Transportation in the Oil Sands Past, Present, Future

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Transportation in the Oil Sands – Past, Present, Future

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Abstract

Issue: Based on current projects with multiple Oil and Gas companies within the Regional Municipality of Wood Buffalo (Ft. McMurrary area), discuss the access requirements and challenges for these sites.

Overview: These sites function as small communities, with huge traffic demands during the AM / PM peaks. Light and heavy truck traffic, in and out of these sites, needs to be accommodated simultaneously on a daily basis. Additionally, there is often a need for segregation of traffic due to integration of weigh scale requirements for larger trucks as well as employee busing access. Most sites started with small two lane roads, and then as the site gets larger, have challenges with congestion based on peak demands for the changing environment. The access points into and out of these sites typically have access requirements that have an effect on the flow of traffic such as: site orientation, badge verification and swipe card requirements, short term and long term parking needs.

Presentation & Paper: The focus of the paper and presentation would go through a Case example where a number of innovative solutions, such as roundabouts, reversible lanes, dedicated bus lanes, and separation of heavy truck traffic were developed to assist in controlling the flow of traffic in and out of the site.

Introduction

Alberta's Oilsands Overview

The oilsands industry in Canada is more than 100 years old; however, relatively little work was done until the middle of twentieth century to exploit the world's second largest (after Saudi Arabia) oil reserves for full scale commercial production. According to the Alberta Energy Resources Conservation Board, the total estimated reserves are about 1.7 trillion barrels. Of that, 173 billions barrels constituted the remaining established reserves, accounting for 95% of Canada's established reserves, and 315 billion barrels was deemed to be "the ultimate recoverable potential." **(Exhibit I)** (3, p.2)**.**

Exhibit I Alberta's Energy Reserves (2007)

	Crude bitumen		Crude oil		Natural gas[a]		Raw coal	
	(million cubic metres)	(billion barrels)	(million cubic metres)	(billion barrels)	(billion cubic metres)	(trillion cubic feet)	(billion tonnes)	(billion tons)
Initial in place	270 296	1 701	10 400	65.4	8 516	292	94	103
Initial established	28 392	179	2 704	17.0	4 827	171	35	38
Cumulative production	864	5.4	2 481	15.6	3 687	131	1.30	1.43
Remaining established	**27 528**	**173**	**250**	**1.6**	**1 140[b]**	**40.5[b]**	**34**	**37**
Annual production	72.8	0.458	31.5	0.198	138	4.9	0.033	0.036
Ultimate potential (recoverable)	50 000	315	3 130	19.7	6 276[c]	223[c]	620	683

Note: (a) Includes coal-based methane (CBM), except for "initial in place," for which no estimate was available. (b) Measured at field gate. (c) Excludes CBM. Note: to convert million cubic meters into billion barrels first divide by 1,000 then multiply by 6.29. To convert billion tonnes (metric) into billion tons (U.S. short), multiply by 1.102. To convert billion cubic meters (for gases) into trillion cubic feet, first multiply by 35.49 then divide by 1,000.

Source: Alberta Energy Resources Conservation Board, "Alberta's Energy Reserves 2007 and Supply/Demand Outlook," ERCB ST98-2008, June 2008, p. 3.

In 2004, Canadian oilsands production surpassed one million barrels per day (bpd) for the first time. It is expected that by the year 2020, the industry may spend over $150 billion on various new oilsands projects in Alberta. These large investments are driven mainly due to greater improvements in oilsands extraction technologies, reduction in unit operating costs, strong global demand for oil, recent oil prices, and prediction of stronger oil demands and higher crude oil prices in future.

Some of the large domestic and international oil and gas companies operating in Alberta include Canadian Natural Resources Limited, Encana, Husky Energy, Imperial Oil, Nexen, Petro-Canada, Shell Canada, Suncor Energy, Syncrude Canada and Talisman Energy. There is great interest in the Alberta oilsands from the international oil community as well and it is expected that some large international oil players may set their foot in Alberta in the near future.

