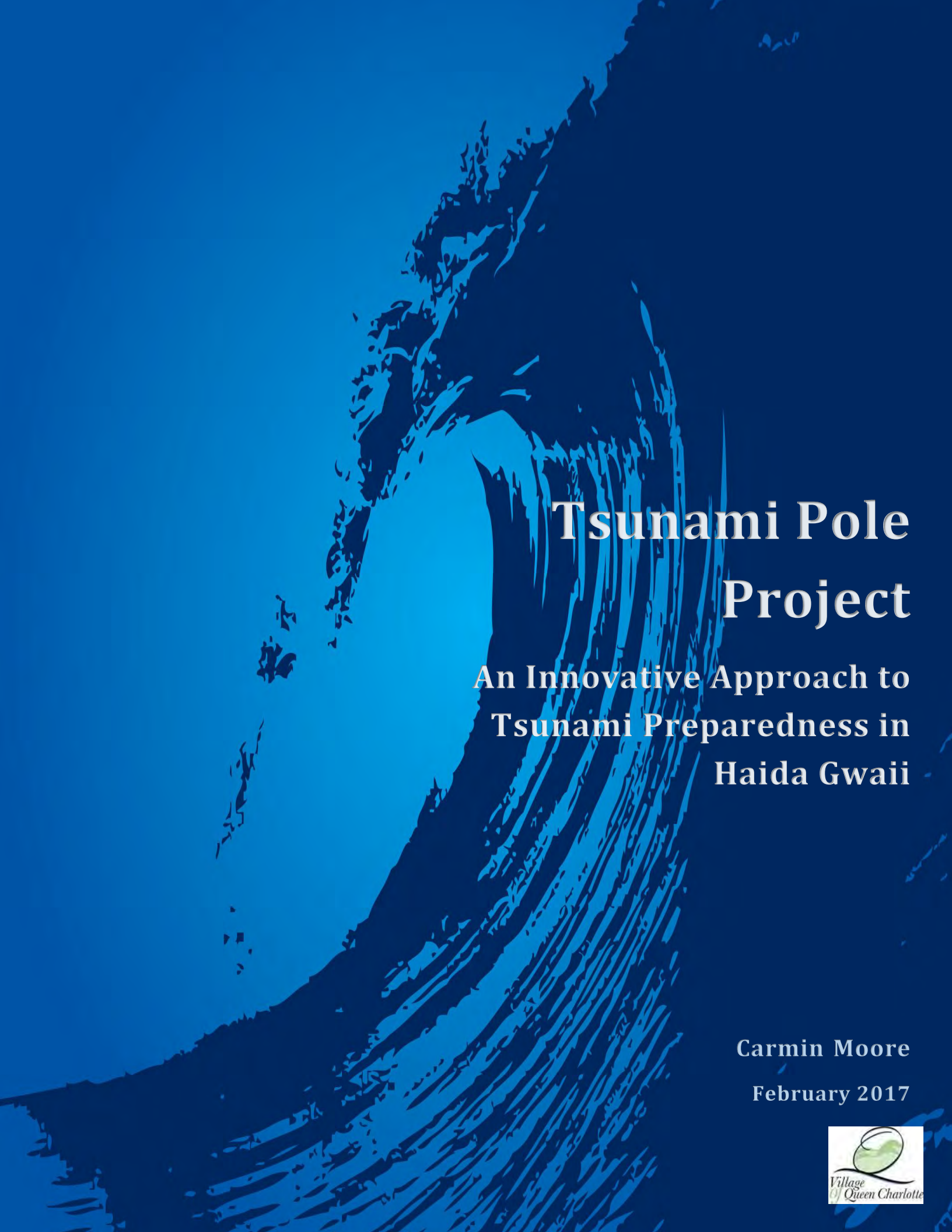


Tsunami Pole Project

An Innovative Approach to Tsunami Preparedness in Haida Gwaii

Carmin Moore

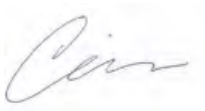
February 2017

Village of Queen Charlotte

ACKNOWLEDGEMENTS

This project was made possible through funding from the Province of British Columbia and donations from BC Hydro and TELUS. There are several individuals and organizations that have contributed to the success of this project. I would like to thank O'Brien and Fuerst, AMS Building Centre, and Northern Development Initiative Trust for their in-kind donations to the project, as well as Ken MacPhail with Silvacare Inc, Ian Walker from the University of Victoria, and Owen Jones from the Council of the Haida Nation for providing the LiDAR data needed for this project. Furthermore, I would like to acknowledge Norm Wagner and Gidgalang Kuuyas Naay Secondary School for their assistance and express sincere gratitude to Alison Bird and Martin Scherwath, Earthquake Seismologists; and Tania Lado Insua with Ocean Networks Canada for their expertise, information, and support with the project.

