating mechanism to transport Alberta tar sands oil to the United States. Opposition, while determined in some cases, is largely diffuse and scattered. To date, other than the detriment of high prices, there are few policies in place to encourage conservation or reduce North America's seemingly insatiable demand for energy.

In terms of policy, the positions from leaders on both sides of the border remain a combination of current economic anxiety and utopian, wishful thinking. Speaking to the Canadian Energy Pipeline Association in Calgary on May 22, Industry Minister Jim Prentice was clear about the economic direction: "The growth of the oil sands has meant that pipeline companies like yourselves will be moving more oil in the coming years, as projects such as TransCanada's Keystone and Enbridge's Alberta Clipper attest to. Pipelines are immensely crucial to the future of the oil sands industry."

On the environmental direction however, although fairly explicit, he was less focused.

Speaking of environmental matters, Prime Minister [Stephen] Harper has made it clear that he wants Canada to be the most responsible environmental producer of oil and gas in the world. And as Minister responsible for pipelines, I will ensure that strict environmental standards will be adhered to in our northern and Arctic region should either or both of the Mackenzie and Alaska gas projects proceed.

We all need to co-operate and pull our own weight in creating a modern, environmentally clean oil and gas industry. And this is where our government is playing a leading role. We understand that we have the responsibility to create an economic environment that helps our industries thrive and compete in a globalized world. But we also have a responsibility for stewardship of the common good, especially in protecting the environment.

This government is committed to protecting the health of Canadians while maximizing benefits to the environment and the economy. In March we published the details of the *Turning the Corner* regulatory framework for air emissions. This framework includes mandatory greenhouse gas (GHG) reductions for industry, along with additional new measures to address two of Canada's key emitting sectors: oil sands and electricity.

Our latest federal budget committed \$250 million for full-scale commercial demonstrations of various energy projects, including carbon capture and storage for coal-fired electricity.

Tough federal regulation of industry's GHG emissions will help achieve the government's commitment to a 20-percent reduction in Canada's overall emissions by 2020, and 60 to 70 percent by 2050. These regulations will be the most important driver of change for moving Canada to a low-emissions economy.<sup>49</sup>

Prentice's points are explicit in that he outlined environmental targets and a financial commitment – it sounds like a program. But it's a program that factors in the unabated development of the oil sands delivery system. The greenhouse gas targets are less than advertised, in that the Canadian government has abandoned the baseline year for measuring reductions (1990) in favour of 2006, when emissions were some 25 per cent higher. So the goalposts have already moved in favour of the oil sands.

To make matters worse, the government, industry, and many others are banking heavily on the viability of carbon capture and storage – note that the \$250 million mentioned by the Industry Minister is for a *demonstration* project. Carbon capture and storage, or CCS, needs to be explored and tried, but experiments and pilot projects do not represent a commercially viable solution for the foreseeable future, given the speed and degree of the impacts from tar sands development and expansion. As the World Wildlife Fund/Co-operative Bank report notes: “CCS is still far from being a viable commercial scale solution and realistically will not be viable for decades to come...According to the United Nations Development Program, ‘CCS technology is projected to come on-stream very slowly in the years ahead...At this rate, one of the key technologies in the battle against global warming will arrive on the battlefield far too late to help the world avoid dangerous climate change’.” The report goes on to say, “It is not acceptable to use a promise of CCS as a licence to significantly expand the exploitation of unconventional fossil fuels, when its availability on a sufficient scale is decades from being achieved, and so many contingencies leave its viability hanging in the balance.”<sup>50</sup>

In his famous essay “Down the Mine”, George Orwell examined the difficult, filthy job of mining coal and mused about its importance to modern society and how many people were utterly oblivious as to how difficult it was to extract. Referring to the backbreaking work and the people who performed it, he noted that “we are oblivious to its existence.”<sup>51</sup> As North America's pollution delivery system expands and develops, the same might be said about North Americans as they start their cars and drive. How many are aware that over this decade, while concern about a clean environment is increasing, their gasoline is increasingly coming from the oil sands and is dirtier to obtain?

## Carbon Capture and Storage

It's not that the jury is out on carbon capture and storage (CCS) – the injection of carbon produced from extracting and processing bitumen back into the earth where the bitumen was taken. In fact, the jury hasn't even begun its deliberations.

In theory, CCS is a promising technology, and there are demonstration projects underway, but they are infinitesimal in comparison with the vast amounts of carbon that would need to be stored to make the tar sands even remotely environmentally viable. We are far away.

Carbon capture and storage may indeed prove to be a panacea, but it's not going to arrive very fast. The Intergovernmental Panel on Climate Change (which won the Nobel Peace Prize in 2007), notes that: "CCS in underground geological formations is a new technology with the potential to make an important contribution to mitigation *by 2030*. [emphasis added]" Technical, economic and regulatory developments will affect the actual contribution." \*

If CCS technology doesn't work well – and it may not -- the pollution delivery system will be in place nevertheless – and in any case, it is a technology that doesn't necessarily address other issues such as air emissions and water discharges.

And what if water discharges into the Great Lakes, and air emissions around them, do increase significantly once the pipeline and refinery expansion is complete? The irony is that since 1970 and the first U.S. *Clean Air Act*, we have slowly made measurable progress in pollution abatement in the Great Lakes region. Acid rain, while not stopped, was curbed; it will come pouring down anew as refinery and upgrader emissions increase in order to supply more dirty oil to meet unabated demand. So will the rain of other toxic pollutants – the still poorly understood soup of chemicals that mix in short- and long- range trans-boundary air pollution.

\* (IPCC 2007c, Working Group III *Summary for Policymakers*, p. 13)., in *National Water Program Strategy: Response to Climate Change* (Public Review Draft), Office of Water U.S. Environmental Protection Agency, March 2008, 115 pages at p. 19.

## 7. The climate change imperative

In the June, 2008 edition of *Scientific American*, Oxford Philosophy Professor John Broome analyzes the ethics involved in curbing greenhouse gas emissions. "Suppose you calculate that the benefit to you and your friends of partying until dawn exceeds the harm done to your neighbour by keeping her awake all night. It does not follow that you should hold your party. Similarly, think of an industrial project that brings benefits in the near future but emits greenhouse gases that will harm people decades hence. Again, suppose the benefits exceed the costs it does not follow that the project should go ahead. Indeed, it may be morally wrong. Those who benefit from it should not impose its costs on others who do not."<sup>52</sup>

Broome notes how two economists, Sir Nicholas Stern of the United Kingdom Treasury and William Nordhaus of Yale University, have published separate analyses of the costs and benefits of addressing climate change and come to different conclusions about the

urgency to act. Stern urges more drastic, immediate action; Nordhaus says the world has time. The difference is based on their different analyses of the cost of climate change to future generations. Stern says the cost will be high, and soon, while Nordhaus says the economic effect won't be felt for a while.<sup>53</sup>

Broome does not presume to determine which economist is right. This is an ethical question, he says. But he does not question that whether the action is quick and aggressive or slower and more benign, there is a need to address climate change. Anecdotally, few people disagree today; whether quickly or gradually, we should be doing something about climate change.

This raises the question: *If we agree that we should act to curb climate change, why are we creating a massive, complex new long distance pipeline and refinery system to do just the opposite?*

## **8. Who can do what? Accountability**

**A** traveler once went to Denmark and noticed the Queen of Denmark shopping all alone in the market. There were no guards, no soldiers, and no officials to keep the public away. "Who protects her?" the traveler asked. "We all do," was the answer.

As the U.S. Government Accounting Office has determined, the system of oversight and management of Great Lakes water quality is fragmented and diffuse? Who does what? If one agency acts, can the other counteract? Even the GAO, with its much-vaunted research abilities, can't answer this question.

In the absence of knowing the unknowable, in terms of which agency or jurisdiction has the ultimate authority to protect the region and its water, shouldn't the short answer be that "they all do?"

That may be wishful thinking. The Great Lakes are governed by an intricate web of transboundary treaties (the Boundary Waters Treaty of 1909), international agreements (NAFTA, the 1972 Great Lakes Water Quality Agreement), national laws (the U.S. Clean Water Act, Canada's Fisheries Act), agencies (the International Joint Commission) and governments, and a tangle of state, provincial and municipal laws, regulations and policies.

While all of these laws and regulations serve their purpose – some more effectively than others – collectively they still do not address the cumulative challenges posed by the relentless economically-driven expansion of pipelines and refineries that will deliver pollution to the Great Lakes Basin. As the GAO observed, there is no one jurisdiction or agency that can step in and take charge. That is not to say that no one can intervene or that all are powerless. For example, the U.S. EPA, stripped of much of its authority during the 2001-2009 Bush administration, nevertheless possesses considerable authority

to exercise over emissions and discharges – *if it chooses*. In Canada, the jurisdictional cracks between federal and provincial authorities often mean that no one assumes responsibility for the Great Lakes. In fact, the Ontario government has been remarkably unengaged in the issue of how tar sands oil will affect the province’s air and water: the province doesn’t seem to even be asking the key questions, let alone contemplating the possible policy answers. This doesn’t have to be the case; in fact, the frequent lack of clarity in Canada on which level of government is responsible for what can be an opportunity for an activist government to assert control over the pollution and degradation arising from the expansion of pipelines and refineries in the Great Lakes Basin to transport and process oil from the tar sands.

