



PRESENTATION MADE TO THE SIMON FRASER STUDENT SOCIETY COUNCIL

PRESENTATION DATE: SEPTEMBER 28, 2016

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SFU STUDENT COUNCIL REPRESENTATIVE



This following is a written version of an oral presentation given by Grayson Barke to the Simon Fraser Student Society (SFSS) Council on September 28th, 2016. Minor changes have been made for readability and citations have been added for clarity and reference. The pictures are copies of the slides shown during the presentation and have been placed in the text roughly where they were shown and addressed during the presentation.



Good evening, everyone. My name is Grayson Barke, and I have been asked by the members of the Environmental Resource Student Union, to raise before this Council, the issue of the Burnaby Mountain Tank Farm expansion and its implications for student life on the Burnaby Campus.

On December 19th of this year, the Canadian government will make a final decision on the Trans Mountain Expansion Project. If approval is granted, the Tank Farm on Burnaby Mountain will expand to accommodate three-times the amount of unrefined petroleum products. This expansion will place larger storage tanks and a greater volume of petrochemicals closer to SFU's Burnaby campus, and closer to the Campus' only access

roads. The expansion of the Burnaby Mountain Tank Farm will undeniably increase the level of risk it poses to all users of the Burnaby Campus; in one risk analyst's expert opinion, this project would not be approved either in the UK or anywhere within the EU (Vince, May 2015). The increased level of risk associated with the Tank Farm expansion profoundly changes the enterprise risk profile of the entire SFU community.

SFU is **unwilling to accept any increase in risk** to the Campus as a result of the Trans Mountain Expansion Project

From SFU's submission to the NEB

The University's administration has made it clear that "SFU is unwilling to accept any increase in risk to the Campus [...] as a result of the Trans Mountain Expansion Project" (SFU Safety & Risk, Aug 2016); however, Mark LeLonde, SFU's Chief Safety & Risk Officer has already acknowledged that, as a result of SFU and the City of Burnaby's limited capabilities, an increase in risk is unavoidable if the Tank Farm is expanded as planned (LeLonde, Sept 2016). This raises two serious questions I believe the SFSS, as the organization tasked with "advocat[ing] for the interest of undergraduate students at Simon Fraser University" (SFSS, Oct 2015), is obliged to answer:

1. Will SFU be able to fulfill its legal and moral responsibilities to provide “a safe environment and workplace for its faculty, students and staff” if the expansion goes ahead as planned (SFU Safety & Risk, Aug 2016)? And,
2. How should students respond as individuals, and collectively, if they feel the Burnaby Campus is no longer a safe environment as a result of this expansion?

Before attempting to answer these questions, it might be useful for me to give a brief overview of how changes to the Tank Farm will result in increased risks to the Burnaby Campus.

Here’s a typical picture of SFU’s Burnaby campus – the kind we use to advertise the natural beauty of the school’s surroundings – and truly it is beautiful.



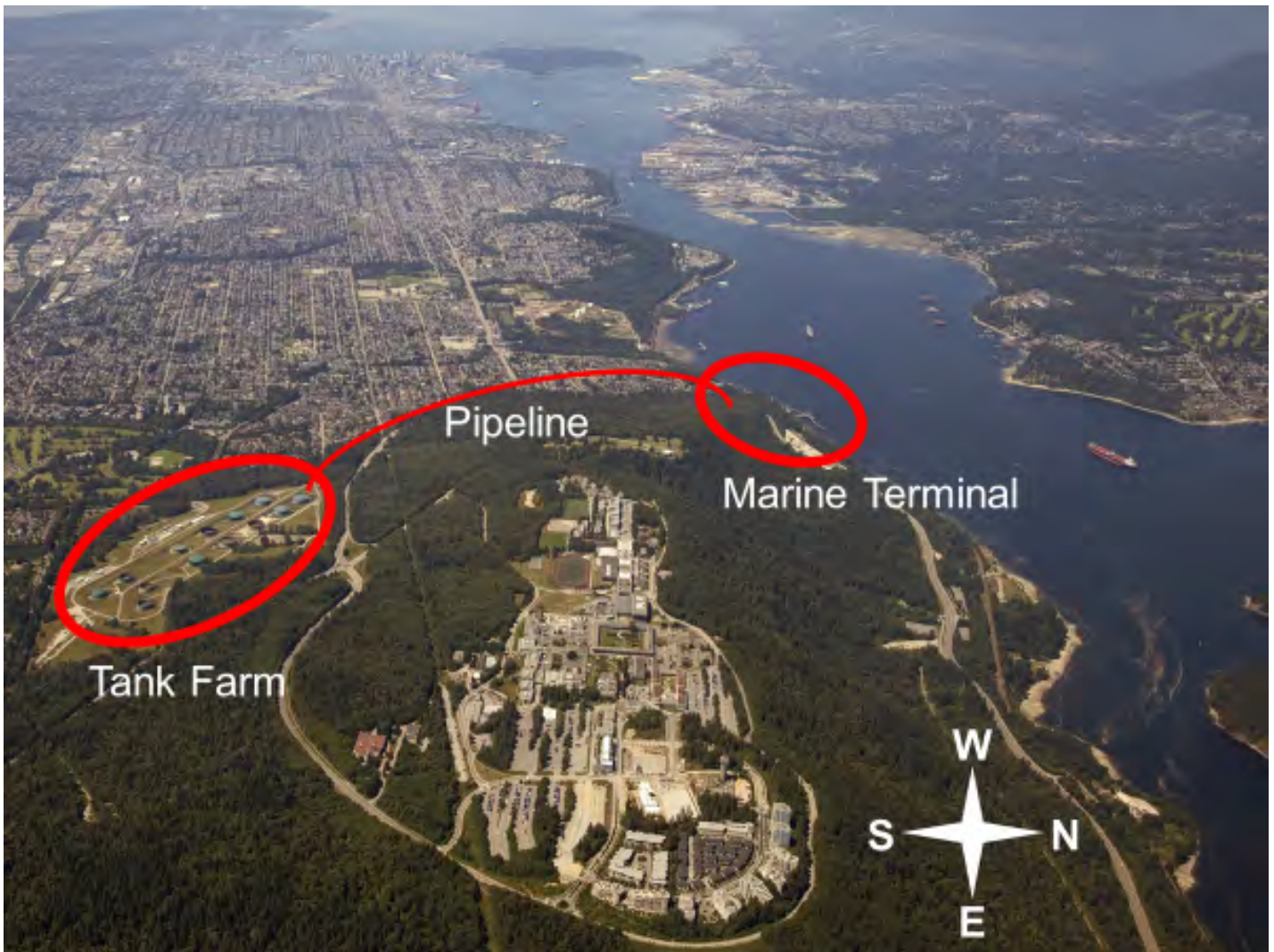
Here's another one:



What both of these photos avoid showing is this:

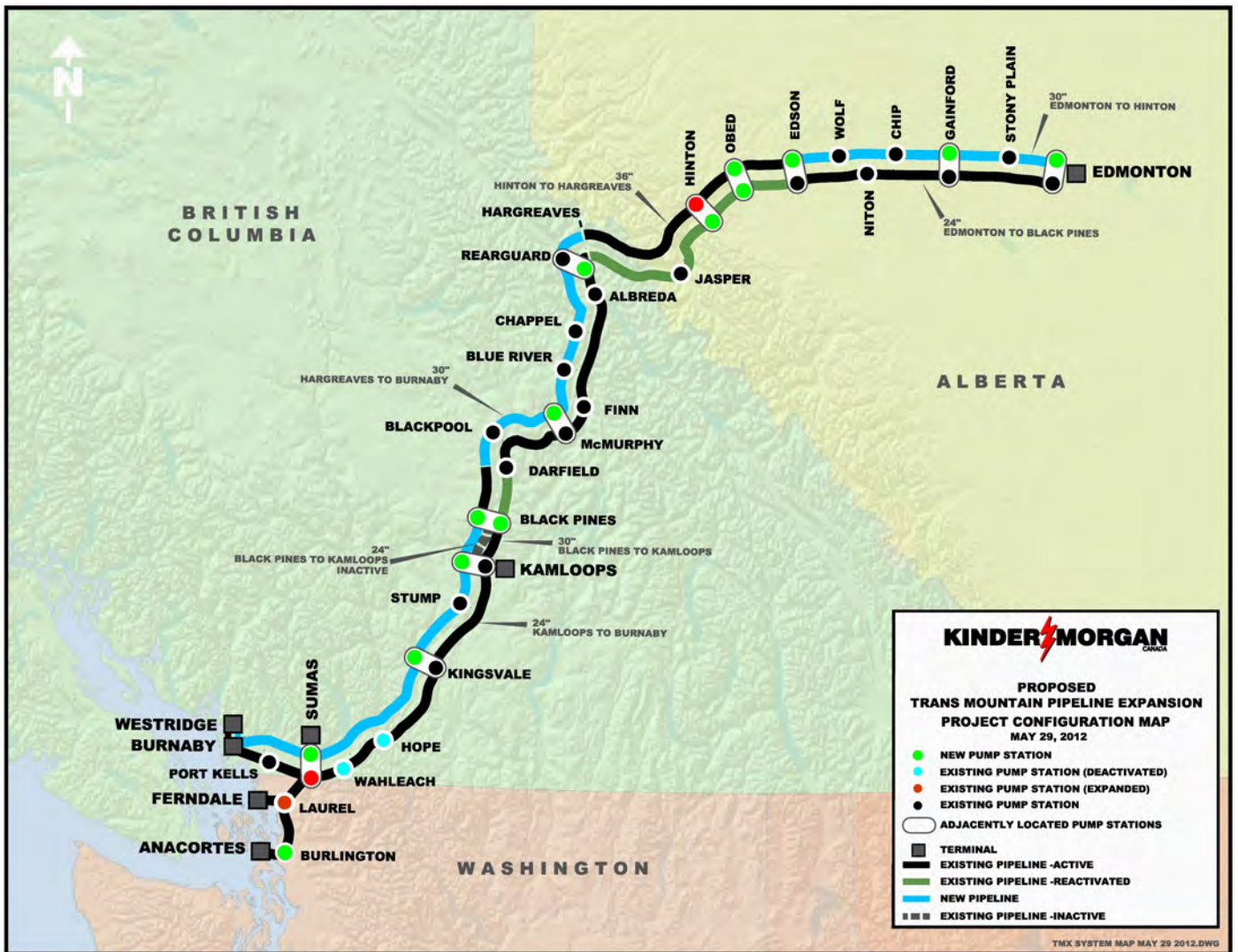


This is the Burnaby Mountain Tank Farm. Located on the south facing slope of the mountain, just below the intersection of Glagardi and University Way, this is Burnaby Campus's nearest neighbor, and a facility that people pass by every day on their way to and from campus.



In this picture, we can see that Burnaby Campus is effectively in the middle of a petroleum storage and transport facility:

- On the south side of the slope is the Tank Farm;
- On the north side, down on the waterfront, is the Westridge Marine Terminal;
- These two facilities are connected by several high-pressure pipelines;
- Both of these facilities are operated by a company called Trans Mountain, and they have been owned, since 2005, by another company called Kinder Morgan.



On May 19th, 2016, Kinder Morgan received approval from the National Energy Board (NEB) to build a new, large-diameter pipeline on their existing pipeline's right of way (NEB, May 2016). This new pipeline will triple the amount of product moving from Edmonton to the Burnaby terminal, which necessitates tripling the storage capacity of the Tank Farm and expanding the marine terminal to accommodate three tankers at once.

Today, the tank farm looks like this:



Photo Credit: City of Burnaby Fire Department

- There are 13 storage tanks with a total capacity of 1.7 million barrels sitting on a 189-acre site;

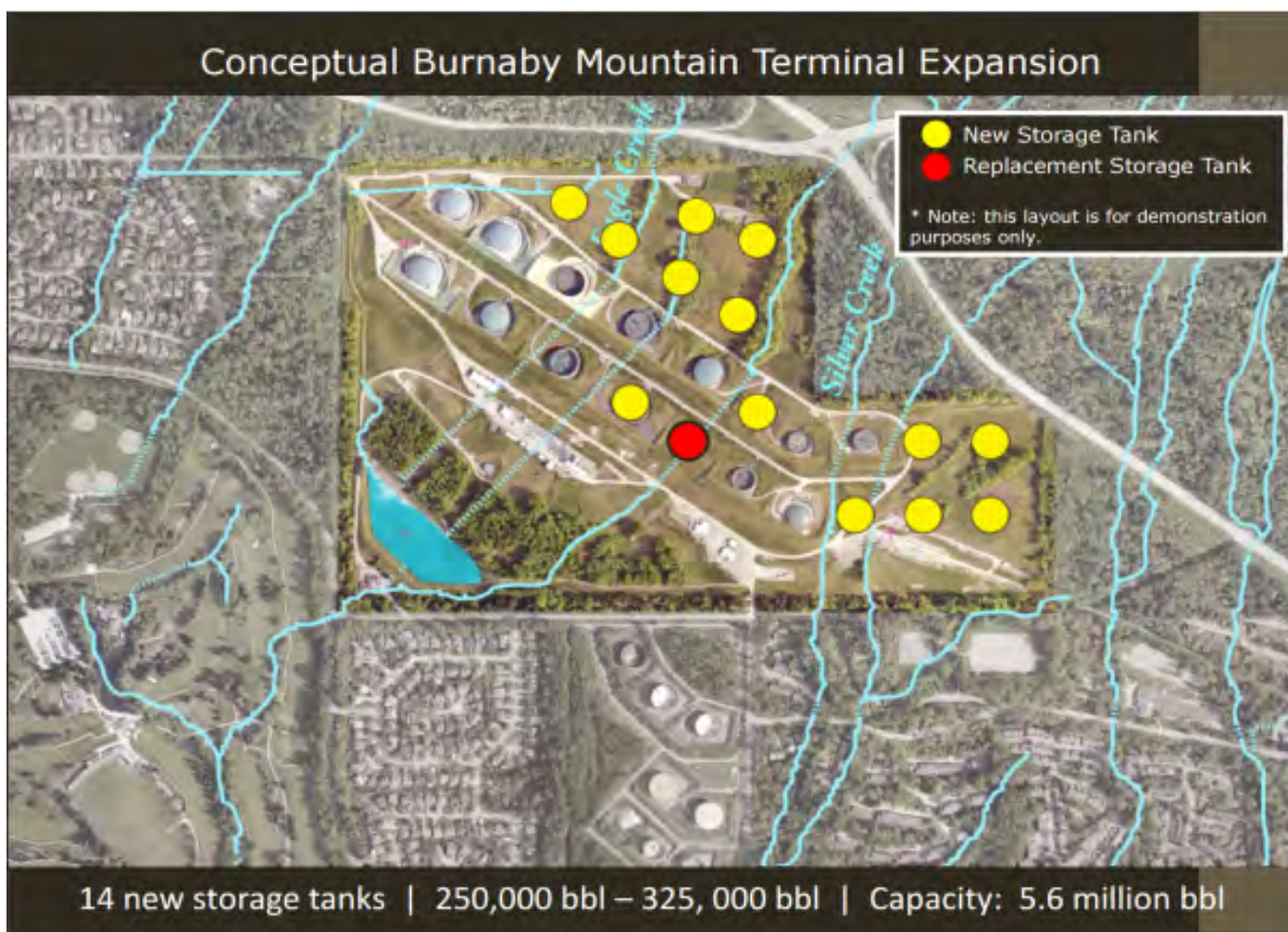


Photo Credit: City of Burnaby Fire Department

- The expansion will add a net 13 new tanks (14 new tanks, plus one replacement), bringing the total to 26 tanks with a 5.6-million-barrel capacity on the same 1.89-acre site;
- To give you some idea of how much volume that is:



Exxon Valdez, 1989

- 1.3 million barrel capacity
- 257,000 barrels spilled

The Exxon Valdez was carrying 1.3 million barrels and spilled 257 thousand barrels;



Deepwater Horizon, 2010

- 4.9 million barrels released

The total amount released after the Deep Water Horizon platform collapsed is estimated at 4.9 million barrels;



Burnaby Mountain

5.6 Million barrels stored after expansion

After expansion, the Burnaby tank farm will hold 5.6 million barrels;



More than the total amount released by Deepwater Horizon or just over four full Exxon Valdeez size ships.