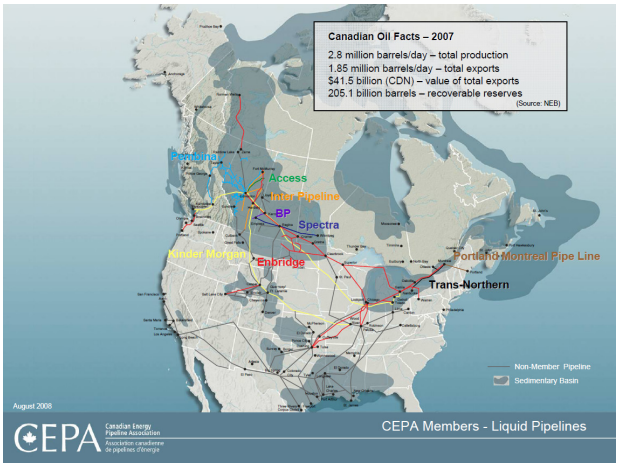
Oilsands production Overview

There are currently two methods of extracting the oil-laden sand known as bitumen: mining and in-situ. Mining is the method of choice if the thickness of ground cover above bitumen is less than 75 metres, while in-situ techniques are used for deeper extraction. Approximately 80 per cent of the recoverable oilsands reserves will require in-situ production, and less than 20 per cent recoverable by mining. Upgrading and refining can be done remotely for both types of recovery (1).

Oilsands mining operations currently involve three dominant players: including Syncrude (a partnership between Canadian Oil Sands Ltd., Imperial Oil and Petro-Canada), Suncor, and Athabasca Oil Sands (a partnership between Shell Canada, Chevron and Western Oil Sands Inc.) By 2017, total annual production is expected to reach 1.18 billion barrels, and in-situ production is expected to equate to 45% of production (3, p.3).

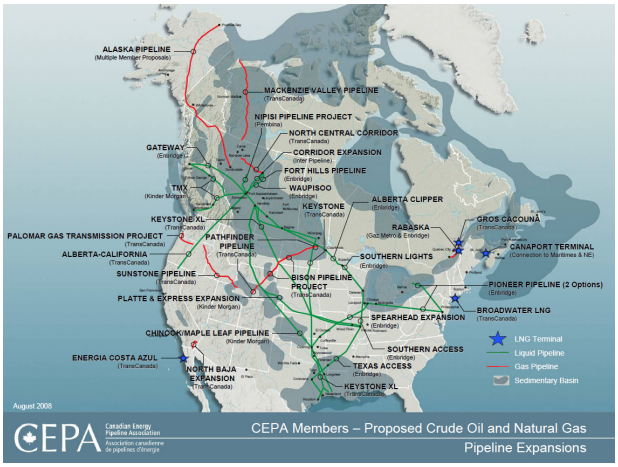
Approximately 580,000 kilometres of pipeline currently exist in Canada to transfer approximately 2.80 million barrels of crude oil and equivalent per day to various locations within North America and ports in British Columbia and Washington state. A series of new pipeline projects are under various stages of planning and construction (**Exhibit II, III)**.

Exhibit II Existing Pipeline Transport Network Within North America



Source: Canadian Energy Pipeline Association (CEPA), Future Projects, CEPA Supplier's Conference, Calgary, Alberta, November, 2008

Exhibit III Pipeline Transport Network Proposed within North America



Source: Canadian Energy Pipeline Association (CEPA), Future Projects, CEPA Supplier's Conference, Calgary, Alberta, November, 2008

Suncor in the oilsands

Suncor has the distinction of being a pioneer in the oilsands industry. In 1963, U.S.-based Sun Oil (now Suncor Energy Inc.) decided to invest in the Alberta oilsands, spending over half a billion dollars and launching its first full-scale commercial production in 1967 with an output of 45,000 barrels per day. The success of Suncor led many other oil companies to follow suit, eventually leading to a rapid expansion of the oilsands industry in Canada. Suncor increased its production from 45,000 bpd (1991) to 260,000 bpd (2006) (3, p.14) and 361,000 bpd (2013) (2). The three main operating divisions of Suncor include Oil Sands, Natural Gas and Refining and Marketing. (Suncor Energy Inc., 2010) .

Suncor's strategy is heavily focused on incremental growth in oilsands production. The company's stated goal is to become the top producer of Alberta oilsands, aiming to exceed production of 500,000 barrels of oil per day, and retain its market share as producer of 30% of all upgraded oilsands products in the face of increasing competition in the Canadian oilsands sector. Central to achieving these goals is the company's ongoing capital expansions. It's in part due to these expansions that the company has seen tremendous employee growth which has resulted in capacity issues at various sites. Old and aging infrastructure found at the sites entry and exit points have been supporting the expanding sites for far too long. The need for expansion became evident as bottle necks developed especially during shift change where peak traffic volumes overload the capacity at the existing access points.

The Oil Sands Main Gate was one of the sites that underwent a review of the entry and exit gate. At the point where Stantec began their review and design, the main access gate was accommodating everything from site personnel to large modules and an integrated bussing systems which Suncor was in the midst of implementing for its employees.