It is ultimately a matter of political will. As the experience in gaining a Congressional resolution on BP’s Whiting expansion demonstrated, political leaders will respond when individuals and organizations raise their concerns in a clear, coherent way. The difficulty for concerned citizens is that their victories are achieved piecemeal; achieving the Whiting resolution required a massive application of legal know-how in the face of BP’s application, which was many hundreds of pages in length. Yet in the end, the main results of the resolution, while important, are not the final word: the environmental movement has managed to slow the pollution delivery system, not stop it. It is worthwhile and productive to inform and align Illinois leaders, such as Rep. Rahm Emmanuel and Chicago Mayor Richard Daley, about the threat to water and air posed by refinery expansion in Indiana, but this is an easier sell in neighbouring Illinois than in Indiana itself. And these leaders are themselves pragmatic and realistic about the limits of their own influence. Speaking in Toronto on July 18, 2008, Mayor Daley explained that he does not oppose BP’s refinery expansion; rather he is calling for the highest possible emission and discharge standards to be applied: “I’m very pro-business...I hope they [BP] come back and decide to build a brand-new state-of-the-art refinery, perhaps the first of its kind in North America.”<sup>54</sup>

## 9. What happens next

**W**ill this ever change? It is hard to predict. A consensus already exists that the Great Lakes and their freshwater are a vital resource; groups ranging from the Brookings Institution to the Great Lakes Governors and Premiers have endorsed various forms of increased bilateral co-operation, some highly detailed and prescriptive, some rather vague.

Sometimes there are small breakthroughs. On September 9, 2008, ConocoPhillips was issued a U.S. EPA permit for a \$2 billion coke unit at its Wood River refinery after reaching a \$3.4 million settlement with environmental groups and committing to technical improvements, monitoring and reducing pollution from flaring. The agreement marked the first time a large refinery has agreed to measure and reduce its greenhouse gas emissions.<sup>55</sup>

A great deal of expectation, if not hope, is placed on the imminent change in U.S. administrations after the November, 2008 election and to a lesser extent the outcome of Canada's October, 2008 federal election. In the U.S., both candidates have pledged repeatedly to put more effort and attention into environmental issues than George W. Bush's administration, and the platforms of both Senators Barack Obama and John McCain both include pledges to act on climate change (though this has been tempered during the fall campaign by Republican calls to drill in offshore areas that are now off-limits). Real change would necessitate addressing refinery pollution, and by implication, acting against attempts to expand refineries in the Great Lakes in ways that would increase pollution. A logical place to begin would be to call for any changes in refining in the Great Lakes to be done in carbon neutral way, and in adherence with the higher refinery standards in place in California. An explicit call of this sort by the presidential candidates would in turn put some pressure on the Canadian government to live up to the same standard – something which has not been the case under successive governments of different political parties.

What is apparent is that there is a political window now. But the window only becomes useful if the issues raised by more and more tar sands oil coming to the Great Lakes are raised comprehensively, not piecemeal, and are raised in terms of broad public concerns rather than special interests.

## 10. Conclusions and Recommendations

The Washington-based organization Environmental Integrity Project raises an intriguing idea: “When permitting the pipelines to carry tar sands crude to U.S. refineries, the responsible U.S. environmental and public lands agencies should consider the cumulative effects on air quality and global warming of all U.S. refineries which process tar sands oil, as well as the global warming impacts of extraction of tar sands crude in Canada on the United States.”<sup>56</sup>

The reason this idea is intriguing is that in essence, it puts the onus for a solution to the pollution and emissions issues raised by the continental pollution delivery system onto its producers. It does not expressly call for forbidding the transport of tar sands oil to the Midwest, nor does it call for curtailing the use of the oil sands. In fact, it forbids nothing. It merely calls for a full and accurate assessment of the “life cycle” emissions and impacts of the proposed projects.

What it does, though, is require the producers to determine how to conduct their activities in much cleaner ways than they do now or have ever done. This has implications, for how regulations are drawn, how they are put into effect and enforced, what the timelines should be and who dictates the timelines.

Why not go further? Why not insist that any expansion of refinery capacity to account for the refining of tar sands product *be done in a carbon neutral way*? Can this in fact be achieved? The industry (with some notable exceptions who continue to contend that

climate change is a myth) insists it is working feverishly on ways to mitigate greenhouse gas emissions. Why not insist that this be a prerequisite for further expansion, and that carbon neutrality must be achieved on a deadline if refinery expansion is to take place at all?

There are numerous additional, subsidiary steps that can be taken. For one, it would make a considerable difference if both the U.S. and Canada were to become serious about energy conservation by adopting stricter standards for automobiles and other products that use petroleum. Behaviour changes now taking place due to the high price of gasoline suggest that market forces will also have an effect, but market forces alone will not change behaviour – over the medium term prices will occasionally fall as well as go up. Concerted policies, as well as market forces, are necessary to effectively curb demand.

Other recommendations from the Environmental Integrity Project concentrate on the United States but can be applicable on both sides of the border. For example:

- Both the U.S. EPA and Environment Canada/Natural Resources Canada should regulate greenhouse gas emissions from oil refineries pursuant to the “New Source Performance Standards” (“NSPS”) applicable to newly modified or constructed oil refineries.
- Both countries should limit greenhouse gas emissions and consider alternatives to tar sands oil feedstock in its “best available control technology” (“BACT”) and “lowest achievable emission rate” (“LAER”) determinations under the “new source review” (“NSR”) provisions of the *Clean Air Act* when issuing construction permits for refinery expansions or new refineries.
- Both should account for “conventional air pollutants” as well as greenhouse gases – the increased air emissions of sulphur dioxide, hydrogen sulphide, sulphuric acid mist, nitrogen oxides, hydrochloric acid, and toxic metals such as mercury, nickel and lead that are produced as a result of processing tar sands feedstock – when issuing construction permits under new source review.

On either side of the border, if refineries seek to expand, they should be required to be built to California emissions and discharge standards. There is no reason to accept lower standards near the most important freshwater resource in the world.

### California Refinery Standards

California is known for its voracious demand for petroleum products, and for pollution standards that are generally far more stringent than U.S. federal or Canadian ones. This extends to the state's refineries. Responsible for over 10 per cent of the U.S. refined product supply, California refineries have since 1996 been required to produce cleaner-burning gasoline, under the most stringent emission reduction criteria in the U.S. In mid-1999, the state's then-governor ordered a phase-out of a key oxygenate used by most refiners to manufacture cleaner burning gasoline to meet emission standards set by the state's Air Resource Board. The oxygenate, MTBE, had been discovered to be highly soluble in groundwater and had found its way into drinking water wells in several locations, requiring closure of the wells. To date, California's refinery standards have not been matched in the U.S. Midwest or in Canada.

SOURCE: Western States Petroleum Association, Issues and Publications, California Petroleum Industry Overview ([www.wspa.org/issues/iff\\_cpio.htm](http://www.wspa.org/issues/iff_cpio.htm))

In addition, it's time to come clean about numbers. The expansion application process is riddled with obfuscation and, unless one happens to be an environmental engineer or lawyer, confusion. A recent study by the Alberta Research Council looked at the plume of contaminants coming from an unnamed Canadian refinery and found that it released 19 times more cancer-causing benzene than the refinery reported, 15 times more smog-causing benzene and 9 times more methane (a potent greenhouse gas).<sup>57</sup> (See Appendix B, Gaming the System for ways in which refineries emissions can be under-reported). Surely we need more accuracy than this in reporting. How much will carbon dioxide emissions increase if all the planned refinery expansions go ahead (and remember, this is before the gasoline itself is used in cars, trucks and factories, generating even more GHGs)? How much will emissions of other air pollutants such as fine particulate matter, sulphur dioxide and nitrogen oxides increase? Will another generation be doomed to fight acid rain? How much will discharges to water increase? While it is true that each company's refineries operate under different processes and measurements can't always be exact, surely the regulators on both sides of the border can insist on a common set of measurement standards for air emissions, emissions from flares, water discharges and the like. And surely these common measurements should be readily available and easy to explain to the public who will have to live with the consequences of expansion.

Indeed, the governments of both Canada and the United States could do a lot to address jurisdictional confusion and gaps by jointly agreeing to an inventory and review of who is responsible for what in the Great Lakes region in terms of refinery expansion and emissions. This review would not be done with the objective of changing anyone's responsibilities. It would merely be an effort to figure out who is responsible, which would enable the public to determine whether responsible actions are being taken. One would think that federal regulators should be responsible for examining cumulative effects (see Appendix C: Who does what).

“The United States is going to be in a carbon constrained economy,” says the Environmental Law and Policy Center’s Howard Learner. In many cases, the refineries that gain permits to expand may hold back. “Everyone is keeping their eyes and ears closely attuned to changing market conditions.” Indeed, market conditions are changing; within five years, the auto industry is expected to build vehicles that use considerably less gasoline and a cap-and-trade regime for carbon emissions is all but inevitable during the next U.S. administration, he explains. This is likely to bring new pressures from other carbon emitting industries to limit refinery expansion. “If you are a company that owns a large number of coal plants and you are looking at somewhat significant CO<sub>2</sub> reductions, you might be concerned that you are going to be asked to do more [in terms of reductions so that refineries can do less and still remain within the carbon cap].”<sup>58</sup>

It’s time to step forward and look back at the same time. We need to look seriously, and with better perspective, at what we are doing. Writers and analysts including Andrew Nikiforuk have compared our dependency on oil and the tar sands to society’s economic dependency on slavery until the 1800s – there were compelling economic arguments as to why it would wreak havoc on society if slavery were abolished, but in the end, long-term reason won out and in fact the economic arguments turned out to be not that compelling. We hear often today how we can’t possibly limit our dependency on oil as quickly as environmentalists advocate: it’s time to look at this dispassionately, weigh the pros and cons, and it may just turn out that addiction to oil is hardly compelling. We cannot do without oil right now; perhaps what we need to contemplate is the energy equivalent of a safe drug injection program.