By itself, tripling the amount of product stored at the Tank Farm significantly increases the risks to SFU; however, two additional aspects of this expansion will also contribute to an elevation of Enterprise Risk:

Expansion = Increased Risks

1) Volume stored

- 1.7 million barrels → 5.6 million barrels

2) Proximity

- tanks closer to each other, to access roads, and to campus

3) Nature of stored product

- switch to 'heavier', more volatile, and more toxic products

Expansion = New Worst-Case-Scenario

- Increasing the volume stored without increasing the footprint of the facility means the storage tanks will be closer to each other, closer to the campus access roads, and closer to the campus itself;
- There are plans to store 'heavier,' more toxic, more volatile, and generally more dangerous petroleum products at the expanded facility.

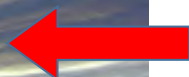
Collectively these three changes will also significantly change how a worst-case-scenario may unfold in the event of an accidental release or fire at the expanded facility.

What does a worst-case-scenario accident at a Tank Farm look like?

Catano Fire,
Puerto Rico 2009



Buncefield Fire,
England 2005



There are two well-studied examples of tank farm accidents that we can examine to get some idea of the catastrophe SFU students, faculty, and staff may face in the event of an accident at the expanded Tank Farm.

This top picture shows a multi-tank fire at the Catano tank farm in Puerto Rico in 2009, and the bottom picture shows the Buncefield Fire, which happened at a tank farm in England in 2005.

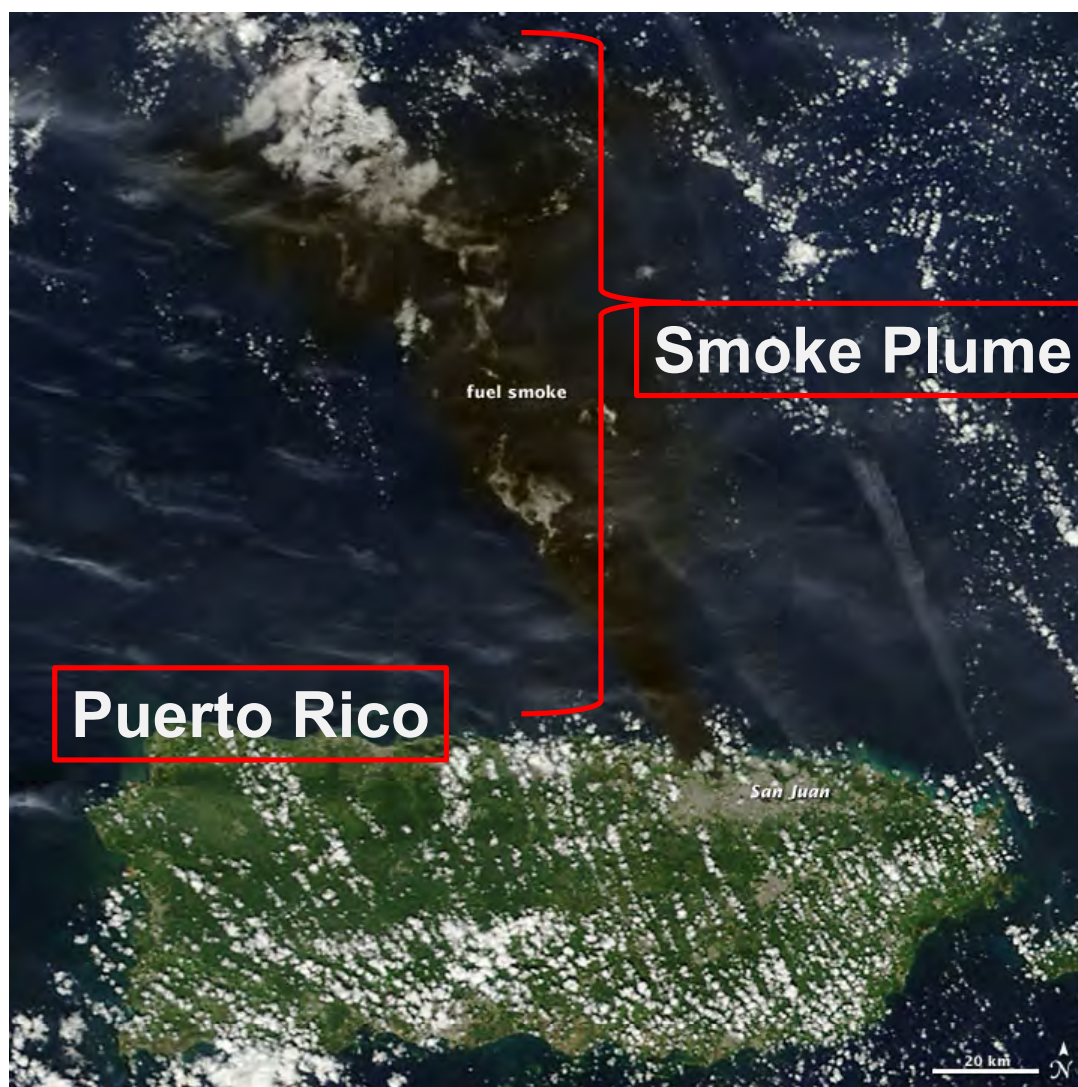


“Boil-Over”

Both of these incidents started with a fire in a single storage tank, which then exploded, causing the surrounding tanks to ignite and explode themselves; this is what’s known as a boil-over event, leading to a catastrophic multi-tank fire – this is a worst-case-scenario.



In Puerto Rico, the initial explosion registered as a magnitude 2.8 earthquake on the Richter Scale and blew out windows over 2 miles away. Both the Governor of Puerto Rico and President Obama declared a State of Emergency in order to mobilize a full response to this disaster. More than 1500 people were evacuated, and it took two days to extinguish the blaze.



Luckily, the huge plume of toxic smoke was blown northwards away from Puerto Rico and surrounding islands.

When the fire was finally brought under control, the Governor said:



“Nobody is prepared for a fire like this. I'm calling on the 4 million Puerto Ricans to thank God tomorrow because this could have been much worse than it was” – Gov. Luis Fortuno