There are many people who have been instrumental in the development of this project. I would like to give a special thank you to Larry Duke, Fire Chief and Emergency Coordinator who came up with the original idea, and Lori Wiedeman, Chief Administrative Officer for The Village of Queen Charlotte for her vision and leadership. I would also like to acknowledge the members of the Steering Committee, which included Emergency Management BC, the Haida and municipal Chief Administrative Officers or their delegates and the representatives from BC Hydro and TELUS for their support and input on the project. This project was a collaborative effort and could not have been completed without all of the key players involved.



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Executive Summary

Haida Gwaii, an archipelago of islands located off the north coast of British Columbia is considered to be in a significant tsunami risk area. In some locations, residents of Haida Gwaii have expressed confusion regarding whether or not their homes or places of work are in a hazard zone, or they have developed some apathy towards tsunami risk due to local geographic features. Tsunami warning signs are frequently stolen and expensive to replace. Due to Haida Gwaii's tsunami risk and lack of signage, the tsunami pole project was developed. This project aims to increase tsunami preparedness by painting visual indicators of hazard and safe zones on utility poles and using communication tools to increase risk awareness.

This report provides details on Haida Gwaii's tsunami risk and the recommended safe planning levels as well as the research and development phase of the project and recommendations for project implementation. The recommended safe planning level for the north coast is 6 meters above sea level, however the LiDAR data acquired measures the topography from mean sea level and therefore the planning level of 10 meters was chosen to account for high tides. Maps were created for each community that outline the hazard and safe zones using the 10 meter elevation line and highlight the specific poles that will be painted.

There are several technical specifications determined in this report including stencil design, paint choice, and application methods. Through consultation with BC Hydro technical specialists, it was determined that the most optimal paint choice is an elastomeric paint. White elastomeric paint will be applied as a background on the pole and blue paint will be used with the stencil. The paint will be applied with a paint sprayer and the stencil will be strapped to the pole using ratchet straps. The stencil will be made out of aluminum and have a foam backing. Glass beads will be added to ensure reflectivity at night.

The communication strategy includes an infographic to promote the project, press release templates for each community to use during implementation, and a quick facts infographic on Haida Gwaii's tsunami risk that was developed in partnership with Ocean Networks Canada. The roll out of the project is planned to coincide with the "High Ground Hike" during Tsunami Preparedness Week in April.

This project was community driven and involved a steering committee that consisted of Haida and municipal Chief Administrative Officers or their

delegates, Emergency Management BC, BC Hydro, and TELUS. The Steering Committee met twice and provided input during the research and development phase. This report provides an implementation manual and budgets for each community. It is up to each individual community to utilize the information in this report and implement the project. The tsunami pole project hopes to build a more resilient and prepared Haida Gwaii in the event of a tsunami.

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BACKGROUND

"…Creating a good visual mark for safe relocation to high ground may help to save lives in the event the area faces a tsunami." - Naomi Yamamoto, Minister of State for Emergency Preparedness

Haida Gwaii, formally known to some as the Queen Charlotte Islands, is an archipelago of over 150 islands located off of the north coast of British Columbia. Haida Gwaii boasts natural landscapes with lush forests, ocean beaches, and matchless scenery giving it the nick name "the Galapagos of the north." It is known for its unique ecosystems with species found nowhere else including distinctive sub-species of the saw-whet owl, the marten, and the largest black bear in the world (Parks Canada, 2012). Haida Gwaii (translated to Islands of the People) is rich in culture, art, and history and is a place unlike any other.

In 2012, a 7.8 magnitude earthquake occurred along the Queen Charlotte fault zone that ruptured Haida Gwaii and generated a tsunami with run-ups measured up to 13 meters in some areas (Fine, Cherniawsky, Thomson, Rabinovich, & Krassovski, 2015). This was Canada's second strongest instrumentally recorded earthquake, the first largest also being in Haida Gwaii in 1949 with a magnitude of 8.1 (Fine et al., 2015).

Researchers have predicted that Haida Gwaii will experience much more seismic activity because of its location along the Queen Charlotte fault zone and Cascadia subduction zone and future strike-slip earthquakes similar to the 1949 event have a higher than average probability to occur in this area (Fine et al., 2015). Moreover, the underthrusting that is occurring beneath Haida Gwaii creates the potential for future large thrust earthquakes and along with them, tsunamis (Hyndman, 2015). With this impending tsunami risk, it is imperative that both residents and visitors alike are prepared and know where the hazard zones and safe zones are in the event of a tsunami.

Most residents and visitors know to go to high ground, but many are unsure how high they need to go and whether or not their work, school, or residence is in a safe zone. "Preparation is key to survival in the event of an earthquake or tsunami" (Government of British Columbia, 2015, p.1); with this in mind, the tsunami pole project was developed.

INTRODUCTION

The Tsunami Pole Project aims to reduce the risk of injury and/or fatality in the event of a tsunami by utilizing existing infrastructure to paint visual indicators of inundation zones and safe zones in communities across Haida Gwaii. These visual indicators will be painted on utility poles that will instruct visitors and residents on where the hazard zones are and where it is safe to go in the event of a tsunami.