Even if that is the best we can do, it is better than what we are doing. If one were to descend from the heavens and encounter North America today, with the threat of climate change looming and pressures on the Great Lakes water (in terms of both water quality and quiet proposals to withdraw and transfer water), there is probably no idea worse than the idea of building a new pollution delivery system to take dirty oil from the West to make the Great Lakes worse. It’s time to contemplate not just what we are doing, but whether we should do this and ask: why?

*Let’s slow down* and consider the following:

- What we’re doing is not sustainable. Piecemeal, poorly regulated, barely planned refinery expansion to bring dirty tar sands oil to the East is not an economic boon – it’s a pollution delivery system.
- Ostensibly the pollution delivery system is supposed to enhance energy security – but it will *lessen* our security. Delivering the tar sands to the Great Lakes will reduce air quality, degrade North America’s largest secure supply of freshwater, increase greenhouse gases and wipe out many of the pollution control gains we have worked hard to attain since 1970.
- If any refinery expansion is contemplated, there must first be thorough analysis of the *cumulative* impact of the entire pollution delivery system, on air and water

quality, climate change and public health. The International Joint Commission (IJC) can start this research, and no major refinery or pipeline expansion should take place until this information provides conclusive direction.

- Expansions that are already underway, at any stage, should be required to adhere to California emissions and discharge standards, on both sides of the border.
- The IJC's Air Quality Advisory Board asked a number of important questions in its Critical Air Quality Summary of December, 2007 (see box, The IJC's Critical Questions). The IJC should follow up by seeking the detailed answers.
- It is still unclear how the aggressive export of dirty tar sands oil is distorting Canada – tilting its economy away from other sectors, affecting livable areas, causing social upheaval as workers depopulate some regions to scramble for work in the tar sands, and creating a multi-billion dollar reclamation liability. To date in Canada, our economic policy has consisted largely of acquiescence to this aggressive and relatively uncontrolled resource extraction. To emphasize: we need to *slow down*: the oil will remain there even if we do not scrape away the face of the earth, carve up the boreal forest, boil toxic chemicals and send them by pipeline to the centre of the continent for more refining and burning. We need a national – and binational – debate about the pace and scale of tar sands development.

As Orwell said in “Down the Mine” in reference to coal, “We all know that we ‘must have coal,’ but we seldom or never remember what coal-getting involves.”<sup>59</sup> The same thing is true of oil, except we *do* know what oil-getting involves. We also know there are different ways of building a civilization. We can do better than spending billions of dollars to deliver pollution to its heart.

### The IJC's Critical Questions

In December, 2007, the International Joint Commission's (IJC) International Air Quality Advisory Board published its Second Summary of Critical Air Quality Issues in the Transboundary Region.\* It asked six key questions – the first two and the last relate particularly to how North America's new pollution delivery system is bringing tar sands toxics and contamination to the East:

1. Accelerated energy development in Canada and the United States and cleaner air - can we have both?
2. As the locus of energy development moves westward, can we tackle western transboundary air quality concerns?
3. Are governments doing enough to deal with increasing aviation and marine pollution along our coasts and in our cities?
4. If data are the currency of effective action, why are the nations' air quality information systems always the "poor cousins"?
5. Individual actions are critical where small-scale, scattered air pollution sources are concerned – can our governments adapt to be effective?
6. New frontiers in air quality: can governments change from reactive to proactive – from cumbersome to nimble?

While the Board and the IJC can be credited with asking these crucial questions, the answers remain unsatisfactory. The Board, in its report, appears aware of this dilemma to some extent. "Both accelerated energy development and cleaner air are possible," the Board reports, but it notes, for example, that the deployment of Best Available Technology and the binational, regional and local regulatory regimes needed are either inadequate to minimize the pervasive environmental impact of a continent-wide conveyor of pollution or are not enforced.

Leaving aside for a moment the jurisdictional details of which agencies or governments can best enhance and enforce transboundary environmental protection in the Midwest and Central Canada, it seems clear that the IJC itself has a larger role to play. The Commission and its advisory board need to be more prescriptive in calling for revised and stronger protections and safeguards. They should point out which governments already have the power to act, what they ought to do and should remind them of the critical element of timing.

One of the overriding messages of this paper is that we need to slow down and put the Great Lakes under an umbrella of protection *before* various piecemeal approvals of pipelines and refinery expansions make it too late. The IJC is one agency that could help by telling those to whom it reports: slow down until these key questions have better answers.

\* Report from the International Air Quality Advisory Board to the International Joint Commission, *Second Summary of Critical Air Quality Issues in the Transboundary Region*, December, 2007

## Appendix A

### Welcome to PADD II: The refineries

**W**elcome to PADD II. PADD stands for the United States Petroleum Administration for Defense District. The U.S. is divided into five PADDs – PADD II encompasses the U.S. Midwest. (In addition to Great Lakes states, the district also includes Kansas, Oklahoma and Tennessee, but this southern tier is not considered for the purpose of this discussion.) The refineries in the remaining northern and eastern tiers of PADD II, together with the Sarnia, Ontario refineries that have potential for expansion, are those that would service the Great Lakes Basin – and add exponentially to emissions, greenhouse gases, water and air pollution.

How much? In its June, 2008 *Crude Oil Forecast, Markets & Pipeline Expansions*, the Canadian Association of Petroleum Producers (CAPP) projects how much Western Canadian crude oil PADD II refineries are expected to receive through to 2015, as well as four refineries in Ontario. See below for an excerpt from this report.<sup>60</sup>

#### Methodology

Taking these projections for the major refineries, one can estimate how many proposed barrels will be upgraded per day, and what this means in terms of carbon emissions, as well as other pollution such as sulphur dioxide, nitrogen oxides, and water consumption.

It is estimated that the carbon emissions required for refining one barrel (159 litres per barrel) of tar sands crude oil is **47.38 kilograms** (39.6 for refining and 7.78 from energy used in distillation). Canada's National Energy Board has estimated that the entire carbon output for each barrel of tar sands crude (from the point of extraction) is 125 tonnes. Canada's federal government has mandated a reduction in carbon intensity per barrel, and this has indeed fallen from 1992 onwards. However decreases in intensity are more than made up for by increases in production, and at current rates emissions will rise.<sup>61</sup>

In terms of vehicle emissions, it is estimated by the Pembina Institute, using Transport Canada data, that the average carbon dioxide emissions for vehicles in Canada (and presumably the United States) are 4.64 tonnes per year (calculation based on 4.64 t/vehicle per year; formula provided by Pembina Institute based on Transport Canada *Transportation in Canada 2005* formula

([www.tc.gc.ca/pol/en/report/anre2005/7D\\_e.htm](http://www.tc.gc.ca/pol/en/report/anre2005/7D_e.htm)). In terms of water usage by oil refineries, one estimate is that 0.52 units of water are used for every unit of refined oil. This is the calculation used in the following table, which analyzes the major PADD II refinery expansions.<sup>62</sup>

## Proposed Expansions of Refineries in and around the Great Lakes Basin to Process Tar Sands Oil

<b>BP Products North America Inc., Whiting, IN</b>				
Proposed Expansion	Increase in Western Crude by 2015	Estimated Increase in Carbon Emissions (in tonnes)	Estimated increase in SOX/NOX and other emissions	Increase in Water Consumption
<p>“BP’s Whiting refinery currently receives crude oil from three sources in roughly equal amounts: predominantly heavy crude from Canada; sweet (light) and sour (medium) crude from the southwest US; and mixed grades from foreign or offshore domestic sources. <b>The planned upgrades will enable the BP Whiting refinery to increase use of secure Canadian crudes from 30 to 80-90 percent.</b> When completed, BP will connect the largest refinery in the US Midwest to one of the largest, most secure and reliable developing oil resources in the world.<sup>63</sup> <b>This is a \$3.8 billion expansion to increase processing of Canadian tar sands from 30% of feedstock to 80-90%.</b> The draft permits are for "significant source modification" (the "construction permit," netting out of NSR) and "significant permit modification" (Title V" operating permit").</p> <p>BP was issued a permit in the summer of 2007 for its refinery expansion, which allowed increased water pollution from mercury, total suspended solids and ammonia. Following objections, BP agreed to abide by the lower limits in its old permit.</p> <p>On May 1, 2008, Indiana’s Department of Environmental Management issued the</p>	<p>Current capacity is 410,000 barrels per day (b/d).</p> <p>“The replacement processing units and enhancements to existing refinery units <b>will increase Canadian heavy crude oil processing capability by about 260,000 barrels per day.</b>”</p> <p>SOURCE:</p> <p>(<a href="http://www.discoverhybridcars.com/environmental-news/bp-pledges-no-increase-in-lake-michigan-discharge-limits-at-whiting-refinery">www.discoverhybridcars.com/environmental-news/bp-pledges-no-increase-in-lake-michigan-discharge-limits-at-whiting-refinery</a>)</p> <p>Proposal is 2.7 billion litre increase in annual gasoline production to 17.79 billion litres per year (713.5 million gallons increase</p>	<p><b>1.36-1.8 million tonnes/year (1.5-2 million tons/year)</b></p> <p>SOURCE: TESTIMONY OF MELEAH GEERTSMA Attorney, Environmental Law and Policy Center Hearing Concerning Draft Permits for BP CHXO Project, Whiting, Indiana: Significant Source Modification No.: 089-25484-00453 and Significant Permit Modification No.: 089-25488-00453 March 14, 2008</p> <p><b>Carbon output from refinery process alone is equivalent to between 295,454 and 387,931 additional vehicles per year.</b> (Calculation based on 4.64 t/vehicle per year; formula provided by Pembina Institute based on Transport Canada <i>Transportation in Canada 2005</i> formula (<a href="http://www.tc.gc.ca/pol/en/report/anre2005/7D_e.htm">www.tc.gc.ca/pol/en/report/anre2005/7D_e.htm</a>)</p>	<p><b>In dispute:</b> BP was granted an air permit by Indiana Department of Environmental Management (IDEM) and began refinery expansion work May 1, 2008. Permit is now being challenged by U.S. Natural Resources Defense Council (NRDC), which launched lawsuit in July, 2008. NRDC contends that expansion failed to account for three new flares, which would increase in sulfur dioxide, nitrogen oxides, volatile organic compounds and particulate matter. NRDC’s lawsuit notes that the additional pollution will cause health problems, such as such as asthma and bronchitis, and environmental problems, such as ozone and <u>acid rain</u>.</p> <p>(Laasby, Gitte, “Enviro group takes BP fight to fed court” <u>Post-Tribune of Northwest Indiana</u>, July 10, 2008 (<a href="http://www.post-trib.com/news/1048655,BPAPPFED710.article">www.post-trib.com/news/1048655,BPAPPFED710.article</a>))</p>	<p><b>21,496,800 litres/day of water 260,000 b/d increase in refined crude (from tar sands) @159 litres per barrel:</b> (based on 0.52 litres of water per liter refined)</p> <p>SOURCE of formula: R-squared energy blog (<a href="http://www.robertrapier.wordpress.com/2007/03/20/water-usage-in-an-oil-refinery/">www.robertrapier.wordpress.com/2007/03/20/water-usage-in-an-oil-refinery/</a>)</p>