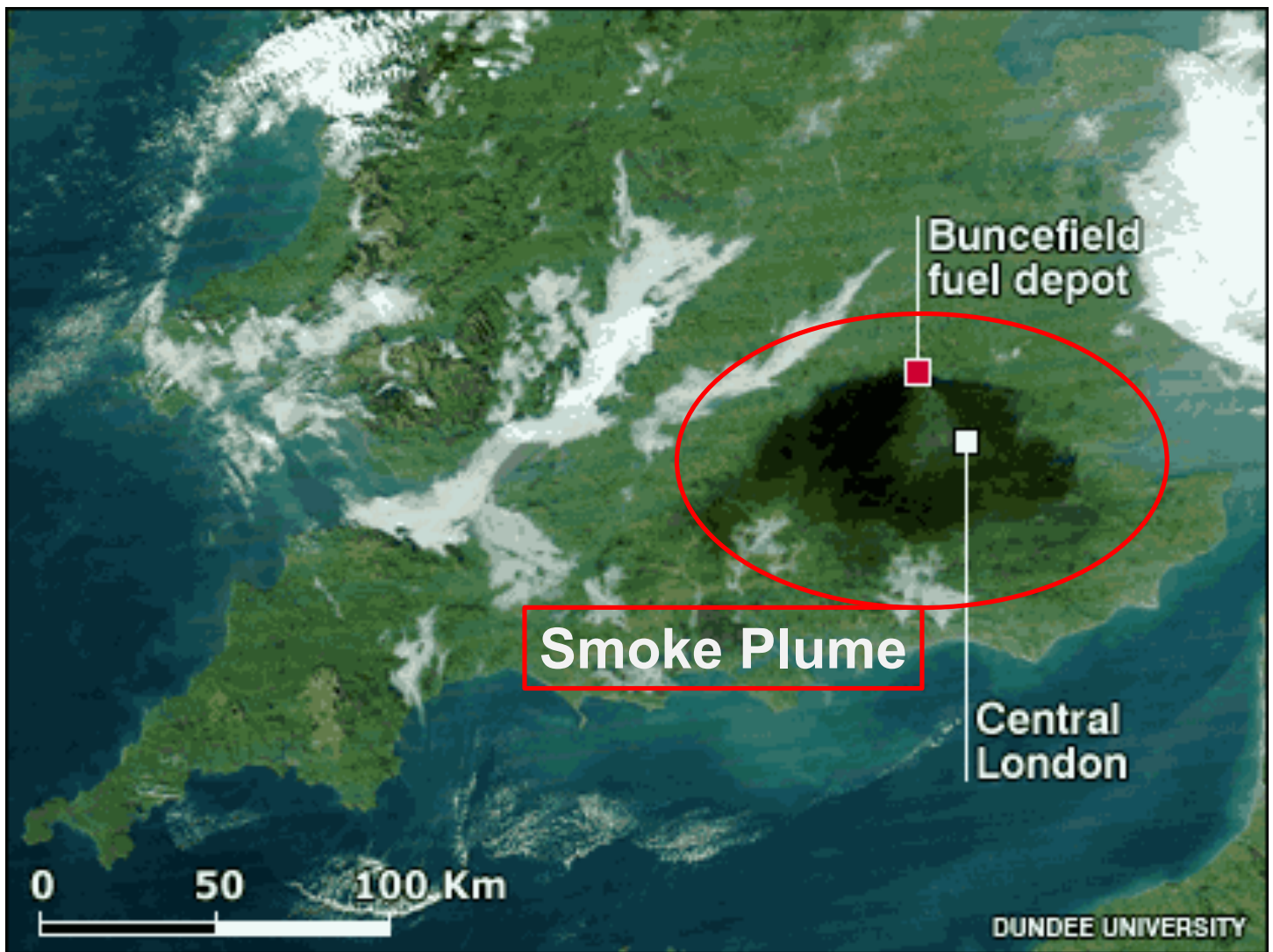
(“Wind Shifts”, Oct 2009)



The Buncefield fire in England has a similar story: initially, a single tank ignited and exploded with the force of a 2.4 magnitude earthquake, causing other tanks to ignite and explode. The initial and subsequent blasts were heard up to two hundred miles away in Belgium, France and the Netherlands.



Buildings near the tank farm had doors and windows blown in, roofs blown off, and a warehouse half-a-mile away collapsed. Windows were blown out of an abbey five miles away. Over two-thousand people were evacuated due to concerns about further explosions, fumes and smoke, and the structural safety of buildings hit by the blasts. Schools, offices, and major roads in a ten-mile radius were closed and people were asked to stay in-doors due to air quality concerns. Responders fought the blaze for four days, but ultimately they let the fire burn itself out.

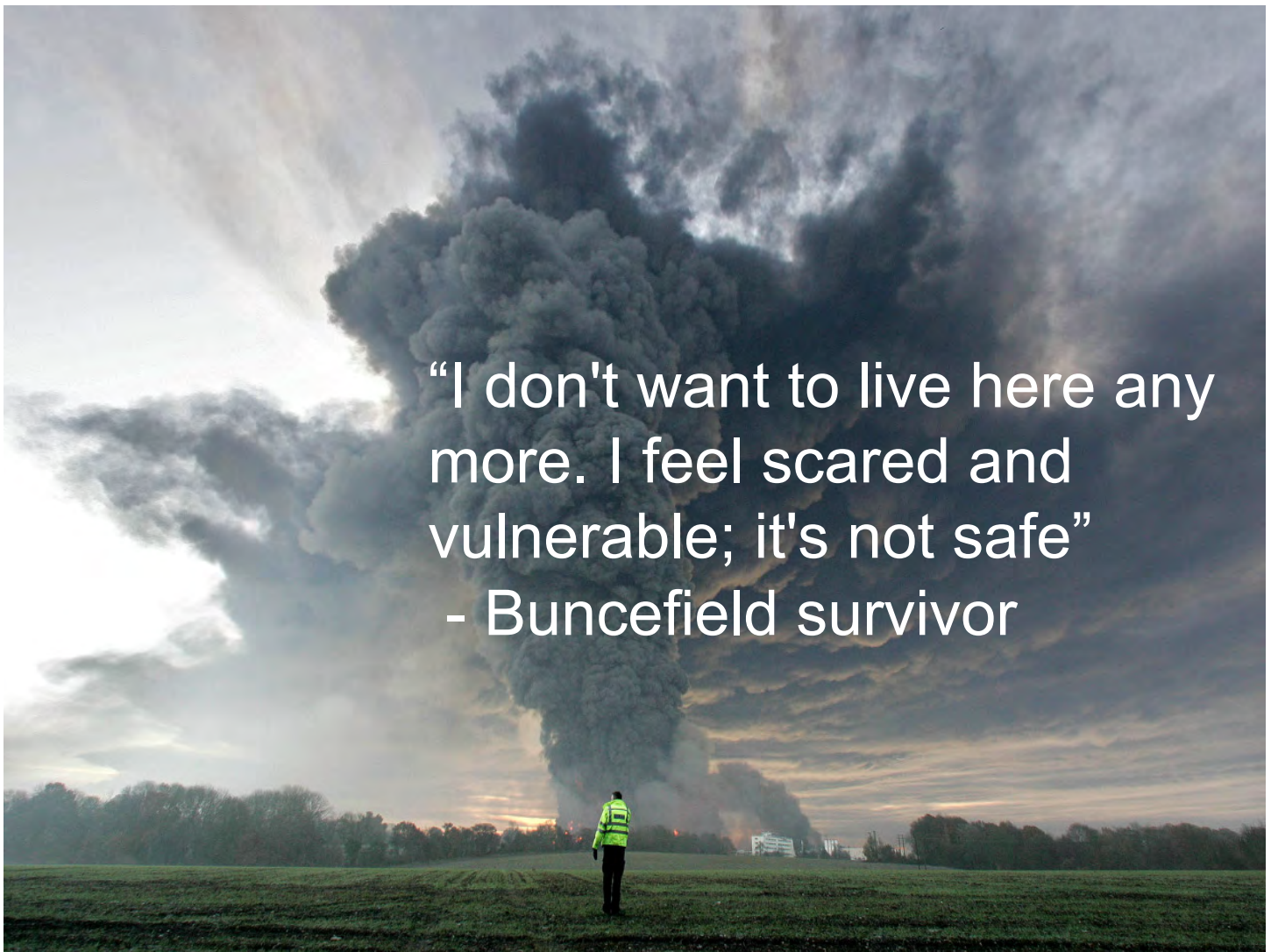


Similar to the Puerto Rico fire, the smoke plume could be seen clearly from space and eventually spread over much of south-east England.



Buncefield Fire - Seen from 20 Miles (32 Kms) Away

And like Puerto Rico, this accident could have been much worse; the initial blast occurred just after 6:00am, when many of the closest schools and offices were empty. Still, 244 people required medical aid, mostly for respiratory issues and cuts and scrapes from flying glass and debris.