"Earthquakes can pose a serious tsunami threat here on Haida Gwaii. This project is a great example of our communities working together to provide a clear indication of where the safe zones are." - Greg Martin, Mayor, Village of Queen Charlotte

The Tsunami Pole project is the first of its kind. It is an innovative and collaborative project with involvement from the Province of British Columbia, BC Hydro, TELUS, local First Nations and municipal governments including the Village of Queen Charlotte, Skidegate Band Council, the Village of Port Clements, the Village of Masset, Old Massett Village Council, and areas E and D of the North Coast Regional District. Indonesia has a comparable tsunami awareness project that uses poles to bring awareness to tsunami risk; yet in Indonesia, the poles are meant to be memorial poles whereas Haida Gwaii's poles will indicate safe and hazard zones. Indonesia experienced a devastating tsunami in 2004 and in order to keep the tsunami risk fresh in the minds of residents, newly erected memorial poles that have indicators of the tsunami run-up levels in the area have been set up in communities across the city of Banda Aceh (Sugimoto, Iemura, & Shaw, 2010). Haida Gwaii's Tsunami Pole Project utilizes existing infrastructure to maximize resources and prevent sign theft, which is common in the area and will paint markers indicating potential tsunami inundation and safe zones on utility poles in each community.

This report provides an overview of the project including a tsunami hazard analysis and impact analysis for Haida Gwaii, processes involved in the research and development phase of the project, and recommendations for implementation. Furthermore, GIS mapping was completed to map the hazard and safe zones in each community and outline which poles to paint, as well as budgets for communities to implement the project. Moreover, a communications strategy and marketing tools were developed to raise awareness and an implementation manual was developed for communities to follow.

Section 1: Setting the Stage

Tsunami Hazard Analysis

The province of British Columbia is considered a high-risk area for earthquakes and more than 1200 earthquakes are recorded each year across the province, most of which are too small to feel (Government of British Columbia, 2015). However, the province has predicted that more large earthquakes capable of mass destruction are foreseeable in British Columbia's future (Government of British Columbia, 2015). Earthquakes can be followed by tsunamis depending on the location, epicenter, and type of the earthquake.

The islands of Haida Gwaii are situated along the Queen Charlotte fault zone between the Pacific and North American Plates. The Pacific and North American plates slide along each other on the Queen Charlotte fault zone and in some areas they press against each other causing pressure to build up (Hyndman, 2015). An earthquake is caused when the pressure is released. Haida Gwaii can be impacted by more than one tsunami-generating earthquake. It is part of its own tectonictsunami-generating regime called the Explorer segment and will also be impacted by the Cascadia earthquake (T. Lado Insua & M. Scherwath, personal communication, January 26, 2017).

Hazard Impact Analysis

It has been recommended by Emergency Management BC for north coast communities including Haida Gwaii to plan for the potential tsunami wave weight of 2 metres with a run-up of 4 metres and a safety zone level at 6 metres (Emergency Management BC [EMBC], n.d.). These measurements are based on current science and scientific estimates of wave heights; yet because these levels are estimates, further research is needed to build accuracy (EMBC, n.d.). In order to gain accurate data on potential tsunami inundation levels, detailed tsunami inundation modeling is required.

The safe zone mark of 6 metres recommended by EMBC includes a fifty percent buffer to allow for non-tidal sea level rise and uncertainties in scientific estimates (EMBC, n.d.). Yet it is difficult to predict the exact potential tsunami run-up levels without tsunami inundation modeling. This may be of particular concern for coastal communities located in inlets. When a tsunami wave approaches an inlet, a resonance effect can occur, which happens when the size

of the wave and the size of the basin have a certain proportion to each other and can cause the wave to bounce off the basins and increase in size (T. Lado Insua, personal communication, December 12, 2016). The wave gets funneled in the inlet and water will pile up, getting trapped before it can escape the next incoming wave. This has occurred in Port Alberni, where the tsunami wave increased in size as it funnelled through the inlet (T. Lado Insua, personal communication, December 12, 2016).

In order for tsunami modeling to be completed, detailed topography and bathymetry of the area will be needed, along with earthquake modeling for Cascadia and the Explorer Segment. Ocean Networks Canada has several possible earthquake scenarios depending on the way the fault breaks. Using the earthquake scenarios, the bathymetry, and topography, a wave model can be run (T. Lado Insua, personal communication, December 12, 2016).

Section 2: Research and Development

Haida Gwaii Preparedness Survey

A survey has been developed in order to hear from residents in each community regarding their tsunami preparedness. The survey can capture Haida Gwaii's tsunami risk perception and preparedness levels in order to improve emergency preparedness programs, gain community input, and measure the before and after picture of how the tsunami pole project may have impacted preparedness levels. The idea is that this survey can be conducted before the tsunami preparedness project is implemented and again after it has been implemented for approximately a year. The survey could also be completed only once after the project is implemented rather than before and after. Each community will launch the survey respectively and will determine when it will be launched. A copy of the survey can be found in Appendix C and a link to complete the online survey can be found here: https://www.surveymonkey.com/r/PV6XLST
A Privacy Impact Assessment for the survey has been completed.