<p>final air permit and BP began construction of the expansion.</p> <p>In July, 2008 NRDC filed a lawsuit to challenge Indiana's permit.</p>				
<b>Marathon Petroleum Co. LLC, Detroit</b>				
<b>Proposed Expansion</b>	<b>Increase in Western Crude by 2015</b>	<b>Estimated Increase in Carbon Emissions (in tonnes)</b>	<b>Estimated increase in SOX/NOX and other emissions</b>	<b>Increase in Water Consumption</b>
<p>Marathon's Detroit refinery received an air permit in June 2008 and construction of the expansion has begun.</p> <p>Noteworthy difference between Marathon in Michigan and BP in Indiana: Marathon plans to spend more than \$50 million on additional control equipment.</p>	<p><b>35,000 b/d (from 80,000 to 115,000 b/d by completion in 2010)</b></p>	<p><b>183,056 tonnes/year</b>, equivalent to 39,452 vehicles (see formula above)</p>	<p>See: "Marathon to Install Air Monitors at Detroit Refinery", by Alejandro Bodipo-Memba, in <a href="#">Detroit Free Press</a> Friday, September 07, 2007: Marathon's plan for growth calls for the use of so-called heavy crude oil that comes from Canada's tar sands, primarily in northern Alberta. Unlike the light-sweet crude from Saudi Arabia and other places, heavy crude has a higher sulfur content and is more difficult to process cleanly.</p> <p>To accommodate the environmental challenges, Marathon said it plans to build additional sulfur extraction units, including a new delayed coker unit, at the refinery.</p> <p><b>Marathon admits that the new project will likely result in as much as 30% greater air emissions (carbon monoxide and particulates) than current levels. But the nation's fourth-largest oil company said it plans to buy credits for particulates from other industrial companies to further offset the impact of the increase. [my emphasis]</b></p>	<p><b>2,893,800 litres/day of water</b> (based on 0.52 litres of water per liter refined) 35,000 b/d increase in refined crude (from tar sands) @159 litres per barrel</p>

			<p>"In terms of air quality, there will be greater particulate (matter) and carbon monoxide emitted," James Wilkins, Manager of the Refining Environmental &amp; Safety Division said. "But our emissions will be lower than what is required and there is a lot of environmental investment that we're putting into this project."</p>	
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**ConocoPhillips/EnCana Wood River, Patoka IL <sup>64</sup>**

<b>Proposed Expansion</b>	<b>Increase in Western Crude by 2015</b>	<b>Estimated Increase in Carbon Emissions (in tonnes)</b>	<b>Estimated increase in SOX/NOX and other emissions</b>	<b>Increase in Water Consumption</b>
<p>Pipeline can deliver up to 435,000 b/d of Western crude—possible expansion to 595,000 b/d<sup>65</sup></p>	<p><b>Up to 595,000 b/d contemplated*</b></p> <p><b>*\$4 billion expansion</b> to increase total production capacity <i>and</i> to devote almost all new and existing capacity to <b>tar sand</b> crude. Together with ConocoPhillips' refinery in Borger, Texas, the company plans to increase total capacity from 450,000 bpd to 600,000 bpd, and increase processing of tar sand oil from 60,000 bpd to 555,000 bpd (that is, almost <i>all</i> of the two refineries' capacity will be devoted to tar sand oil). Thus, this expansion seeks to <b>increase total production capacity of the two refineries by one third, and increase tar sands oil processing capacity by 817%</b>. See, e.g. , <a href="http://www.conocophillips.com/newsroom/news_releases/2006news/10-05-2006.htm">http://www.conocophillips.com/newsroom/news_releases/2006news/10-05-2006.htm</a>, and <a href="http://www.conocophillips.com/newsroom/news_releases/2007news/01-03-2007.htm">http://www.conocophillips.com/newsroom/news_releases/2007news/01-03-2007.htm</a>. SOURCE: Refinery Database</p>	<p><b>160,000 b/d increase to refine tar sands crude could produce 836,400 tonnes/year</b> (based on formulas used above, BP Whiting)</p> <p><b>Carbon output from refinery process alone is equivalent to 180,259 additional vehicles per year.</b></p>	<p><b>Emissions increases unclear – Expansion stalled in court:</b> On June 6, 2008, an appeal board of the U.S. Environmental Protection Agency upheld a challenge by the Natural Resources Defense Council to the air permit required for the project.</p> <p>The decision sends ConocoPhillips and the Illinois EPA, which had granted the permits, back to the drawing board.</p> <p>The legal challenge mounted by environmental groups in August 2007 argued that harmful air pollution from the refinery's flares, which relieve pressure in the refining process, was not being sufficiently controlled.</p> <p>SOURCE: <u>Environment News Service</u>, "U.S. EPA Rejects ConocoPhillips Refinery Expansion", June 10, 2008</p>	<p><b>13,228,800 litres/day of water</b> (based on 0.52 litres of water per liter refined) 160,000 b/d increase in refined crude from tar sands) @159 litres per barrel)</p> <p>SOURCE of formula: R-squared energy blog (<a href="http://www.robertrapier.wordpress.com/2007/03/20/water-usage-in-an-oil-refinery/">www.robertrapier.wordpress.com/2007/03/20/water-usage-in-an-oil-refinery/</a>)</p>

	( Status of Refinery Air Permitting Actions for Oil Refineries in the United States (current as of April 9, 2008)		<a href="http://www.ens-newswire.com/ens/jun2008/2008-06-10-091.asp">www.ens-newswire.com/ens/jun2008/2008-06-10-091.asp</a>	
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**Marathon Petroleum Co. LLC, Robinson, IL**

Proposed Expansion	Increase in Western Crude by 2015	Estimated Increase in Carbon Emissions (in tonnes)	Estimated increase in SOX/NOX and other emissions	Increase in Water Consumption
Current capacity is 192,000 b/d	Possible expansion apparently cancelled but could be revived "Although Marathon had been considering an expansion of its Robinson, Illinois refinery in order to process <b>tar sands</b> as of July 31, 2007 (see, e.g. , <a href="http://www.reuters.com/article/companyNewsAndPR/idUSN3122370020070731">http://www.reuters.com/article/companyNewsAndPR/idUSN3122370020070731</a> ), Marathon has apparently abandoned this plan. See, e.g. , <a href="http://www.reuters.com/article/sphereNews/idUSN1536152620080115?sp=true&amp;view=sphere">http://www.reuters.com/article/sphereNews/idUSN1536152620080115?sp=true&amp;view=sphere</a> ). However, it is worth keeping an eye on these "shelved" tar sands expansion plans, in case they are revived." SOURCE: Refinery Database ( Status of Refinery Air Permitting Actions for Oil Refineries in the United States (current as of April 9, 2008)	N/A at this time	N/A at this time	N/A at this time

**Marathon Petroleum Co. LLC, St. Paul MN**

Proposed Expansion	Increase in Western Crude by 2015	Estimated Increase in Carbon Emissions (in tonnes)	Estimated increase in SOX/NOX and other emissions	Increase in Water Consumption
Current capacity is 70,000 b/d	<b>Expansion plans are unclear</b> – Marathon may opt only to expand Detroit (see above) " It remains <b>unclear</b> whether Marathon is considering	N/A at this time	N/A at this time	N/A at this time