“I don't want to live here any more. I feel scared and vulnerable; it's not safe”
- Buncefield survivor

This accident also caused lasting psychological trauma to survivors. One survivor said to the BBC, "After the explosion happened I was in a very bad way - I was constantly crying" ("Buncefield Victims", Mar 2006); another explained, "I was lying awake last night thinking, 'I don't want to live here anymore.' I feel scared and vulnerable, it's not safe" (Dear, Dec 2005).

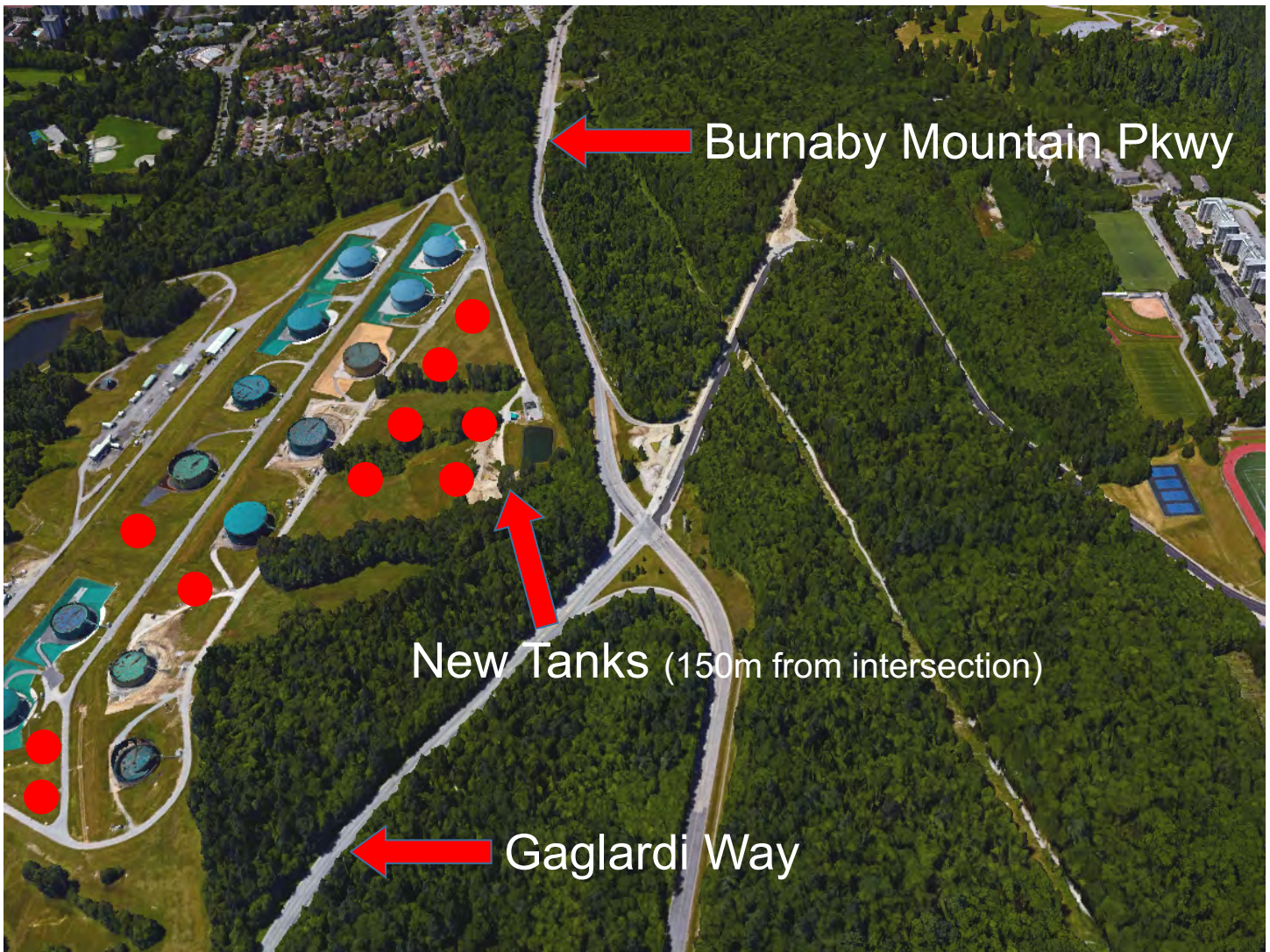


While the Tank Farm near SFU is similar to those in England and Puerto Rico, there are some important differences in our situation that increase the potential for loss of life in a catastrophic accident.



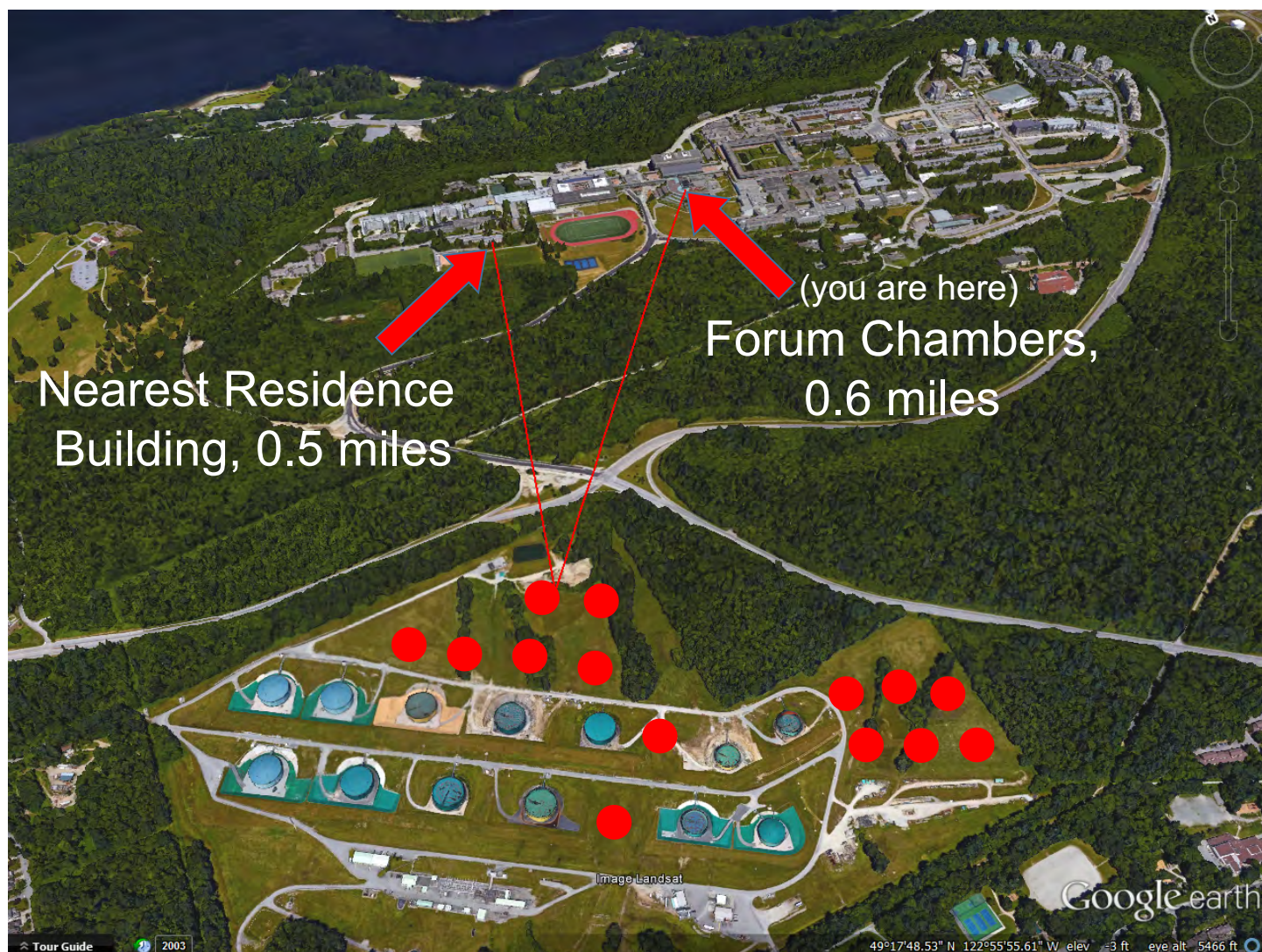
In their submission to the NEB, the Burnaby Fire Department identified three main areas of concern with respect to SFU's Burnaby campus:

1. The Fire Department feels inadequately prepared to respond in a timely and effective manner to a major fire at the expanded Tank Farm, because of the changes to the facility's layout and the additional volumes of product being stored there (Bowcock, May 2015);



2. The Fire Department also feels that evacuation of the Burnaby campus may be impossible given that the campus' only exit routes pass by the Tank Farm (Bowcock, May 2015). Here we see the intersection of Burnaby Mountain Parkway and Gaglardi Way, where the expansion plans place tanks within 150m of the only two roads in and out of campus;
3. The Fire Department concluded there is a "high probability of fire extension to the forest areas of the Burnaby Mountain Conservation Area," and expressed concern they would be unable to suppress a forest fire if Gaglardi and University Way are impassable (Bowcock, May 2015).

What will users of SFU's Burnaby campus experience during a worst-case-scenario disaster at the Burnaby Mountain Tank Farm? What unique factors do we need to consider to understand the potential impacts and to ensure SFU is prepared for them?



To start, let's do a quick comparison of the distances at play in the two tank farm disasters I described, and SFU's situation. In the Buncefield disaster, windows were blown in as far as five-miles away; buildings were damaged as far as two-miles away; and a building within half-a-mile collapsed. In Puerto Rico, windows in a two-mile radius were blown in. Forum chambers, where we're sitting right now, is just 0.6 miles away from where the closest tank will be, and the nearest residence building is 0.5 miles away. So we are squarely in the blast zone where windows will break, and buildings may collapse.

The following scenario is based on information found in the Burnaby Fire Department's "Evidentiary Paper" (Bowcock, May 2015):

Imagine for a moment it's 11:25am, on a Wednesday morning in the middle of Spring semester. Unbeknownst to the roughly 30,000 students, faculty, and staff, at SFU's Burnaby Campus, there is a situation developing at the nearby tank farm. A critical piece of equipment has failed; vapors have been released and ignited. The fire spreads back to one of the tanks, and within seconds there is a boil-over situation. Personnel at the tank farm have no time and no means to respond before the tank explodes, vaporizing several of the surrounding tanks, and igniting many others.

The initial blast will be the first thing that people on Burnaby Campus will experience. It will hit with the force of a small earthquake, knocking people off their feet. The blast could be lethal for anyone on the southern side of the campus, especially people on the football-field, in residence, and anyone on the road coming to or from campus.



Photo Credit: City of Burnaby Fire Department

Most of the windows at the front of campus will be blown in – including windows in the AQ, MBC, WMC, the Gym, Residence, and the new Student Union Building when its complete – potentially causing injuries to many people:

- The blast will be deafening and disorienting, making it harder for people to respond quickly to alerts and evacuation notices;
- The blast will likely damage the buildings, possibly compromising their structural integrity, making it unsafe to remain inside.

The Subsequent Blasts:

- Also loud, disorienting, potentially lethal, and damaging to the buildings;

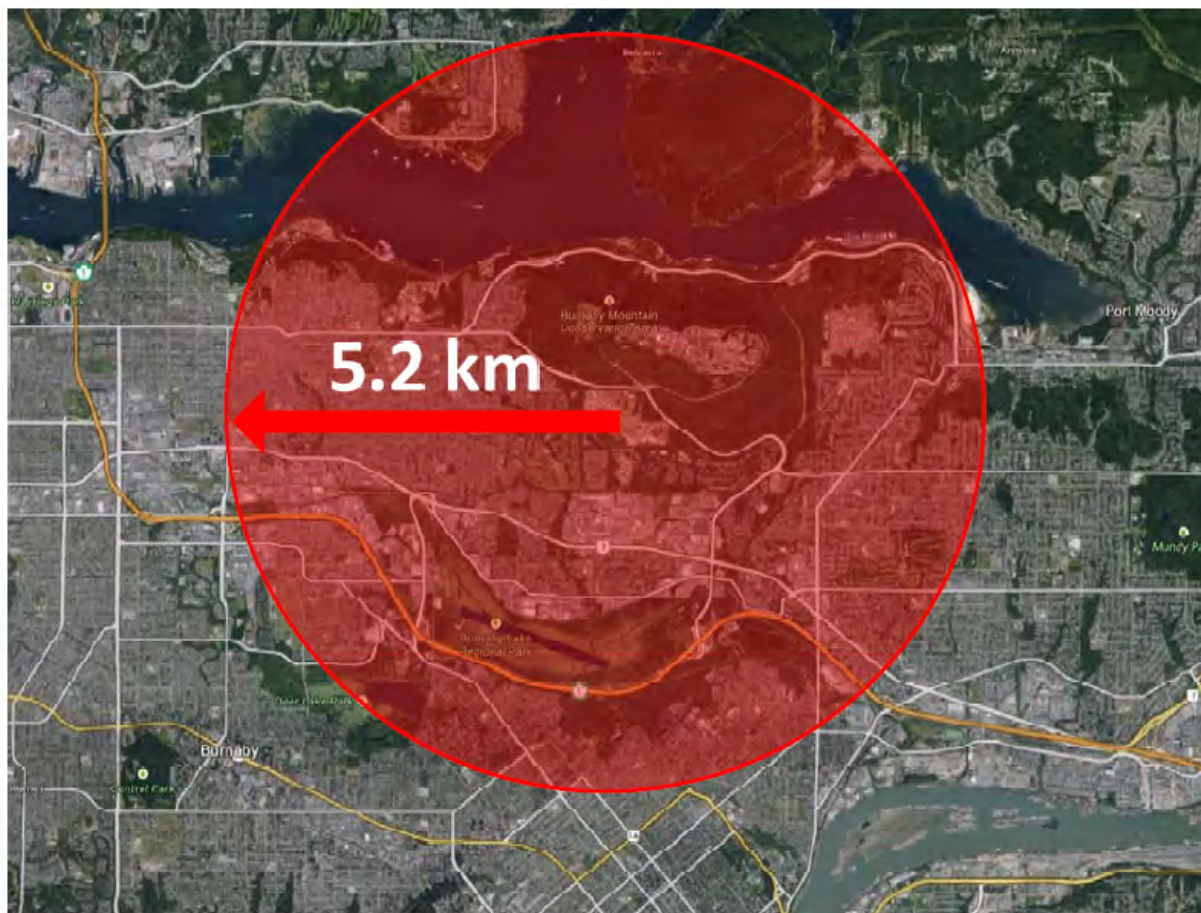
The Intersection:

- In a blast, the main intersection could be wiped out or covered in flaming oil, making it impossible for responders to assist people on campus, and impossible for Burnaby Campus to evacuate;

The Fire:

- After the explosion, the fire will start sending thick clouds of smoke into the air;
- Depending on the way the wind is blowing, the suffocating smoke may blow directly towards the now shattered, window-less campus;
- The smoke will contain sulfur-dioxide which can kill you in high concentrations and cause serious breathing difficulty even in low concentrations;
- People will likely need respirators to breath outside, or inside buildings without windows.

Diagram 7
5.2 km downwind SO₂ Exposure Area



This map from the Burnaby Fire Department shows their estimate of a 5 km radius of exposure to sulfur-dioxide.



Anabatic (inflow) Winds:

- These summer winds are very predictable on a sunny warm day.
- Typical to any fjord or inlet an afternoon wind picks-up and blows from the south up Indian Arm.
- These winds can surprise inexperienced paddlers who travel 1-hour north up Indian Arm and find they have to paddle back into a head wind when they are already tired.