Technical Specifications

Several technical specifications need to be considered when implementing this project including sign specifications such as graphic design and stencil dimensions, height to place the signs on the poles, amount of poles to be painted in each community, paint type, and application methods. Several different testing methods were completed and documented and final technical specifications and application methods were determined.

Signs

It is imperative that the signs do not create any safety hazards and do not obstruct the utility poles to ensure the pole can be climbed by BC Hydro and TELUS workers. According to Work Safe BC (2012), section 19.4 of the *Occupational Health and Safety (OHS) Regulation* states:

> (1) Mailboxes, signs, clotheslines, or other obstructions are prohibited on or close to poles on which workers are required to work.
>
> (2) Tags authorized by the owner which are placed on a pole for identification purposes must be less than 1.7 m (5.5 ft) above grade, on the side of the pole which a climbing worker will face.

Purpose of guideline

The purpose of this guideline is to clarify the application of section 19.4 of the *Regulation* to utility poles.

Interpretation

This section of the *Regulation* is intended to keep wooden utility poles clear of obstructions to ensure a safe climbing area for workers. It does not apply to poles which are not climbed by workers. The owner of a pole may also have restrictions and requirements and should be contacted before placing any object on or close to a pole.

Painting the poles using a stencil is the best way to get around this issue. The paint will not obstruct the poles and will leave it clear for workers to climb them if ever needed.

Graphic Design

In order to paint the utility poles, stencils were created that can be strapped on to the poles using ratchet straps for painting. The graphic designs for the stencils were created by Kim Hayhurst of Northern Development Initiative Trust and were based on the province of British Columbia's standard tsunami hazard symbol as seen to the left (Government of British Columbia, 2015). The stencils are made out of 0.040 thick aluminum with a foam backing. Aluminum is used as it is firm enough to hold the intricate design and handle being painted over. The aluminum will be curved to hug the pole and the foam backing will ensure a snug fit to the pole and collect any dripping paint. Five different stencils with specific messaging were created. See Appendix A for graphic images of the stencils.

Stencil Dimensions

BC Hydro poles vary in size dimensions according to the class and type of the pole. All Hydro poles are largest at the base and gradually get smaller towards the top. The optimal placement of the sign as detailed later on, is approximately 6 feet above the butt of the pole.

There are two different pole types that BC Hydro uses for poles: western cedar and lodge pole pine. Each pole type has six different class types and they vary in size according to class. As depicted in Table 1 and 2 below, the total average circumference of all class types for western cedar Hydro poles at 6 feet above the butt is 42 inches. The total average circumference for the lodge pole pine at 6 feet above the butt is 39 inches. Considering class 2 and 3 of both pole types

are the largest and most commonly used, and the dimensions are based on the minimum circumference, it has been determined to base the stencil dimensions on an average circumference of 46 inches. This was calculated by determining the average of both pole types in class 2 and 3, which is 45.25 inches and then rounded up to the nearest whole value.

With the average circumference of the hydro poles being 46 inches at around the 6 foot mark, the average diameter of the poles is 14.64 inches. To optimize visibility, the signs should be approximately 13 inches in width and 30 inches in height.

"BC Hydro supports efforts to help the residents of coastal communities be better prepared for the possibility of a seismic event. This initiative will provide guidance and clarity during tsunami events when a quick response is essential for the safety of those involved." – Hugo Shaw, Senior Vice President, BC Hydro

Table 1

Western Red Cedar Poles (Fibre Stress 5600 psi)						
Demensions at Top and 6 ft from Butt						
Class	1	2	3	3	5	6
Min. Top Circumference (in)	27	25	23	21	19	17
Length (ft)	**Min. Circumference 6 ft. from Butt (in.)**					
30	40	37.5	35	32.5	30	28
35	42.5	40	37.5	34.5	32	30
40	45	42.5	39.5	36.5	34	31.5
45	47.5	44.5	41.5	38.5	36	33
50	49.5	46.5	43.5	40	37.5	
55	51.5	48.5	45	42		
60	53.5	50	46.5	43.5		
65	55	51.5	48	45		
70	56.5	53	49.5	46		
75	58	54.5	51			
80	59.5	56	52			
85	61	57	53.5			
90	62.5	58.5	54.5			
Average Circumference:	**52.46154**	**49.23077**	**45.92308**	**39.83333**	**33.9**	**30.625**

Table 1. The information in this table was provided by BC Hydro. The table details the dimensions for the Hydro poles that are made with western red cedar by class type. The total

average circumference of all pole types is 42 inches. Class 2 and 3 are most commonly used in Haida Gwaii for an average circumference of 47.5 inches.