	<p>an expansion of its St. Paul Park, Minnesota refinery in order to process <b>tar sands</b>. Reuters reported on July 31, 2007 that Marathon was considering tar sands expansion at its refineries in Detroit, MI; Robinson, IL; and St. Paul Park, MN (<i>see</i> <a href="http://www.reuters.com/article/companyNewsAndPR/idUSN3122370020070731">http://www.reuters.com/article/companyNewsAndPR/idUSN3122370020070731</a>). On Jan. 15, 2008, Reuters reported that Marathon had chosen to expand the Detroit refinery, and thus "<i>not</i> to pursue other projects, <i>such as</i> two [tar sands] projects ... in Robinson, Illinois, and Catlettsburg, Kentucky...." <i>See</i> <a href="http://www.reuters.com/article/sphereNews/idUSN1536152620080115?sp=true&amp;view=sphere">http://www.reuters.com/article/sphereNews/idUSN1536152620080115?sp=true&amp;view=sphere</a> (emphasis added). Thus, while it appears that Marathon has decided not to expand its St. Paul Park refinery, the matter is not entirely clear. Possible tar sands expansion under consideration - no permit applications yet submitted."</p> <p>SOURCE: Refinery Database ( Status of Refinery Air Permitting Actions for Oil Refineries in the United States (current as of April 9, 2008)</p>			
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**Murphy Oil USA Inc., Superior WI**

Proposed Expansion	Increase in Western Crude by 2015	Estimated Increase in Carbon Emissions (in tonnes)	Estimated increase in SOX/NOX and other emissions	Increase in Water Consumption
Current capacity is 34,300 b/d	Major expansion under consideration.* *Murphy is considering a <b>\$6 billion</b> expansion of its refinery in Superior, Wisconsin to process <b>tar sands</b> . This expansion would result in a <b>670%</b>	<b>Possible increase of 1 million tonnes/year if capacity is increased</b> (equivalent to 225,690 vehicles/year)	<b>N/A at this time</b>	<b>Possible 16.6 million litres</b>

	<p><b>increase</b> in capacity -- from 35,000 bpd to 235,000 bpd – and would involve filling approximately <b>400 acres of wetland</b> (possibly the largest wetland fill in U.S. history). <i>See, e.g.</i> , <a href="http://www.cleanwisconsin.org/campaigns/MurphyOilExpansion/LakeSuperior_1207.html">http://www.cleanwisconsin.org/campaigns/MurphyOilExpansion/LakeSuperior_1207.html</a>. SOURCE: Refinery Database</p>			
<b>Suncor, Sarnia ON</b>				
<b>Proposed Expansion</b>	<b>Increase in Western Crude by 2015</b>	<b>Estimated Increase in Carbon Emissions (in tonnes)</b>	<b>Estimated increase in SOX/NOX and other emissions</b>	<b>Increase in Water Consumption</b>
<p>“Suncor Energy is investing \$960M for the modernization of its Sarnia refinery. The modernization aims to comply with federal regulations concerning diesel desulphurization and to expand the refinery’s throughput capacity. Suncor Energy is an integrated energy company, focusing on the exploitation of Canada’s Athabasca oil sands. The number of jobs that would be created is not available.” SOURCE: Ontario Economic Development Website: New Investments in Ontario (<a href="http://www.2ontario.com/edp/ksearch_list.asp?keyword=sarnia">www.2ontario.com/edp/ksearch_list.asp?keyword=sarnia</a>)</p>	<p><b>Expansion at St. Clair plant is currently focused on ethanol production</b></p>	<p><b>N/A at this time</b></p>	<p><b>N/A at this time</b></p>	<p><b>N/A at this time</b></p>
<b>Shell Canada, Sarnia, ON<sup>66</sup></b>				
<b>Proposed Expansion</b>	<b>Increase in Western Crude by 2015</b>	<b>Estimated Increase in Carbon Emissions (in tonnes)</b>	<b>Estimated increase in SOX/NOX and other emissions</b>	<b>Increase in Water Consumption</b>
<p>Studying the feasibility of building a new heavy oil refinery capable of producing between 150,000 and 250,000 barrels per day of various light oil products. Shell has also secured options on approximately 6,000 acres of land slated for industrial development in Lambton County, near Sarnia.</p>	<p>118,000 b/d increase in Western Crude for <b>all</b> (not just Shell) Sarnia refineries.  <b>NOTE:</b> In July, 2008, Shell announced that it will not proceed with refinery expansion in Sarnia “at this time.”</p>	<p><b>N/A at this time</b></p>	<p><b>N/A at this time</b></p>	<p><b>N/A at this time</b></p>

## **Excerpt: CAPP overview of PADD II refinery expansion<sup>67</sup>**

### **2.2.2 Ontario**

There are four refineries (excludes Nova Chemicals' Sarnia facility) located in Ontario with a total refining capacity of almost 385,000 b/d. These refineries process both western Canadian crude oil as well as crude oil (imports and eastern Canadian crude oil production) that is received by tankers from the Portland-to-Montréal pipeline and, subsequently, the Enbridge Montréal-to-Sarnia pipeline (Line 9). Ontario refineries have, for a number of years, based their feedstock sourcing on both availability and pricing.

In 2007, Ontario refineries processed almost 380,000 b/d of which 65 percent or about 247,000 b/d was from western Canada. Receipts of western Canadian crude oil are projected to rise to 365,000 b/d or 94 percent of refining capacity by 2010.

### **2.3.2 PADD II**

PADD II, located in the U.S. Midwest, has historically been the largest market for western Canadian crude oil, and it has a refining capacity of 3.6 million b/d. In 2007, PADD II processed about 1.1 million b/d of western Canadian crude oil, and this is projected, according to the refiner survey, to grow to almost 2.4 million b/d in 2015, an increase of almost 120 percent. The forecasted receipt of western Canadian crude oil in 2015 equals about 67 percent of current refining capacity (Figure 2.7). As discussed later in the report, however, the anticipated large growth in western Canadian crude oil production means that producers have to look beyond the markets they have historically served and actively seek access to new markets. For purposes of this report, PADD II has been divided into north, east and south.

#### ***Northern PADD II***

Northern PADD II has 11 refineries located in Illinois, Indiana, Minnesota, North Dakota, Ohio (Toledo) and Wisconsin and they run predominantly heavy crude oil which reflects their complexity. Total refining capacity in northern PADD II is 1.9 million b/d, and the Illinois/Indiana area makes up 61 percent of the region's refining capacity followed by Minnesota with 19 percent.

In 2007, imports into northern PADD II were 1.0 million b/d and western Canadian crude oil accounted for 95 percent of those imports. Imports of western Canadian crude oil are expected to grow to almost 1.4 million b/d in 2010 and to about 1.9 million b/d in 2015, a 90 per cent increase in comparison to 2007 (Figure 2.8). Historically, western Canadian heavy crude oil was the feedstock of choice; and, in 2007, it approximated 600,000 b/d or 62 percent of total western Canadian crude oil refined in that area. Receipts of heavy crude oil are projected to rise up to 1.5 million b/d in 2015. The large growth in heavy crude oil reflects certain refiners' expectations to add conversion capacity and, therefore, reduce receipts of U.S. domestic or imports from the U.S. Gulf Coast.

Western Canadian conventional medium sour crude oil receipts are forecasted to rise slightly. Light synthetic crude oil is projected rise moderately and remain flat at about 137,000 b/d through 2015.

***Eastern PADD II***

Eastern PADD II is located east of Chicago and Patoka, but excludes Toledo, Ohio which is considered an existing market in northern PADD II. Eastern PADD II has a refining capacity of 717,000 b/d and, in 2007, western Canadian crude oil accounted for only 13 percent or 90,000 b/d of that capacity. Receipts of light synthetic crude oil are expected to increase in 2009 and 2010 then decline. Heavy crude oil deliveries are expected to grow from 37,000 b/d in 2007 to 150,000 b/d in 2011, and then rise to 225,000 b/d in 2014. Proposed expansions and conversions, if they proceed, will result in higher runs of western Canadian heavy crude oil in the next several years.

## Appendix B

### Gaming the System: How refineries can hide air pollution

**D**etermining the air emissions from refineries, and increases in emissions can be difficult at the best of times. The task is made even more difficult because the rules are inconsistent for recording and reporting these emissions. In some cases, the inconsistencies and allowed omissions of data are so large that a refinery can actually report that its emissions are decreasing when they are in fact doing the opposite – the pollution that reasonably ought to be reported remains off the books and, figuratively at least, vanishes into thin air.

Here is a list of 10 of the most significant ways in which reporting can be fudged so that the reported results differ substantially from what is actually happening in the air. Note number 6 (in boldface).