Suncor's Main Gate

Suncor's Oil Sands site is approximately 30 minutes from the town of Ft. McMurrary, north on Highway 63. The Main Gate to the site has functioned as the primary access since the early 1970s. Over the course of the last forty years, the plant and production have increased dramatically, however the main entrance to the site has seen minimal upgrades. A two lane road provides access through the main gate area, along with access to adjacent weigh scales, and staff parking areas.

Security into the site has been solely dependent on the manual review of personnel ID cards, which has become an overwhelming task during shift change in the morning peak periods, not to mention operating in an extremely cold winter environment. The manual check does not guarantee that the IDs being presented are current, nor does it record and account for who is on site at any given time. This information is extremely important in the event of an emergency and evacuation of the site. Therefore updating the security access to the oil Sands site was critical in maintaining an appropriate operating state and meeting current security policy objectives.

Benefits of upgrading the access also include increased safety and security for the site, the ability to track all personnel on/off site in the event of an emergency, and an economic benefit of being able to better track, collect and analyze data.

Past – Main Gate Prior to Redesign

Exhibit IV: Suncor 1963

Exhibit V: Suncor 2011

A brief history of the main gate

Suncor's main gate has provided primary ingress and egress to the Suncor site since 1973. The Main Gate accommodates all staff, contractors, large deliveries and visitors on an existing two lane roadway.

Due to the large amount of vehicles using the main gate, a second gate (East Gate) was implemented to assist with traffic management. This second access point was implemented to accommodate only light passenger vehicles for inbound traffic during the morning peak, which allowed the main gate to prioritize larger vehicles such as buses, trucks, and multi passenger shuttles. As the Main gate operated over capacity, the east gate solution was a temporary fix and slightly alleviated excessive queuing at the Main Gate.

During the afternoon peak, all traffic exits through the Main Gate. However due to a variety of shifts that overlap on site (8hr, 10hr, 12hr), the PM peak is disbursed over a longer time period and typically only showed significant queuing between the hours of 17:00 and 18:00. However, these queues extended as much as 2.5 km into the site.

In addition to an increase in volume at the main gate, additional operations have been implemented over the years to include:

- Main security control point for staff, contractors and visitors. Security is controlled from a single location/building, with security personnel manning the entry by conducting manual visual ID and vehicle inspections.
- Staff and visitor parking lot which accommodates 800+ stalls.
- Two weigh scales located west of the Main Gate. These scales accommodate large trucks and semi-trailers that are required to weigh in and out of the site. (Not all trucks and semi-trailers are required to weigh in and out)
- Semi-trailer storage area west of the weigh scales.
- Onsite shuttle bus loop for pick up and drop off of staff from parking area.
- Electrical Substation which feeds power to the Main Gate and surrounding area.
- Training Centre
- Water well to provide non-potable water to the washrooms.

Exhibit VI: Existing Main Gate Access Road

Approximately 300m north of the Main Gate is the bus transfer area which is utilized extensively in the morning and afternoon peak periods and during shift changes for staff. Busing operations in this area require buses to queue in two single file lanes and assist with transfers between town buses and site buses, along with transferring staff between buses headed for the Base Plant and the Steep Bank Mine site. The area consists of a paved roadway with two rows of concrete barriers to act as a holding area for staff waiting to transfer.

Traffic that utilizes the main gate include light passenger vehicles, coach buses, yellow school buses, tanker trucks, gravel trucks, B-trains, construction equipment haulers, and even periodically, large mining trucks (not loaded).

Health and Safety is a top priority in the Oil Sands and all projects and operations are subject to meeting a high standard of safety. Suncor Energy initiated a scoping study identifying the Health and Safety, Economic, and Regulatory risks of the current access operations at a number of their facilities. The biggest risks being to ensure that those entering the site were approved to do so, and should there be a need to evacuate the area, all staff could be accounted for in a timely manner. It was determined that through the implementation of a "proof-positive", electronic access via proximity card readers and gate controlled systems for the main entry access gates to any site operation would provide a high level of security and mitigate the risks identified. The preferred solution recommended in Suncor's scoping study for the Oil Sands site included the following conceptual upgrades:

Oil Sands

- *Main Gate: A six lane system will be planned for the Main Gate. This will include automatic gates, card readers, IT, cameras, power infrastructure, guard shelters, and traffic control structures. The current weigh station will be relocated nearby to allow for the lane expansion. A Pedestrian Turnstile module will also be set up in the area to accommodate employees walking to buses and a future shuttle service if required. Fencing and civil work will be required for the bypass road.*
- *East Gate: A secondary gate to the main plant, the East Gate will require a four vehicle lane system with two lane reverse options and accompanying automatic gate and card readers. Secondly, a large equipment bypass will be made available. Fencing and civil work will be required for the large equipment bypass road.*
- *North Gate: This gate is minimally used throughout the year and as such is planned to have a two lane automated gate (barrier arm only), a security shelter, and a large vehicle bypass. Minor fencing and civil work may also be required.*