The Burnaby Fire Department acknowledges that the wind direction will play a huge role in a worst-case-scenario. I'm not an expert in local wind conditions, but anyone who's gone kayaking or sailing up Indian Arm in the summer will tell you the wind blows north up the inlet. Deep Cove Kayak has a caution about these strong winds on their website (Deep Cove Kayak, 2016):

- **Anabatic (inflow) Winds:** These summer winds are very predictable on a sunny warm day. Typical to any fjord or inlet an afternoon wind picks-up and blows from the south up Indian Arm.

In a worst-case-scenario, the wind could be blowing north up Indian Arm, carrying the smoke directly towards campus. Lastly, as mentioned, there is also a real danger that a fire at the Tank Farm will start a larger forest-fire on Burnaby Mountain, further reducing the likelihood of a successful emergency response or evacuation.



Due to the high likelihood that a worst-case-scenario disaster at the Tank Farm will prevent road-access to campus, in-turn preventing first emergency personnel from reaching the scene and making large-scale evacuation impossible, the University's plan is to have people remain on campus and "shelter in place" (LeLonde, Sept 2016). That means students, faculty, and staff will be directed to the lower levels of the campus that, hopefully, weren't too damaged by the blasts and still have their windows intact. Because the smoke will be noxious, the University will do its best to seal off the air intake systems, but this procedure has not been tested. At the moment, this is the best plan available – to ask people to shelter in buildings that have been damaged by multiple blasts, with the hope of sealing them off, while we wait, possibly several days, for the fire to burn itself out. SFU's Chief Safety and Risk Officer estimates, that if all goes well, we will have enough food on campus for about 48-hours (LeLonde, Sept 2016). Of course, the University will be working closely with the owners of the Tank Farm and the Burnaby Fire Department to make sure proper plans are in place before the expanded Tank Farm is operational. However, we must question if there can ever be an

effective or adequate response against an earthquake-force explosion, a “fireball of several hundred meters,” and the resulting kilometers-high column of smoke and toxins (Vince, May 2015). SFU hopes to have a fully-developed response plan in place by 2018, and they will run full-scale response simulation exercises involving emergency responders and all campus users on a regular basis. So, in the future, Frosh Week might include mandatory evacuation and shelter-in-place drills.

I hope I have conveyed to you how serious a worst-case-scenario at the Tank Farm could be. At this point, you may be reasoning that the likelihood of a worst-case-scenario must be extraordinarily low, otherwise the government would not approve the Tank Farm expansion. Right?

The Tank-Farm Expansion will increase the likelihood of a catastrophic event

**From
1 in 1,000,000/year**

**To
1 in 2000/year**

Well, that’s the funny thing about the approval process for this project – the company did not consider the probability of the worst-case-scenario I described. The company considered a boil-over, or multiple-tank fire to be impossible, and the government regulator accepted this assertion without any verification (NEB, May 2016). The City of Burnaby commissioned an independent study of the company’s proposal; it was performed

by Dr. Ivan Vince, one of the world's leading industrial risk analysts, who was involved in the post-disaster analysis of the Buncefield fire. Dr. Vince calculated the Tank Farm expansion will increase the risk of a catastrophic event from 1 in 1million/year to 1 in 2000/year (Vince, May 2015).

Opinion on Potential Off-Site Risks of the Proposed Expansion of Burnaby Tank Farm

prepared for the City of Burnaby

by Dr Ivan Vince CEng FIChemE CSci CChem MRSC FEI

ASK Consultants

Bromley, UK

22 May 2015

“The application for expanding the Burnaby Terminal would, in my opinion, have failed in the UK and, in all probability, throughout the EU.”

“A valid risk assessment (addressing both severity and likelihood), with due consideration of boil-over, would in my opinion, lead to the conclusion that the risk is already high and would become intolerably high if the expansion went ahead”

In his expert opinion, “[t]he application for expanding the Burnaby Terminal would have failed in the UK and, in all probability, throughout the EU” and he concluded:

“A valid risk assessment, addressing both severity and likelihood, with due consideration of boil-over, would in my opinion lead to the conclusion that ***the risk is already high and would become intolerably high if the expansion went ahead***, in view of the logistical complexity of fire-fighting on a congested and sloping site, the proximity of residential areas and forestry and the difficulty, in an emergency, of safely evacuating Simon Fraser University.” (Vince, May 2015, emphasis added)

Severity \times Probability

10,000 Fatalities

128,000 Injured

\$75-200 Billion in damages

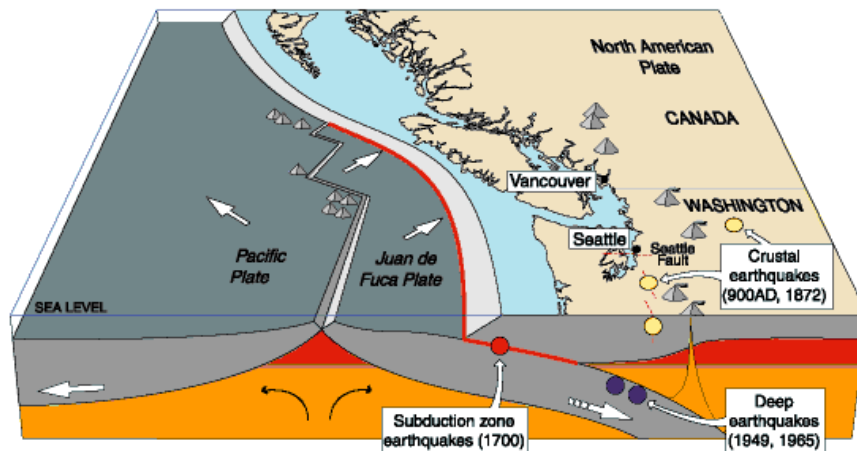
In Metro Vancouver



30% Chance of a Magnitude 8.0-8.6

10% Chance of a Magnitude 8.7-9.2

In the next 50 years



The 1 in 2000 chance of a worst-case-scenario per year are not good odds for SFU; however, when we also consider the likelihood of a major earthquake happening in the region – which was most recently calculated to be a 30% chance of an 8.0 magnitude quake in the next 50 years – the risks become intolerable, at least for me personally (Schulz, July 2015).

I am not going to stand here and tell you how to respond to this threat as individuals, or how we should respond as advocates for undergraduate interests – but I will tell you how I am responding. If the Tank Farm expansion goes ahead, as planned, I will be leaving Simon Fraser University. I also live up here, in the UniverCity community, and I will be moving as far away as possible from this part of North Burnaby. For me, the risks are just too great. I like SFU; I am happy here, and I plan to start my master's degree here next year. I don't want to leave, but I am not comfortable with this level of risk.

While I won't tell you what to do, I believe there are certain things that the SFSS, as a distinct organization within the University, should do:

At the start of this presentation, I said the University "is unwilling to accept any increase in risk to the Campus [...] as a result of the Trans Mountain Expansion Project" (SFU Safety & Risk, Aug 2016). It is clear that an increase in risk is unavoidable if the expansion goes ahead. From speaking with Mark Lalonde, it is my understanding that the University is proceeding under the assumption that the expansion will be approved in December, and the university will do whatever it can with its limited resources to reduce the risks to students, faculty, and staff. While the University will do their best to manage the increase in risk, it seems to me, they will not be taking any further action to prevent the increase in risk to the Campus in the weeks leading up to the government's final decision on this project in December; however, the University's position or inaction does not mean that we, as students, have to accept these risks too. We can take action:

1. I believe our first responsibility to our fellow students is to share information: to provide enough information to all students so that they can make informed decisions about the risks they will be exposed to. I do not believe the University or the SFSS should be making assumptions or decisions about what levels of risk individuals are comfortable with;
2. Collectively, we should decide what level of risk the SFSS, as a distinct organization, is willing to accept. I suggest adopting, and insisting upon, the University's original standard of no increased risk;
3. Collectively, we should decide what our response will be if the University is unable to ensure that there is no increased risk, or, unable to ensure that Burnaby Campus remains a safe environment and workplace for students, faculty, and staff;
4. The SFSS should work closely with the University, the owners and operators of the Tank Farm, emergency responders, all levels of government, and any relevant individuals and organizations – as independent representatives of student interests – to ensure that the individual and collective safety needs of students will be met. In other words, we should not blindly trust that the University will be able to look after us, or that the companies or decision makers involved will consider the safety needs of students to be a priority; we need to look out for ourselves and for each other.