Table 2

Lodge Pole Pine (Fibre Stress 6600 psi)						
Demensions at Top and 6 ft from Butt						
Class	1	2	3	3	5	6
Min. Top Circumference (in)	27	25	23	21	19	17
Length (ft)	**Min. Circumference 6 ft. from Butt (in.)**					
30	39	36.5	34	31.5	29	27
35	41.5	38.5	36	33.5	31	28.5
40	44	41	38	35.5	33	30.5
45	46	43	40	37	34.5	32
50	48	45	42	39	36	
55	49.5	46.5	43.5	40.5		
60	51.5	48	45	42		
65	53	49.5	46	43		
70	54.5	51	47.5	44.5		
Average Circumference	**47.44444**	**44.33333**	**41.33333**	**38.5**	**32.7**	**29.5**

Table 2. The information in this table was provided by BC Hydro. The table details the dimensions for the Hydro poles that are made with lodge pole pine by class type. The total average circumference of the poles in Table 2 is 39 inches. Class 2 and 3 are most commonly used in Haida Gwaii for an average circumference of 43 inches.

Paint and Application

Paint Type

Hydro poles are treated with two types of preservatives depending on the pole. Poles that are a slight green in colour are most likely treated with CCA, which is water-based preservative that gives a hard finish. The poles that are more of a honey brown in colour are most likely treated with pentachlorophenol, which is an oil-based preservative.

It is important for the safety of workers who have to climb the hydro poles to have a surface to climb that is not slippery or hard in order for their boots to grip the pole. There is one type of paint that will adhere to the treated wood

poles and not create a slippery surface for workers. The recommended paint to use is an elastomeric paint. After researching elastomeric paint types, it was determined that there are two types of elastomeric pain that works well on wood surfaces and can be tinted in both blue and white: Deck and Dock Coating by SuperDeck® and Elasto-wall, General Paint. "The Superdeck® Deck and Dock elastomeric coatings work best on wood, concrete and composite decking that has been severely damaged. It resurfaces and waterproofs in one product. Its flexible formula is designed to with stand temperature changes so that it expands and contracts with the substrate while not compromising on protection" (Sherwin-Williams, 2017).

The paint needs to be reflective and unfortunately there is currently not a reflective elastomeric paint on the market in Canada. Therefore, in order for the signs to be reflective, glass beads can be used on top of the paint to create a reflective surface. The glass beads create a rough surface to the poles and should be easy for workers' boots to grip.

Height of Signs

The signs need to be painted above six feet because BC Hydro tests the poles below the six feet mark. Moreover, there are pole identification tags around the six foot eleven inch mark on every hydro pole and these cannot be covered. The maximum height of the signs cannot exceed ten feet below the neutral wire or five feet below the TELUS wire, which is the lowest wire on the pole due to safety concerns for those painting. Workers painting the poles need to be clear of the wires by a minimum of five feet.

The optimal height of the signs will be similar to that of a traffic sign in order for signs to be viewable by the headlights of vehicles driving by. Signs need to be in the driver's field of vision in order to be effective and grab attention (Ministry of Transportation and Highways, 2000). The Ministry of Transportation and Highways (2000) asserted that the bottom of a sign should be placed 1.5 meters above the edge of the road. This can be increased to a maximum of 2 meters above the road edge for special circumstances. Considering BC Hydro requires the signs to be painted above the 6 feet mark on the pole, signs should be placed at around 2 meters (6.5 feet) above road level. The Hydro poles where the butt of the pole is below road level may be painted closer to the 1.5 meter line as long as this is above 6 feet on the pole.

Amount of Painted Poles

Hydro poles that are located on street corners of intersections will be painted with directional arrows pointing to the safe zones. Depending on the length of

the street, one or two poles will be painted mid-street indicating you are in a hazard zone and to continue to the safe zone.

According to the Ministry of Transportation and Highways (2000), improper or excessive use of signs can lead to desecration of signs, detract from their effectiveness, and/or lead to non-compliance of signs. Therefore, sign placement needs to be strategic and not overdone. It is also imperative that the signs do not distract from other important traffic signs and are not placed next to other road warning or regulatory signs. Signs should also not be placed in such a way that parked vehicles will block sign visibility (Ministry of Transportation and Highways, 2000).

Testing Methods

BC Hydro donated some poles that could be used for testing. The poles used for testing were six feet and 8 feet in height and were old hydro poles that were taken down and replaced. TELUS also donated some poles that were still in the ground in the Village of Queen Charlotte that were ready to be removed and replaced.

Figure 1

Figure 1. This is stencil design #2. Graphic was created by Kim Hayhurst and used in Test #1.

Test #1

Materials: 2” paint brush, dry pentachlorophenol treated Hydro pole, white and blue elastomeric paint, glass beads, NAPA Ultra Pro Gravity Feed Sandblaster, stencil #2 as seen to the left in Figure 1 made with polystyrene (stencil dimensions: 16.5” by 45”) .

The first test was completed to inquire whether or not the glass beads will stick to the paint and what the best application method is. A 2 inch paint brush was used to apply the paint. The brush did not get into the wood grain properly and also slipped under the stencil at some points creating a messy look. The paint also bled outside of the stencil because in needed a heavy application to get into the wood grain and the stencil did not sit flat against the pole (see Figure 2). It was determined that a paint sprayer will be needed to get an accurate consistency of paint applied into the wood grain and provide a cleaner look.