Buses

- *An estimated 120 buses will be outfitted with electronic card readers for employees gaining access to coach buses.*

Present – Design

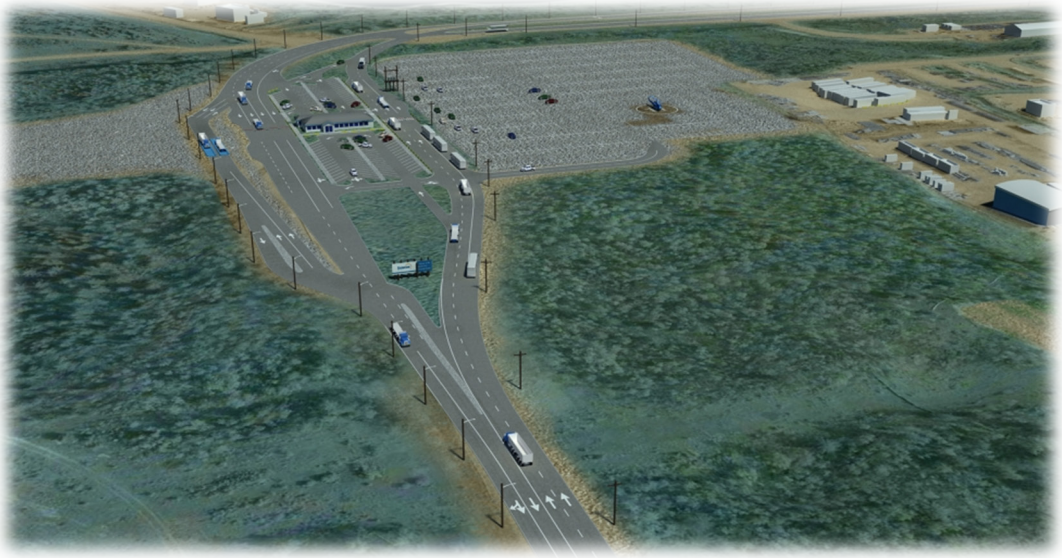


Exhibit VII: Concept Rendering of Scoping Study design

Project Goals

Access operations at the Suncor Oil Sands site during morning and afternoon peaks involved a manual, visual ID process that operated relatively quickly with employees and contractors showing their security and vehicle badge to then get waved through. Suncor realized that providing an automated system could add time to each vehicle entering the site, potentially causing increased delays between vehicles. It was at this point that Suncor engaged Stantec to do a detailed traffic analysis for the area and better define the preferred alternative to move forward into detailed design and construction.

Through discussions with the Suncor team, the goals of the project were to improve the Main Gate entrance and operations by:

- Enhancing safety and security
- Enhancing Suncor's ability to document access to the site
- Preventing trespassers from accessing the site at or near the gate
- Providing secure and efficient operations for staff traveling by bus
- Reducing the delay for vehicles accessing the site
- Reducing the impact to the environment resulting from vehicle delay at the gates
- Reducing conflicts between inbound and outbound traffic including buses, cars, trucks and, transferring bus passengers
- Planning for increased capacity for the expansion of onsite operations
- Reducing inefficiencies of Suncor's mining operation by ensuring the site accesses are not a source of delay
- Improve the "first impression" of visitors, employees, and Contractors new to the Suncor site

In order to achieve the stated goals, the following design philosophies were employed to develop concepts and options:

- Separate traffic into different vehicle streams dependent on the final destination. This includes buses, light passenger vehicles (site trucks), staff parking, and large trucks and semi-trailers
- Control and separate access where possible. This would solve the existing issue of having a number of access locations for adjacent operations (Weigh Scale, Bus Turn Around, Staff Parking) in close proximity to the Main Gate which has resulted in interference with access to and from the site
- Minimize the high frequency of left turn movements through the main traffic streams
- Plan for the Main Gate as the primary access once Suncor's Transportation Enhancement Program (STEP) program is implemented. Maintain the ability to accommodate all existing traffic entering/exiting the site. This reduces the need for additional part time security staff to man the East Gate, but allows for some flexibility for the East Gate to be used as a temporary access point during turn around when site traffic increases, or a permanent entry with full access control infrastructure similar to the Main Gate should the site require additional capacity

Analysis

In addition to the points above, and of the upmost priority for the project, was the need to develop a plan that gives staff both arriving and departing from site on buses priority access over other vehicles. Coordination with the STEP program became a major component of the project. In order for this program to be successful, there must be proven visual and operational benefits for staff to utilize buses. Critical to the success of the overall project is confirmation that electronic access at both the Main Gate and East Gate, would not negatively impact the existing operations. A traffic model was developed to analyze the impacts of implementing proximity readers and swipe cards as the form of electronic access. Later in the process, a second assessment of the traffic volumes was completed using VISSIM to model the queue lengths represented by the traffic data.