1. “Upset” emissions (accidental releases) as well as start-up, shutdown and maintenance emissions are typically unreported and can be a significant portion of a refinery’s total emissions.<sup>68,69</sup>
2. “Fugitive emissions” are underestimated. (Fugitive emissions are pollutants emitted into the atmosphere unintentionally through leaks in equipment or wear and tear on equipment.) Because these emissions are underestimated, measured emissions downwind of refineries are significantly higher than their self-reported air pollution in public databases.<sup>70, 71</sup>
3. There is little confidence that self-reported air emissions are an accurate reflection of actual air pollution emitted from refineries.<sup>72</sup>
4. More fugitive emissions: the “coker area” of a refinery – where heavy oil such as that derived from tar sands bitumen is processed into lighter weight products – is one of the largest sources of volatile organic compounds and benzene (a toxic air pollutant and known carcinogen). U.S. refineries fail to report fugitive emissions from this area.<sup>73, 74</sup>
5. Refineries use inconsistent approaches to calculate projected emission increases, resulting in inconsistent applications of air pollution control requirements.<sup>75</sup>
6. **Standard air pollutant emission factors for refineries are of questionable accuracy for oil derived from tar sands.**<sup>76,77</sup>
7. Companies can agree in court to reduce emissions but get more credit for reductions than those they are actually making at refineries.<sup>78</sup>

8. Refineries have a long track record of continuing non-compliance with environmental regulations.<sup>79</sup>
9. Changes in U.S. permitting requirements allow refineries to “cherry pick” emissions for permitting analysis – the companies themselves decide what to analyze.<sup>80</sup>
10. U.S. permitting requirements allow refineries to estimate how much an expansion project will affect emissions in the future but do not require refineries to make these estimates enforceable.<sup>81</sup>

## Appendix C

### Who Does What: Jurisdictional ability to address refinery expansion and emissions

JURISDICTION	RESPONSIBILITY	ACTIVITY	ABILITY TO ACT
<b>International</b>			
<ul style="list-style-type: none"> <li>Canada-U.S. Boundary Waters Treaty, 1909</li> </ul>	<ul style="list-style-type: none"> <li>Administered by the International Joint Commission (3 appointees from Canada and 3 from U.S.)</li> <li>Great Lakes Water Quality Board and science advisory board reports to IJC, which issues biennial report</li> <li>Language inhibits national water diversions or transfers but unclear and untested as to effectiveness</li> </ul>	<ul style="list-style-type: none"> <li>IJC Air Quality Advisory Board warned in 2005 that Best Available Technology needed to combat emerging oil sands environmental problems but found “little evidence” that governments are seriously committed.</li> </ul>	<ul style="list-style-type: none"> <li>IJC <i>Second Summary of Critical Air Quality Issues in the Transboundary Region (December 2007)</i> asked key questions about Western pollution problems migrating east but addressed with only tentative and speculative discussion (see box)</li> </ul>
<ul style="list-style-type: none"> <li>Great Lakes Water Quality Agreement , 1972</li> </ul>	<ul style="list-style-type: none"> <li>1972 Great Lakes Water Quality agreement commits Canada and the U.S. to control pollution; expanded in 1978 and in 1987 Protocol, which mandated remedial action and lakewide management plans</li> </ul>		<ul style="list-style-type: none"> <li>Under 1909 Treaty and subsequent agreements, issues of transboundary pollution, water transfers and airshed have been addressed incompletely and inconclusively – not clear, for example, whether water transfers could be allowed through extra-parliamentary bodies such as Security and Prosperity Partnership (SPP)</li> </ul>
<ul style="list-style-type: none"> <li>North American Free Trade Agreement (Canada-U.S.-Mexico), 1993</li> </ul>	<ul style="list-style-type: none"> <li>NAFTA Commission on Environmental Co-operation (CEC) established “to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law.”</li> </ul>	<ul style="list-style-type: none"> <li>CEC publishes annual “Taking Stock” report listing major pollution and environmental transgressions in NAFTA countries</li> </ul>	<ul style="list-style-type: none"> <li>Limited authority for CEC but ever-developing information base</li> </ul>
<b>National</b>			
<ul style="list-style-type: none"> <li>U.S. and Canadian federal governments</li> </ul>	<ul style="list-style-type: none"> <li>U.S. administers national laws including Clean Water Act; Canada administers</li> </ul>	<ul style="list-style-type: none"> <li>U.S. Bush administration has been historically weak or hostile in terms of environmental</li> </ul>	<ul style="list-style-type: none"> <li>U.S. general election November 2008; both presidential candidates have called for climate</li> </ul>

	<p>federal laws including <i>Fisheries Act</i></p> <ul style="list-style-type: none"> <li>• U.S. Environmental Protection Agency has sub-cabinet status, reports to President</li> <li>• Environment Canada is a cabinet department</li> <li>• U.S. national system has more checks and balances – executive, legislative and judicial branches can dispute and often overrule protective measures</li> <li>• Canadian parliamentary system has some judicial oversight but points of contention are more often between federal and provincial governments</li> </ul>	<p>protection; Vice President Dick Cheney has visited the tar sands and criticized/downplayed conservation as “personal virtue”</p> <ul style="list-style-type: none"> <li>• Canadian government has followed policy of minimal interference with tar sands/pipeline development; focused on “intensity based” carbon reductions in tar sands which would not lower overall emissions, minimal contribution to discussion of how U.S. refinery expansion/emissions would affect Great Lakes or Canadian water/airshed</li> </ul>	<p>change action, with Democrat (Barack Obama) questioning tar sands oil</p> <ul style="list-style-type: none"> <li>• Canadian election to take place in October 2008</li> <li>• U.S. Congress has passed overwhelming but non-binding resolution (387-26) asking Indiana to reconsider BP Whiting refinery permit</li> <li>• It is possible to use additional, tangential environmental milestones and protective legislation – e.g., U.S. <i>Clean Air Act</i> amendments governing acid rain to examine whether oil sands refining in East will reverse gains from these measures, and if so, the legal effect</li> </ul>
<b>State/Provincial</b>			
<ul style="list-style-type: none"> <li>• State environmental protection agencies issue refinery permits</li> <li>• Provincial environment ministries responsible for water quality, with some overlapping federal responsibility</li> <li>• Energy resources largely a provincial responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• Indiana has issued refinery expansion permit for BP Whiting, near Chicago</li> <li>• Most, though not all, other significant refinery expansion programs are at earlier stages of permitting and developing</li> <li>• In Canada, Ontario refinery expansion relates more to biofuel capabilities, but ability to access tar sands oil is within contemplation</li> <li>• Ontario government has had little opportunity to take notice of the tar sands coming East pollution issue to date</li> <li>• Alberta government is strongly in favour of maximizing tar sands exploitation, facing widespread environmental criticism for advocacy and minimal environmental protection/climate</li> </ul>	<ul style="list-style-type: none"> <li>• Permits still open to legal challenges though expansions are well underway</li> <li>• Some tension between state approvals and federal EPA oversight</li> </ul>	<ul style="list-style-type: none"> <li>• Emerging regional concern about the effects of expanding reliance on tar sands oil in Midwest</li> <li>• Ontario concern over tar sands oil is less developed—relates mostly at this point to the environmental effects in Alberta, not Eastern/Central Canada</li> <li>• Alberta pro-tar sands political/public relations campaigns have met considerable resistance</li> </ul>

	change plans		
<b>Local</b>			
<ul style="list-style-type: none"> <li>• Individual mayors, councils</li> <li>• U.S. Conference of Mayors</li> <li>• Non-governmental organizations</li> </ul>	<ul style="list-style-type: none"> <li>• Mayors in cities adjacent to refineries have resisted expansion</li> <li>• U.S. Conference can increase attention to the issue, especially as cities they represent (over 30,000 are also major consumers of the petroleum products refined)</li> <li>• NGOs are increasingly focused on tar sands issues, including tar sands effects in East</li> </ul>	<ul style="list-style-type: none"> <li>• Chicago Mayor Richard Daley has publicly questioned Whiting, IN refinery expansion</li> <li>• U.S. Conference of Mayors resolution (June 2008) questions degrading environmental effects of using tar sands</li> <li>• NGO campaigns and research attracting increasing media/Internet attention</li> </ul>	<ul style="list-style-type: none"> <li>• Mayors and councils can mobilize local residents</li> <li>• U.S. Mayors Conference resolution attracted notice across North America – important during an election year</li> <li>• NGO/academic activity will be increasingly important to debate and further pipeline/tar sands activity</li> </ul>