Considering the stencil did not fit flat to the pole, it was concluded that the stencil needs to be made in a firmer material that will keep its shape when bent around the pole. Moreover, it was determined that the stencil was too large and needs to be scaled down and other minor adjustments made. The symbol in the stencil overwhelmed the sign and therefore a stencil with a smaller symbol will be made so that the words are the focal point. Also, the letters were a bit too fat, particularly on the tsunami word; they tended to blob

Figure 2

together a bit on the "S" once the paint was applied. The stencil needs to have thinner letters to provide cleaner lines.

The glass beads were first applied by blowing them on, which did not allow for enough coverage. The beads were then applied using a sandblaster, which at first blew off the paint from the high pressure and the beads would bounce off the poles rather than sticking to the paint. After lowering the PSI levels in the compressor and only lightly pressing the trigger on the sandblaster gun, the beads came out softly and were distributed well. It is important to note that the paint dries quickly and so the beads need to be applied immediately after the paint so they adhere. The sandblaster also speeds up the drying time so this needs to be done as quickly as possible.

Figure 2. This is a picture of the result of test #1.

Test #2

Materials: CCA treated Hydro pole that was sprayed with water 24 hours before paint application, white and blue elastomeric paint, glass beads, NAPA Ultra Pro Gravity Feed Sandblaster, 2" paint brush.

Figure 3

Figure 3. This is a picture of the pole painted with both white and blue paint and coated in beads. The picture was taken without a flash in order to compare the difference with a flash as seen in Figure 4.

Figure 4

Figure 4. This is the same pole in Figure 3 above except the picture was taken with the flash on in order for the beads to reflect off the flash for the picture. The reflectivity of the beads is shown well in this picture. This picture also highlights that the beads can appear a bit splotchy if not evenly distributed before the paint dries. It is important to apply the beads generously and as quickly and evenly as possible.

Figure 5

Figure 5. After applying one coat of paint and one coat of glass beads, a second coat of paint along with a second layer of glass beads was applied with a 24 hour dry time in between coats. Figure 5 is a picture taken with the flash after the second coat.

Test #3

Materials: slightly damp pentachlorophenol treated Hydro pole that was sprayed with water 24 hours before paint application and lightly misted immediately before application, white and blue elastomeric paint, glass beads, NAPA Ultra Pro Gravity Feed Sandblaster, 2" paint brush.

This test was completed to test the paint on a damp pole and see how it stands up to harsh weather conditions. The pole was placed outside and over 2 months' time it has endured hail, rain, snow, sun, and strong winds. The paint and glass beads seem to have endured the weather quite well and are still in the same condition as they were when first applied.

Figure 6

Figure 6. This is a picture of the honey brown Hydro pole painted with the blue paint and coated in glass beads. As depicted in the picture, as the paint got thinner near the end, the glass beads did not adhere as well. The reflectivity of the beads can only be seen near the bottom before the paint thins out.

Test #4

Figure 7

Materials: slightly damp pentachlorophenol treated Hydro pole that was cut off from the top of a pole and brought down for testing, white and blue elastomeric paint, glass beads, NAPA Ultra Pro Gravity Feed Sandblaster, paint sprayer, stencil #1 in aluminum with ¼ inch rubber foam backing, plastic drop sheet, and Velcro straps.

Figure 7. Figure 7 is the result of test 4. The letters in the stencil turned out a bit blurry due to the small circumference of the pole. The stencil still did not quite sit flat to the pole.

Test #5: Final Test

Materials: slightly damp pentachlorophenol treated Hydro pole that was still in the ground outside in the community, white and blue elastomeric paint, glass beads, NAPA Ultra Pro Gravity Feed Sandblaster, paint sprayer, stencil #1 in aluminum with ¼ inch rubber foam backing, plastic drop sheet, and ratchet straps.

Figure 8

Figure 8. This is a picture of the final test. The white background with the blue graphic seems to work best. The graphic is clear and the letters are clear and clean with a tiny bit of overspray. The pole used for this test is quite a bit smaller than the majority of the poles on Haida Gwaii. A pole that is a bit bigger will be optimal for use with the stencil. It was determined that the final stencil will be made with a ½ inch foam backing to add a little extra cushion for molding to the pole.

Final Recommended Application Methods

After several tests were conducted, optimal application methods were determined. Please see the Implementation Manual in Appendix B for more details on application.

Stencils

The stencil can be strapped on to the pole using a ratchet strap on the top and bottom of the stencil. Use the ratchet to pull the stencil as tight as possible around the pole. Once the stencil is in place, use a hammer and nails and hammer a nail through the nail holes on either side of the stencil so that the top of the hole rests on the nail. When you are finished painting, remove the stencil but leave the nails in place; this will help in re-anchoring the stencil in the same place for applying the second coat. It is important to note that the nails cannot be left in the poles for long due to safety concerns and must be removed immediately after painting the second coat.

Paint

Paint should be applied with a paint sprayer. The paint needs to be applied thick and it is recommended that 2 coats are applied for longer wear.