The scope of the analysis was limited to lanes required for contractor and staff vehicle traffic based on the assumption that buses would be given priority access through a designated lane. Vehicle counts were provided by Suncor identifying the numbers below and forming the basis for the analysis:

- Hourly peak inbound volume of 828 light vehicles (900 total vehicles)
- Hourly peak outbound volume of 511 light vehicles (593 total vehicles)

Peak inbound volume accounts for 900 vehicles entering the site over a one hour period. Typical traffic patterns experience a peaking characteristic where more vehicles arrive during a particular 15 minute period within the hour. A peak hour factor was established using the data provided which results in approximately 30% of the peak hour traffic accessing the site during the busiest fifteen minute period of analysis.

The preferred gate system requires that each individual and vehicle accessing the site to swipe an ID card. The potential for variations in the amount of time vehicles require to access the site was identified. The micro simulation was run assuming processing times of 20s, 15s, and 10s per vehicle. This is the

time that it takes for a vehicle to approach, swipe and clear the gate area and equates to 3 veh/min, 4 veh/min and 6 veh/min respectively. A summary of the analysis results are as follows:

- A processing time of 20s per vehicle; five to six lanes should be provided.
- A processing time of 15s per vehicle; four to five lanes should be provided
- A processing time of 10s per vehicle; four lanes should be provided

Also reviewed in the analysis were results based on Suncor's STEP program. To account for the STEP program, the micro simulation was performed assuming a 40% reduction in light vehicle traffic which accounts for half of its 80% target. The results of this micro simulation suggest that the site access demand can be accommodated with four or possibly three lanes in the peak direction (assuming a 15s processing time).

The above analysis and number of lanes assumes a single point of entry/exit which replicates the existing operations of East Gate accommodating the majority of the inbound traffic in the AM peak and Main Gate accommodating outbound in the PM peak.

In the final version of the traffic analysis, using VISSIM, it was assumed that all traffic would use the Main Gate, and that the actual processing time for vehicles would on average be closer to 10s per vehicle, with the occasional vehicle being over 20s per vehicle. This was modelled, and an average time of 12s per vehicle was selected for the opening day scenario.

Design

The design of this project was completed in two stages. Initially, the design followed the path of the original scoping study which provided a number of lanes inbound and outbound at the main gate, along with upgrades at two other access points on site. This was the ideal solution that simplified the operations of the site and provided the most robust system with flexibility to handle a variety of scenarios. Upon completion of the preferred option, a detailed cost estimate was completed to establish an overall project cost. The option (illustrated below), including the other two access locations, upgraded electronic access equipment, and direct / indirect costs came in at over 78 Million dollars.

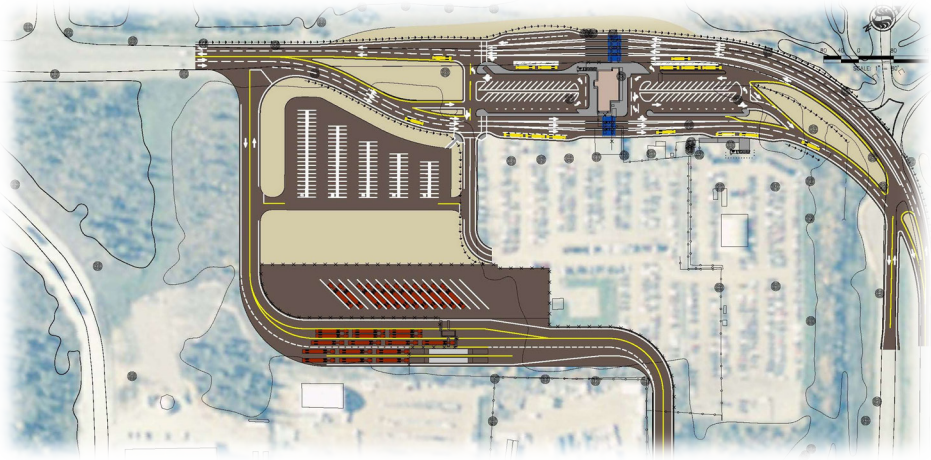


Exhibit VIII Multi-Lane Option

This caused an immediate halt to the project, and the need to re-investigate other alternatives which could provide the required access operations with less infrastructure. This required the design team to be creative in their solutions in providing the same level of access requirements.