## Endnotes

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- <sup>1</sup> Alberta Energy website ([www.energy.alberta.ca/OurBusiness/sands.asp](http://www.energy.alberta.ca/OurBusiness/sands.asp))
- <sup>2</sup> Ibid.
- <sup>3</sup> Gillespie, Curtis, “Scar Sands”, in *Canadian Geographic*, June 2008.
- <sup>4</sup> International Joint Commission, “Second Summary of Critical Air Quality Issues in the Transboundary Region Report from the International Air Quality Advisory Board to the International Joint Commission, December 2007, p. 5 ([www.ijc.org/php/publications/pdf/ID1620.pdf](http://www.ijc.org/php/publications/pdf/ID1620.pdf))
- <sup>5</sup> U.S. Conference of Mayors, 76th Annual Meeting, June 20-24, 2008 (Miami)2008 Adopted resolution on high-carbon fuels ([www.usmayors.org/resolutions/76th\\_conference/energy\\_05.asp](http://www.usmayors.org/resolutions/76th_conference/energy_05.asp))
- <sup>6</sup> “They Can’t Just Walk All Over Us: Farmers Resist a Pipeline | Tar Sands Watch, [www.tarsandswatch.org/they-cant-just-walk-all-over-us-famers-resiste-pipeline](http://www.tarsandswatch.org/they-cant-just-walk-all-over-us-famers-resiste-pipeline) [sic]
- <sup>7</sup> Alberta Energy website ([www.energy.alberta.ca/OurBusiness/sands.asp](http://www.energy.alberta.ca/OurBusiness/sands.asp))
- <sup>8</sup> Canadian Association of Petroleum Producers (CAPP), *Royalty Review Status and Update*, June 2008, slide 7.
- <sup>9</sup> Humphries, Marc, *North American Oil Sands: History of Development, Prospects for the Future*, CRS (Congressional Research Service) Report for Congress, Order code RL34258, January 17, 2008, p.24.
- <sup>10</sup> Enbridge, Inc. website ([www.enbridge-expansion.com/expansion/](http://www.enbridge-expansion.com/expansion/))
- <sup>11</sup> Enbridge, Inc. website ([www.enbridge-expansion.com/expansion/main.aspx?id=1218&tmi=292&tmt=4](http://www.enbridge-expansion.com/expansion/main.aspx?id=1218&tmi=292&tmt=4))
- <sup>12</sup> On July 8, 2008, Shell Canada Limited announced that it will not progress a proposed expansion of its Sarnia refinery “at this time,” citing market conditions and inflationary pressures on the oil and gas industry. (Shell Canada Limited news release, July 8, 2008 ([www.shell.com/home/content/ca-en/news\\_and\\_library/dir\\_news\\_library.html](http://www.shell.com/home/content/ca-en/news_and_library/dir_news_library.html)); Suncor is spending \$120 million at its St. Clair plant to expand its capacity to produce ethanol (*Daily Commercial News*, June 17, 2008 ([www.dcnonl.com/article/id28264](http://www.dcnonl.com/article/id28264).)
- <sup>13</sup> Refinery database, Alliance for the Great Lakes website ([www.greatlakes.org/NETCOMMUNITY/Page.aspx?pid=638&srcid=674](http://www.greatlakes.org/NETCOMMUNITY/Page.aspx?pid=638&srcid=674))
- <sup>14</sup> McTague, Jim, “Of Oil, Sludge and Politics as Usual”, in *Barron’s Online*, October 15, 2007, [www.online.barrons.com/article/SB119222945120057893.html?mod=googlenews\\_barrons](http://www.online.barrons.com/article/SB119222945120057893.html?mod=googlenews_barrons)
- <sup>15</sup> BP website, BP Whiting Refinery Modernization Project ([www.whiting.bp.com/go/site/1550/](http://www.whiting.bp.com/go/site/1550/))
- <sup>16</sup> [www.chicagotribune.com](http://www.chicagotribune.com), May 30, 2008
- <sup>17</sup> Schaper, David, “BP Refinery Expansion Plan Sparks Opposition”, *All Things Considered*, National Public Radio website, August 14, 2007 ([www.npr.org/templates/story/story.php?storyid=1277463](http://www.npr.org/templates/story/story.php?storyid=1277463))
- <sup>18</sup> Nikiforuk, *Tar Sands: Dirty Oil and the Future of a Continent*, Douglas and McIntyre, Toronto, publication September 2008, author’s manuscript
- <sup>19</sup> McTague, op cit.
- <sup>20</sup> Shaper, op cit.
- <sup>21</sup> McTague, op cit.
- <sup>22</sup> Nikiforuk, op. cit., author’s manuscript. See also endnote 10.
- <sup>23</sup> McGuire, Kim, “Refinery expansion in Wood River hits a snag”, June 6, 2008, in *St. Louis Post-Dispatch* website ([www.stltoday/news/stories.nsf/illinois\\_news/story/BB3D30BB74E0FFED862575600](http://www.stltoday/news/stories.nsf/illinois_news/story/BB3D30BB74E0FFED862575600))
- <sup>24</sup> Nikiforuk, op cit., author’s manuscript
- <sup>25</sup> Refinery database, Alliance for the Great Lakes website
- <sup>26</sup> Peter Lougheed interview in “The Second Coming of Peter Lougheed”, Gray, John, in *Report on Business Magazine*, September 2008, pp. 72-79 at 76.
- <sup>27</sup> Bramley, Matthew, Neabel, Derek and Woynillowycz, Dan, “The Climate Implications of Canada’s Oil Sands Development”, Pembina Institute background paper, November 29, 2005, pp 2-3. PLEASE NOTE: In August, 2008, the Pembina Institute withdrew from the Cumulative Environmental Management Association (CEMA), an industry/non-governmental organization monitoring group that looked at emerging and current environmental issues in the tar sands. The Pembina Institute was a founding member. Pembina stated that: “Because of its consistent failure to recommend systems to protect the environment, CEMA has lost all legitimacy as an organization and a process for environmental management in the Athabaska oil sands region.”

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<sup>28</sup> Ibid, op cit.

<sup>29</sup> Schindler, D.W., Donahue, W.F. and Thompson, J.P.; *Running out of Steam? Oil Sands Development and Water Use in the Athabasca River-Watershed: Science and Market based Solutions*, Program on Water Issues, Munk Centre for International Studies (Trinity College, University of Toronto) and Environmental Research and Studies Centre, University of Alberta, May, 2007.

<sup>30</sup> Leaton, James et al, *Unconventional Oil: Scraping the bottom of the barrel?* Report by World Wildlife Fund and Co-operative Bank Insurance Investments, Edmonton, 2008, p. 5.

<sup>31</sup> Ibid., p.5.

<sup>32</sup> Netzer, D., “Alberta Bitumen Processing Integration Study: Final Report,” [www.energy.gov.ab.ca/Petrochemical/844.asp](http://www.energy.gov.ab.ca/Petrochemical/844.asp).

<sup>33</sup> Nikiforuk, op cit.

<sup>34</sup> The Security and Prosperity Partnership of North America (SPP) was launched in March, 2005 as a trilateral effort (Canada, the United States, and Mexico) “to increase security and enhance prosperity among the United States, Canada and Mexico through greater co-operation and information sharing.” ([www.spp.gov](http://www.spp.gov)) It is ostensibly a trade and security initiative, but critics in all three countries have expressed concern about ulterior motives. The suspicion is that the SPP, beyond the reach of legislators, is part of an agenda to align and harmonize the economic and security interests of all three countries beyond what elected officials in any of the three would contemplate and advocate. This could include the transfer of water – not a tradable good under the North American Free Trade Agreement – from Canada to the United States. On August 20, 2007, CBC News noted that: “Because the SPP is not a treaty, like the North American Free Trade Agreement, it doesn’t require changes in law or a vote in Parliament. The Council of Canadians, a group that opposes what they call ‘deep integration’ with the United States, calls the SPP ‘the political manifestation of a corporate plan for economic and security integration that was never voted on in any country.’” (<http://www.cbc.ca/news/background/spp/>).

<sup>35</sup> Testimony of Don Savard, former Vice President of Enbridge Inc. to Alberta Royalty Review, 2007

<sup>36</sup> CBC website ([www.cbc.ca](http://www.cbc.ca)), “U.S. urges ‘fivefold expansion’ in Alberta oilsands production”, January 18, 2007

<sup>37</sup> Speech by Hon. Jim Prentice to Council of the Americas, Washington, DC, May 8, 2008.

<sup>38</sup> Humphries, Marc, op. cit., p.27.

<sup>39</sup> Ibid., p. 27

<sup>40</sup> Schwartz, Nelson, “Can BP bounce back?” in *Fortune*, October 31, 2006 ([www.money.cnn.com/magazines/fortune/fortune\\_archive/2006/10/16/8388595/index.htm?postversion=2006100210](http://www.money.cnn.com/magazines/fortune/fortune_archive/2006/10/16/8388595/index.htm?postversion=2006100210))

<sup>41</sup> Ibid.

<sup>42</sup> Ebner, David, “Enbridge pipeline shut down after leak”, in Report on Business, April 16, 2007 ([www.theglobeandmail.com/servelet/story/RTGAM.2007041](http://www.theglobeandmail.com/servelet/story/RTGAM.2007041))

<sup>43</sup> “Enbridge: Minnesota Pipeline Blast at Previously Repaired Leak”, Dow Jones Newswires, November 30, 2007 ([www.rigzone.com/news/article.asp?a\\_id53520](http://www.rigzone.com/news/article.asp?a_id53520))

<sup>44</sup> Bergquist, Lee, “State says pipeline builder damaged streams, wetlands”, in Milwaukee Journal Sentinel, May 24, 2008 ([www.sqwalk.com/blog2008/001279.html](http://www.sqwalk.com/blog2008/001279.html))

<sup>45</sup> “BP’s Whiting refinery cited by EPA”, Associated Press, November 30, 2007, ([www.cbs2.com/northwestindianabureau/whiting.bp.refinery.2.599886.html](http://www.cbs2.com/northwestindianabureau/whiting.bp.refinery.2.599886.html))

<sup>46</sup> March 24, 2008 submission to Indiana Department of Environmental Management, Office of Air Quality

<sup>47</sup> Ibid.

<sup>48</sup> U.S. Government Accounting Office Report GAO-03-515, “Great Lakes: An Overall Strategy and Indicators for Measuring Progress Are Needed To Better Achieve Restoration Goals”, April 2003, summary

<sup>49</sup> Hon. Jim Prentice, speech to the Canadian Energy Producers’ Association, Calgary, May 22, 2008

<sup>50</sup> Leaton et al, World Wildlife Fund and Co-operative Bank Insurance Investments report, op. cit, p. 19.

<sup>51</sup> Orwell, George, “Down the Mine”, ([www.george-orwell.org](http://www.george-orwell.org))

<sup>52</sup> Broome, John, “The Ethics of Climate Change”, in *Scientific American*, June 2008, Vol. 298, No. 6, pp. 97-99 at 98

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<sup>53</sup> Ibid., p. 99

<sup>54</sup> Chicago Mayor Richard M. Daley, comments to the author at the 2008 Great Lakes & St. Lawrence Cities Initiative Conference, Toronto, July 18, 2008.