In my opinion, doing anything less than these four things would be negligent and a dereliction of our duty to represent and advocate for undergraduate interests.

Aside from these core responsibilities, there are many other actions that we as students and citizens can take to ensure that our collective and individual safety needs will be met. These are just my suggestions; it is my hope that we can all work together to choose and implement the best course of action:

1. Do nothing – wait for the December decision and trust that the University will continue to provide a safe environment if the tank farm expands;
2. Gather more information – we need to make sure we are sharing the most up-to-date, and accurate information with students. We could reach out to the various organizations involved in the project and invite them to speak to the student body directly:
 - Mark Lalonde, SFU’s Chief Safety and Risk Officer has already agreed to speak to Council should we request it;
 - We could also ask Chris Bowcock, Burnaby’s Deputy Fire chief to speak;
 - We can request that representatives from the University’s administration answer our questions and concerns;
 - We can ask the company who owns the Tank Farm to speak with us;
 - We can ask politicians from all levels of government to acknowledge the risks this expansion poses to SFU, and insist they support student safety.
3. Follow the lead of other organizations:
 - The GSS – is also working under the assumption the expansion will be approved – we could discuss a joint response plan with them;
 - First Nations – at every Council meeting, and indeed, at every major meeting and event at SFU we acknowledge that SFU is on the Unceded Territories of the Coast Salish Peoples. Those peoples, and the Tsleil-Waututh Nation in particular, are standing up to the Trans Mountain Expansion Project, along with more than 50 other nations from across North America – we could choose to stand with them. Perhaps this is a conversation for another day, but I believe all of us at SFU should consider whether the simple territorial acknowledgement is enough, or whether more support is required from those who live, work, and study on unceded territory.

4. Tell our story – this is potentially our most effective leverage point if we decide to take action:
 - Canadians value education, and I think many would be troubled to learn of the risks and challenges students at one of our Nation’s premier research and learning institutions are facing because of this project;
 - SFU is a large community with strong connections to many well-known and well-respected individuals, including alumni and donors. Undergraduate students are the largest group within the University, we are the core of this community; we are in a position to call upon the community’s resources and goodwill to stage an effective communications campaign.
5. Get Radical – SFU has a long and celebrated history of activism, and I believe protecting each other’s safety and advocating for the future of our university is perhaps the worthiest cause any of us can stand for as students, and a cause worth fighting for.

Before I wrap this up, and I thank you all for your patience and attention in listening to what I have to say, I want to answer the question that I anticipate you as educated individuals and critical thinkers probably have: why am I doing this, why do I care, what is my motivation, what are my intentions?

As I disclosed earlier, I do have my own selfish reasons for calling attention to this issue: I live up here and I don’t want to move. I plan to do a Masters degree at SFU and I don’t want to switch schools; but, beyond that, there are two main reasons that will not allow me to ignore this issue:

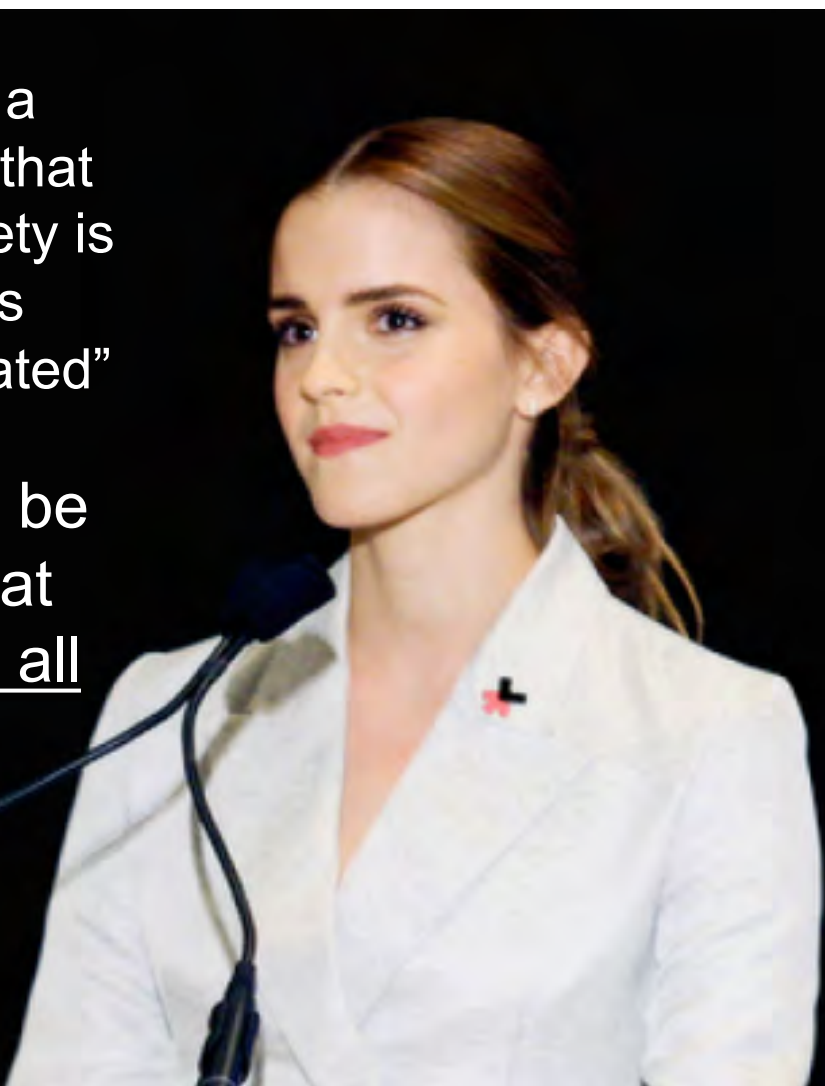
Firstly, like all of you, I am heavily invested in SFU in terms of time, money, and effort, and my future success, to a large extent, depends on the existence and reputation of this institution. Not only is SFU my community and my neighborhood, it is also the only real proof of my education and abilities. If SFU’s reputation declines because students and faculty do not want to be at a school where there is a genuine and omnipresent risk of a major catastrophe, then our degrees and reputations will suffer as well.

Secondly, I firmly believe universities should be a safe place for all students.

A University should be a place “that recognizes that when one persons safety is violated, everyone feels their own safety is violated”

“A University should be a place of refuge, that takes action against all forms of violence”

Emma Watson, UN Goodwill Ambassador, Sept. 20, 2016



In a recent speech, UN Ambassador Emma Watson said that a university “should be a place that recognizes that when one person’s safety is violated everyone feels their own safety is violated” (Watson, Sept 2016). Watson was speaking about sexual violence on university campuses, but she calls on universities to take action against all forms of violence.

I argue that the expansion of the Tank Farm is a gross violation of our individual and collective safety. If this project goes ahead, SFU’s Burnaby Campus will be a refuge for no one.

Lastly, I care a great deal about all the people who make SFU a place where I am happy to be – my fellow students, my professors, and all the staff whose hard work make this university function. I don’t want to see people in my community, people that I care about get hurt or killed.

Personally, I believe that we owe it to ourselves, to each other, to the faculty and staff, and all past and future graduates to fight for safety at our university. I don't expect you all to charge with me unto the breach, but I do hope we can have a productive discussion about how to respond to this threat to the SFU community.

Thank you all again for your attention.

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