Constraints and solutions

One of the primary constraints to each option considered was avoiding impact to the existing infrastructure along the east side of the security building, including: the existing training center, utility building, and power substation. Additionally, consideration of additional features such as additional parking or on-site roadway upgrades, were eliminated in order to construct an option that met the needs of the present.

General Concept Overview

During Stantec's original review of the area, a number of concepts were developed at a high level for feasibility. However there was one concept that stood out above the rest which provided the access requirements needed for the site, did not impact the existing features on the east side of the security building, and required less overall pavement to construct. This option utilized contra-flow lanes to address the peak demand on the inbound, and then reversed the lanes for the PM peak. This option was originally deemed too complicated for the average driver and had a higher risk rating in the original planning stages due to the potential of a head on collision. The design team was tasked with reviewing the contra-flow lane concept for feasibility while also addressing the perceived safety concerns associated with the configuration. In the end, a plan was developed (illustrated below) that met the needs of the project.

Exhibit IX Preferred Reversible Lane Option

A traffic analysis was completed on the existing vehicles entering the site using a 15 second processing time. The results showed that four to five lanes would be required for both the inbound and outbound directions to accommodate the volume of light vehicles and multi passenger shuttles using the access. An additional lane in each direction would also be required for buses to allow for priority ingress and egress.

Main **Gate - Operations**

The Main Gate functions as the site security hub and as the primary Oil Sands access point. The project provides for permanent electronic access control at the Main Gate for all persons and all vehicles. Prior to reaching the Main Gate, tractor trailers approaching the site are directed east to a trucks-only access gate which is staffed at all times and includes two weigh scales as well as a security personnel building. Parking lot traffic is similarly directed east prior to reaching the Main Gate, then north along a gravel road dedicated for parking access only. Persons parking in the Main Gate lot are able to enter the site through a turnstile located adjacent to the existing security building without crossing vehicle traffic entering the site, providing for their safety. Buses receive priority treatment at AM and PM peak hours via dedicated inbound and outbound lanes for bus use only. During non-peak hours, these lanes accommodate all vehicle types, thereby forgoing the initial capital cost of two additional paved lanes and associated access-control infrastructure. Light vehicles are accommodated during the AM and PM peak hours via three reversible lanes. It is anticipated that these lanes will function as inbound during the AM peak and as outbound during the PM peak; however, security personnel may override (reverse, open, or close) reversible lane functions autonomously for each lane under special circumstances or emergencies. Small security booths are provided on raised median islands to accommodate security personnel, providing for their access to all lanes. Booths would be pre-manufactured to a Northern Alberta climate specification. Space is provided between reversible lanes to address inbound and outbound security operations and searches when required. A canopy is provided at the entry/exit point allowing for higher-intensity, whiter lighting for optimal security visibility for personnel and cameras and a bypass route is provided for the hauling of mining equipment into and out of the site. Provisions are made for the regular operation of on-site and off-site shuttle buses in similar fashion to current process. A turnout is provided in close proximity to the turnstile, and accommodates two inbound buses simultaneously in the event that individual badging is desired for access to the site under heightened security operations. The turnout also provides flexibility for those onboard who may be unauthorized to access the site, and require services at the security building.

Exhibit X: Main Gate – Approaching Access

Exhibit XI: Main Gate – Approaching Roundabout

East Gate - Operations

Using traffic simulations it was determined that the East Gate would not be required for inbound or outbound traffic as part of daily operations. However, in order to provide flexibility to overall site operations, it was determined that the East Gate was still a critical component to the overall site access / egress. Therefore, minor upgrades have been proposed for the East Gate that includes pavement widening to provide two inbound lanes and one outbound lane, and minor grading work to improve the existing drainage flow in the area. The East Gate would be operated only on an "as needed" basis in the event of critical access issues at the Main Gate. Access issues could include gate or system malfunction, vehicular or pedestrian incident causing severe traffic delays, or potential strike or demonstration activities at the Main Gate impeding access. Electronic proof positive access would still be required to maintain the security objective for this project, and would be accommodated through security staff using portable hand held devices to manually scan ID cards. It should be noted that manually scanning at the East Gate would be a considerable impact to daily security resources, and if required more frequently than anticipated, formal electronic controls should be implemented at this location. The current design allows for future security infrastructure to be incorporated at a later date.