Glass Beads

The glass beads can be applied using a sandblaster immediately after the second coat of paint is applied. The sandblaster used in the research phase was a NAPA Ultra Pro Gravity Feed Sandblaster. The PSI on the compressor needs to be reduced to approximately 70 PSI in order to get a light pressure from the gun. The trigger cannot be pressed all the way and needs to be pressed lightly for the beads to come out softly. If pressure is too high, the beads will shoot out, bounce off the poles, and even remove the paint.

SECTION 3: IMPLEMENTATION

COMMUNITY MAPPING AND BUDGETS

MAPPING

Using ArcGIS software, each community's tsunami hazard zones and safe zones where mapped out. In order to determine the zones, LiDAR data was used, which is a survey method that measures topography using laser light. LiDAR provides the most accurate digital elevation model possible. Using LiDAR data to map out which utility poles will be painted, ensures accuracy and efficiency. The LiDAR data used measures the topography from mean sea level.

Figure 9

Figure 9. Map of all the BC Hydro poles on Haida Gwaii. The purple dots are utility poles.

The LiDAR data for Old Massett, Masset, and Tow Hill was provided by Owen Jones from the Council of the Haida Nation and was originally obtained by Ian Walker from the University of Victoria. The LiDAR data for Queen Charlotte, Skidegate, Tlell, and Sandspit was provided by Ken MacPhail from Silvacare Inc. LiDAR for the Port Clements forestry area was provided by Silvacare; however, there is no data available for the populated community areas. Port Clements may be flown for LiDAR later this year. The LiDAR data acquired measures the topography from mean sea level. The recommended safe planning level for the north coast is 6 meters above sea level; therefore in order to account for high tides, a planning level of 10 meters was chosen. Maps were created for each community that outlines the hazard and safe zones using the 10 meter elevation line and highlights which poles to paint the signs on. The pole maps created are to be used as a guide and community leaders can determine if they would like all the recommended poles painted or to reduce the amount of poles suggested. It is not

recommended to paint more poles than the pole map suggests because according to the Ministry of Transportation and Highways (2000) too many signs may lead to non-compliance.

While mapping the pole locations for Old Massett, a safe zone area spanning just over a block was found on Eagle Avenue. This area is over the 10 meter elevation line and some parts of this block are between 11 and 12 meters above mean sea level. The tsunami pole map created for Old Massett indicates to paint safe zone signs on the poles in this area, however it is left to the community to decide whether or not they would like their residents evacuating to this area or would prefer to keep them evacuating out of town.

The community maps that were created are not included in this report due to size of the maps and have been provided to each individual community directly along with an excel spreadsheet that details the pole identification number (BC Hydro's identification number that is on a yellow tag on the pole), location of the pole, and stencil number to cross reference with the map.

Figure 10

Figure 10. This image is an aerial view of the section of Old Massett that has a strip of land above the 10 meter elevation line. The small blue squares are the poles that could be painted with the safe zone stencil. The green, orange, and red squares are poles that can be painted with the hazard stencils.

BUDGETS

Budgets have been created for each unique community based on the estimated costs it may take to implement the project. The budget estimates provided are based on the amount of poles recommended to paint as outlined in the pole maps. Each community has a different number of poles that can be painted. The costs of labour in the budgets are calculated by adding the approximate cost per hour to paint the amount of poles in the pole map. This includes the first coat of paint for the background around the pole, which is calculated at 2 hours per pole. The first coat will take longer than the second because the area to be painted will need to be tapped off and the pole will need measuring for accurate placement of the paint, as well as measuring the distance above the edge of road; this process will need 2 workers. The second coat including the 2 coats using the stencil will be twice as fast. Table 3 provides an example of how the hours of labour were calculated. It is also important to note that the items listed in the budgets are estimates and prices may vary when purchasing. The budgets for each community can be found in Appendix F.

Table 3: Hours of labour

First coat of paint for background around the pole	
Number of Poles	44
Poles per hour	2
Hours of labour	22 or 3 days at 7 hrs/day
Second coat of paint for background	
Poles	44
Poles per hour	4
Hours of labour	11 or 1.5 days at 7 hrs/day
First and second coat using stencils	
Poles	44
Poles per hour	4 (x2 for 2 coats)
Hours of labour	22 or 3 days at 7 hrs/day
Total Hours of labour	55

Table 3. This chart was used to calculate the estimated hours it may take to have the poles painted. This chart was used to calculate the hours of labour for all communities.

Communications Strategy

With the support of Emergency Management BC's Government Communications and Public Engagement department, initial communications were generated by means of a press release and news reports. These reports include a press release from the Government of British Columbia, which can be found here: https://news.gov.bc.ca/releases/2016TRAN0382-002570; an article in the Haida Gwaii Observer, which can be found here: http://www.haidagwaiiobserver.com/news/407095466.html?mobile=true; and a radio interview and written article with CBC radio, which can be found here: http://www.cbc.ca/news/canada/british-columbia/tsunami-warnings-utility-poles-1.3886280

Further to the above media coverage, two infographics have been created to bring awareness to the project before and during implementation and to increase tsunami risk perception. Moreover, press release templates have been drafted for each community to use when they are ready to implement the project in their community. The strategy for these communication tools are outlined below.