<sup>55</sup> Buss, Will, "New coke facility to open by 2021: ConocoPhillips unit cost is \$2 billion, in *Belleville (IL) News-Democrat*, www.belleville.com.

<sup>56</sup> Environmental Integrity, "Tar Sands Feeding U.S. Refinery Expansions with Dirty Fuel: *Facts at a Glance*, undated, ([www.environmentalintegrity.org/pubs/Facts%20at%20a%20Glance\\_6%20%2008.pdf](http://www.environmentalintegrity.org/pubs/Facts%20at%20a%20Glance_6%20%2008.pdf))

<sup>57</sup> Mittelstaedt, M., "Oil refineries drastically underestimate release of emissions, study says," in *Globe and Mail*, September 6, 2008, www.globeandmail.com.

<sup>58</sup> Interview with Howard Learner, July 21, 2008.

<sup>59</sup> Orwell, op cit.

<sup>60</sup> Canadian Association of Petroleum Producers (CAPP), *Crude Oil Forecast, Markets and Pipeline Expansion*, June 2008, 41 pages.

<sup>61</sup> Tar Sands Watch, "A Dirty Little Secret: Canada's Global Warming Engine," ([www.tarsandswatch.org/files/adirtylittlesecret.pdf](http://www.tarsandswatch.org/files/adirtylittlesecret.pdf)); Gell, Keilan, Fueling Change in the Tar Sands, research on greenhouse gas emissions per barrel ([www.tothetarsands.ca/2007/09/27/greenhouse-gas-emissions/](http://www.tothetarsands.ca/2007/09/27/greenhouse-gas-emissions/))

<sup>62</sup> Rapier, Robert, *R-squared energy blog*, ([www.robertrapier.wordpress.com/2007/03/20/water-usage-in-an-oil-refinery/](http://www.robertrapier.wordpress.com/2007/03/20/water-usage-in-an-oil-refinery/)): "I have frequently been asked how this compares to the water usage for an oil refinery, and each time I do some back of the envelope calculations and come up with about 0.5 gallons of water per gallon of crude oil processed."

<sup>63</sup> BP America website, *Addressing Energy Security*

([www.bp.com/sectiongenericarticle.do?categoryId=9019756&contentId=7035857](http://www.bp.com/sectiongenericarticle.do?categoryId=9019756&contentId=7035857))

<sup>64</sup> On Jan. 3, 2007, ConocoPhillips entered into a joint venture with EnCana Corporation to create a **tar sands joint enterprise**. The extraction ("upstream") business is known as "FCCL Oil Sands partnership," and the refining ("downstream") business is known as "WRB Refining LLC." See, e.g., ConocoPhillips 2007 Annual Report at 30, available at [http://www.conocophillips.com/about/company\\_reports/annual\\_report/2007\\_ar.htm](http://www.conocophillips.com/about/company_reports/annual_report/2007_ar.htm). Thus, ConocoPhillips' Wood River Refinery (as well as its refinery in Borger, Texas) is currently owned by "WRB Refining, LLC," whose parent company is ConocoPhillips.) SOURCE: Refinery Database ( Status of Refinery Air Permitting Actions for Oil Refineries in the United States, current as of April 9, 2008)

<sup>65</sup> Bordetsky, Ann, Casey-Lefkowitz, Susan et al, *Driving It Home: Choosing the Right Path for Fueling North America's Transportation Future*, Natural Resources Defense Council/Pembina Institute/Western Resource Advocates, 2007, 44 pages at p. 15. ([www.nrdc.org/energy/drivingithome/drivingithome.pdf](http://www.nrdc.org/energy/drivingithome/drivingithome.pdf))

<sup>66</sup> Alliance for the Great Lakes, *Great Lakes Regional Refinery Expansion*, ([www.greatlakes.org/NETCOMMUNITY/Page.aspx?pid=638&srcid=663](http://www.greatlakes.org/NETCOMMUNITY/Page.aspx?pid=638&srcid=663))

<sup>67</sup> CAPP, op cit., p. 9.

<sup>68</sup> Shine, B. EPA/SPPD Technical Memorandum: Potential Low Bias of Reported VOC Emissions from the Petroleum Refining Industry. EPA Docket No. EPA-HQ-OAR-2003-0146 (July 27, 2007).

<sup>69</sup> Murphy, C.F., Allen, D.T. 2005. Hydrocarbon Emissions from Industrial Release Events in the Houston-Galveston Area and their Impact on Ozone Formation. *Atmospheric Environment* 39, 3785-3798.

<sup>70</sup> U.S. EPA. 1999. Proper Monitoring Essential to Reducing 'Fugitive Emissions' Under Leak Detection and Repair Programs. EPA Office of Enforcement and Compliance Assurance, EPA 300-N-99-014 (Oct. 1999). Available at <http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/emissions.pdf> (accessed Sept. 18, 2008).

<sup>71</sup> Chambers, A.K., Strosher, M., Wooten, T., Moncrieff, J., McCready, P. 2008. Direct Measurement of Fugitive Emissions of Hydrocarbons from a Refinery. *J. Air & Waste Manage. Assoc.* 58, 1047-1056; Frisch, L., 2003. Fugitive VOC-Emissions Measured at Oil Refineries in the Province of Västra Götaland in South West Sweden; Publication No. 2003:56; Göteborgs Länstryckeri AB: Göteborg, Sweden, 2003.

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<sup>72</sup> Henry, R.C., Speigelman, C.H., Collins, J.F., Park E. 1997. Reported Emissions of Organic Gases are not Consistent with Observations. Proc. Natl. Acad. Sci. USA 94, 6596-6599.

<sup>73</sup> Chambers et al., above note 4.

<sup>74</sup> Shine, above note 1, at page 5.

<sup>75</sup> A review of permits finds an instance where one refinery included flaring emissions [ConocoPhillips Wood River Refinery Construction Permit/PSD Approval (Aug. 5, 2008). Available at [http://yosemite.epa.gov/r5/il\\_permt.nsf/1aa55bd5a0796efd862566b4005a68db/8e9e557b10db3601852572a70069744b/\\$FILE/06050052.pdf](http://yosemite.epa.gov/r5/il_permt.nsf/1aa55bd5a0796efd862566b4005a68db/8e9e557b10db3601852572a70069744b/$FILE/06050052.pdf) (accessed Sept. 18, 2008)], while another didn't [BP Products North America Inc., Whiting Business Unit, Part 70 Significant Source Modification (May 1, 2008). Available at <http://permits.air.idem.in.gov/25484f.pdf> (accessed Sept. 18, 2008)].

<sup>76</sup> The U.S. EPA maintains a compilation of standard emission factors, commonly known as "AP-42" factors, that is available on the internet at <http://www.epa.gov/ttn/chief/ap42/index.html>. The AP-42 emission factors for refineries are in Chapter 5 of Volume 1.

<sup>77</sup> Standard emission factors based on conventional crude may under estimate emissions from tar sands crude where the concentrations of key pollutants may be higher. Limited testing of crude oil derived from tar sands indicates it contains higher levels of sulfur, nitrogen, corrosive organic acids, vanadium, nickel, and other harmful metals than conventional crude. Bruce, G.W. 2005. Bitumen to Finished Products. Presentation at Canadian Heavy Oil Association Technical Luncheon. November 9, 2005. Calgary, Alberta. Available at <http://www.choa.ab.ca/documents/Bitumen%20to%20finished%20products.ppt#30> (accessed Sept. 18, 2008); Rettger, P., Arnold, J., Brandenburg, B. Felch, C. 2006. The Long Lake Integrated Upgrading Project: Status Report and Discussion of Soot Processing. Presented at Gasification Technologies – 2006. October 1 - 4, 2006. Washington, D.C. Available at <http://www.gasification.org/Docs/Conferences/2006/29RETT-Paper.pdf> (accessed Sept. 18, 2008)..

<sup>78</sup> A list of over 20 affected refining companies and their consent decrees are at U.S. EPA, Petroleum Refinery National Priority Case Results, <http://www.epa.gov/compliance/resources/cases/civil/caa/oil/> (accessed Sept. 18, 2008). Consent decrees typically prohibit refineries from using emission reductions required under the consent decree to "off set" emission increases that may occur from a future expansion. U.S. EPA, BP Amoco Civil Judicial Settlement, Jan. 18, 2001. Available at <http://www.epa.gov/compliance/resources/cases/civil/caa/bpamoco.html> (accessed Sept. 18, 2008). It is unclear whether refineries are in fact not crediting themselves for these reductions when calculating facility-wide emission changes due to expansion plans.

<sup>79</sup> U.S. EPA. 2007. EPA Notifies BP of Major Clean-Air Violations. EPA Press Release (Nov. 30, 2007). Available at <http://yosemite.epa.gov/opa/admpress.nsf/ab2d81eb088f4a7e85257359003f5339/323c297070f9648c852573a3004b0774!OpenDocument>. An earlier 2001 BP Amoco consent decree is referenced above in note 11.

<sup>80</sup> Under rule changes made in 2002, refineries can use old inflated baseline years occurring within the previous 10 years that may understate the actual emission change at the facility resulting from a planned expansion. U.S. EPA. 2002. Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR): Baseline Emissions Determination, Actual-to-Future-Actual Methodology, Plantwide Applicability Limitations, Clean Units, Pollution Control Projects. 67 Federal Register 80186 (Dec. 31, 2002).

<sup>81</sup> Under rule changes made in 2002, refineries could potentially increase emissions beyond projections after a period of 5 or 10 years after a construction permit was issued for an expansion without facing enforcement consequences. *Ibid.*