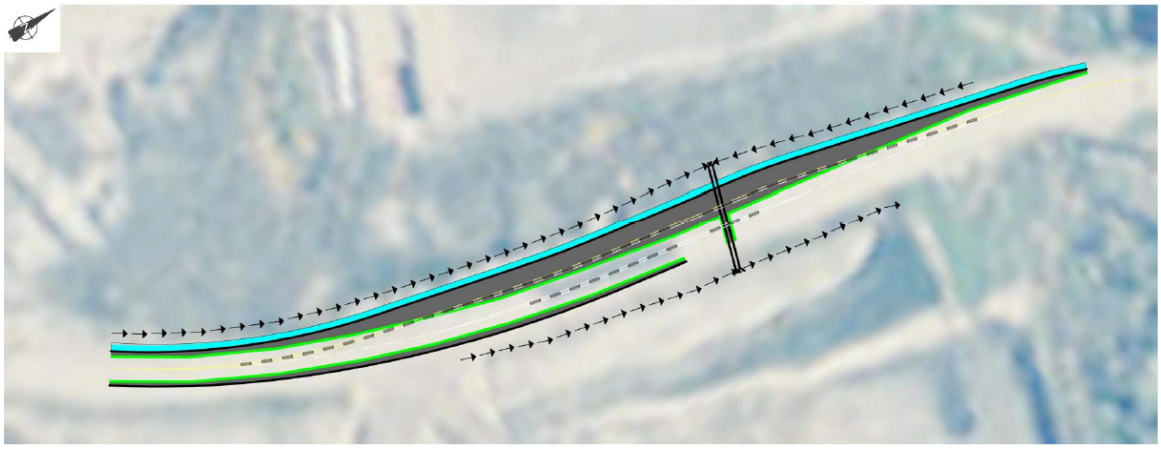


Exhibit XII: East Gate Upgrades

North Gate

As a result of low traffic volumes, the improvements made to the North Gate were restricted to the installation of electronic access control. Portable hand held devices to scan IDs would be used by security staff to maintain the security levels proposed for this site.

Trucking Access

Tractor trailers approaching the site are directed east to a trucks-only access gate which is staffed at all times and includes two weigh scales as well as a security and SCM personnel trailer. Single inbound and outbound lanes are provided on opposite sides of the security building to accommodate trucks with no

requirement to use the scales. A gravel area is provided nearby to the security trailer to allow a truck to turn around if it arrives at the gate in error. Two weigh scales are provided east of the security building in similar configuration to current operations and are intended to function in the same fashion. Each scale would be operated in both directions, with one being utilized for commodity weigh in/out, and the other being used for general weighing as per existing operations. Access to the site is electronically controlled for all trucks and all persons. Access control equipment is permanently mounted to the site paving surfaces. Trucks leaving the site are accommodated safely by means of a roundabout at the OS Access Road. Sufficient queuing space will be provided for the trucks to ensure they will not interfere with peak traffic curfews.

Security

The selected security equipment was reduced to only include electronic access at the following locations to meet the needs and intent of the EAP (Electronic Access Project):

- Main Gate
- Truck Access Gate
- Millennium Lodge
- Borealis Lodge

The security system hardware shall include but not be limited to:

- Vehicle lane pedestals that contain the primary electronic access equipment including proximity card readers, cameras, intercom, pass/fail visual indicator lighting, license plate camera, and all the necessary power and communication feeds.
- Lightweight, breakaway gate arms to control vehicles proceeding through the Main Gate and Truck Access without proper clearance.
- Automatic barrier fence to control vehicle and pedestrian access at the Main Gate and bus loading areas at the Millennium and Borealis Lodges.
- Modular full height turnstiles at the Main Gate for pedestrian access from the parking areas.
- Modular full height turnstiles complete with Guard-shack (sea cans) for pedestrian access and manual security access at the Millennium and Borealis Lodges.
- Portable hand held card readers to be used by Security as back up measures to the electronic access equipment

Future – Our design and beyond

Future Internal Opportunities

During the design process, a number of other Suncor internal departments were looking to provide upgrades to their facilities as part of the Electronic Access project. This was one of the reasons the initial plan came in at such a high estimated price. The re-design of the layout eliminated many of those

"nonessential" amenities from the project. Now that the project is under construction and nearing completion, internal departments within Suncor are looking at how the access operates, and how it can improve other operations throughout site. The design allowed for some additional space to be provided within the project area, currently being utilized as the Contractors laydown area. Currently that area is being considered for truck staging for on-site operations, truck staging for off-site operations, and potentially future parking should it be required.

An additional benefit to the project which could have future impacts on site was the implementation and construction of the roundabout at the entrance to Suncor. In the early stages of concept development, the proposal of a roundabout was deemed a crazy idea, adding too much complexity to site operations for drivers in the region. The safety benefits of the roundabout were promoted, along with the compatibility with the reversible lanes, and eventually accepted as the right solution for the area. The roundabout was the first phase of construction as it added opportunity to move and control traffic into the site. Since the partial opening of the roundabout, not only has it provided a physical means of speed control before entering the construction area, but is has also functioned as better control and safer operations for left turning vehicles. With the roundabout in place, Suncor can now realize the operational benefits of this form of traffic control, and utilize in other locations on site where appropriate.

Change Management

The design identified above was tendered and is currently under construction. The challenge with this stage of the project, and future implementation of the revised access configuration, becomes Change Management. Due to the size and history of Suncor at this location, no different than a typical City, there is a mentality to maintain the status quo, since they've always done things a certain way. Implementing the Electronic Access at Suncor's Oil Sands site will have an impact on every vehicle that enters it. This was considered a risk during the design, and therefore a large emphasis was placed on Change Management.

To mitigate this risk, Suncor undertook a number of strategies to ensure change management would be handled effectively. For starters, the Communications group within Suncor started to sit in the project coordination meetings to make sure the project status and intent was understood. This allowed for timely updates to the rest of Suncor through their internal website, and a media to start discussion of change. To aid in the communication, the team also developed video animations to better explain the new changes that were going to occur. Access was broken down into three main vehicle streams, Light passenger, Bus and tractor-trailer, and provided short videos explaining how each respective vehicle would enter the site. This proved to be beneficial not only for educating staff and trucking companies as to how the site access will function, but also the general contractor during construction. The animations have helped to visualize what the final product will look like and better define coordination items between different sub-contractors.

The final challenge with Change Management will be reducing the number of light passenger vehicles that travel to site. The design was based heavily on existing volumes, and the anticipation that the STEP initiative will be realized in the near future by reducing the number of employees who drive to site, and encourage more staff to take the Suncor provided transportation. This will require a steady review of

the busing operations through the gate and ensuring operations have been optimized to reduce delay for those travelling by bus.

Flexibility to expand

One thing that is consistent with the Oil and Gas industry is that when the price of oil is high, there is a motivation to increase production. This can have an effect on the site by increasing the plant population of workers, and activity throughout the site. The design identified above accommodates existing traffic at the Main Gate Location. Should it be required, additional capacity can be achieved by utilizing the East Gate access. Should the site start to experience a significant change in traffic patterns, or required a change in operations, the current design utilizing reversible lanes might not be as flexible to accommodate. The benefit of this design was that it formed the west half of the original multi-lane design that provided inbound and outbound traffic on either side of the security building. Should there ever be a need to increase capacity at the main gate, there is still the potential to implement the original multi-lane design, should the area warrant the cost to implement.

Closure

What could we do better

One thing that could have been done better throughout the project would have been to better define and relate the initial costs of the project. The opinion of quantity and costs were provided at the end of each stage of development. Unfortunately, the link between stages, and development of scope through each stage had an adverse effect on the total bottom line number. In the future, for this particular client, it would be better to have an appreciation for the initial costs, and then advise when additional scope was added, and the value it provided to the project.

Client feedback

To date, the client is satisfied with the project, and the areas that are substantially complete, appear to be functioning as designed. A positive comment toward the project has been the introduction of the roundabout. Although there was a lot concern with respect to the operational performance, especially with the 700 large trucks that maneuver through the area, the roundabout appears to function with little issues. It also provides for an ideal location to place new Suncor branded signage which will help properly identify the area to newcomers. The third benefit of the roundabout is the potential to address an upstream uncontrolled turning issue where vehicles can wait for several minutes to make a left turn across 4 lanes of traffic waiting for a gap. Turning right at the intersection and towards the roundabout provides a controlled location to do a U-turn and provide a safe alternative to left turning traffic.

Closing Remarks

Suncor's Oil Sands site has seen tremendous expansion over the years resulting in the need for a redesigned entry/exit gate. Suncor's Main Gate was the first project initiated to completely overhaul

how access into the site is acquired. Since its initiation, two other sites have also implemented an electronic entry/exit system taking into consideration multiple users and peak hours of use.

Due to the size of these sites being developed in the oil sands, the entry and exit points function very similarly to the entry and exit into a community within a larger city. AM and PM peak travel times are critical in analyzing capacity, coupled with that is the need to accommodate larger modules, busing programs, parking, and the ability to safely and accurately track employees and visitors to the site.

The case example used throughout this paper described the planning and implementation of a security gate that will enable a more efficient transportation of people and goods. It will enable Suncor to gather and store information that could then be used in strategic planning for both this specific site as well as others that are planned in their capital budgets. A brief history of the oil sands expansion was provided. Based on the growth trend seen throughout northern Alberta, we anticipate greater focus will be placed on transportation needs with the emphasis of increasing efficiency and reducing costs. This project is a great example of how innovative transportation projects are being implemented within oil and gas projects.

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