Pole Project Infographic

This infographic has been created in partnership with Emergency Management BC's design unit.

Audience

The general public: primarily residents and visitors of Haida Gwaii.

Objectives

For residents and visitors of Haida Gwaii to understand the tsunami risks that are present, become knowledgeable on the tsunami pole project, and be prepared on what to do in the event of a tsunami.

Key Messages

1. How Haida Gwaii is getting prepared: tsunami pole project
2. What to do in the event of a tsunami: Follow utility poles to high ground
3. Promote Tsunami Preparedness Week (second week in April). Possibly promote the High Ground Hike.

Communication Channels

1. Haida Gwaii Facebook pages and groups, municipal websites, community halls/ events (printed copies), the Observer newspaper, Haida Gwaii Trader, CBC Radio.
2. Businesses to have printed copies available: Ferry terminals, airports, hospitals, RCMP stations, BC Ambulance Services, fire departments, hotel and B&B operators.

Infographic Layout

- The infographic will have an image that describes what to do in an earthquake and tsunami and will highlight the tsunami pole project with a graphic showing a stick person or persons hiking to high ground, following the signs on utility poles to safety. EMBC's Graphic Design Unit will assist with the design elements of the infographic.
- It will also have a short blurb on the project that will state: "Haida Gwaii in partnership with BC Hydro and Telus is increasing tsunami preparedness with signs on utility poles to direct people to safety."
- This page could also potentially have other brief points such as: Tsunami waves may arrive within minutes, do not wait for official warnings; take only a 72 hour emergency kit, do not take time to pack. Yet we do not want too many words to detract readers attention from the main points.
- At the very bottom of the document there will be logos of all involved stakeholders as a small border.

Quick Facts Infographic

Audience

The general public: primarily residents and visitors of Haida Gwaii and those doing the High Ground Hike in April.

Objectives

For residents and visitors of Haida Gwaii to understand the tsunami risks that are present, and be prepared on what to do in the event of a tsunami. This infographic will include quick facts about tsunami risk on Haida Gwaii including some stats from past earthquakes and some myths about inlets being protected from tsunamis.

Key Messages

1. Haida Gwaii is at risk of tsunami.

2. Promote tsunami preparedness.
3. Promote Tsunami Preparedness Week (second week in April). Possibly promote the High Ground Hike.

Communication Channels

1. Haida Gwaii Facebook pages and groups, municipal websites, community halls/ events (printed copies). Disseminate this infographic during Tsunami Preparedness Week in the second week of April.
2. Hand out to people during the High Ground Hike.

Content: Quick Facts

The quick facts listed below were created in partnership with Ocean Networks Canada.

- Canada's 1st and 2nd largest instrumentally recorded earthquakes occurred on Haida Gwaii (Fine, Cherniawsky, Thomson, Rabinovich, & Krassovski, 2015).
- The 2012 magnitude 7.7 earthquake was Canada's 2nd largest instrumentally recorded earthquake followed by a tsunami on the west coast of the islands with run-ups measured up to 13 meters high (Fine et al., 2015; Hyndman, 2015).
- Current scientific research involves estimating future earthquake and tsunami impacts from several various possible event scenarios (T. Lado Insua, personal communication, December 12, 2016).
- Oral First Nations stories and written records from Japan confirm that the last rupture of the Cascadia fault happened in January 1700, with an estimated earthquake magnitude of 9 followed by a large tsunami (Leonard, Rogers, & Mazzotti, 2013).
- These Cascadia earthquakes occur every 300-600 years and can happen any time (Leonard et al., 2013).
- Haida Gwaii will be impacted by the Cascadia earthquake but is also part of its own tectonic tsunami-generating regime (called Explorer segment), as we have seen in 2012.
- The tsunami hazard for potentially damaging run-up (at least 1.5 m) of the outer Pacific coastline of Canada is approximately 40–80% in 50 years (Leonard et al., 2013).
- **Myth:** Inlets are protected from tsunamis and are not at risk
  Reality: Tsunami waves can get bigger in inlets because the waves amplify due to the shape of the inlet. Port Alberni on Vancouver Island is an example of a location where tsunami amplification occurs.

- **Other Messages:** ARE YOU PREPARED? Do you have a 72 hour emergency kit ready to grab and go?

The completed Quick Facts Infographic can be found in Appendix D.

Press Releases

Audience

General public including politicians and government representatives

Objectives

1. For politicians and other governments to be knowledgeable on the tsunami pole project and possibility of implementation in other coastal communities.
2. For other coastal communities to become aware of the project and understand the benefits of implementing it in their own communities.
3. Draw awareness to the general public in Haida Gwaii regarding the project and tsunami risk.

Key Messages

1. Haida Gwaii is at risk of tsunamis
2. Tsunami pole project aims to prepare residents and prevent harm in the event of a tsunami
3. Details on pole project: where and when it will be implemented.

Communication Chanel

1. Direct email to politicians
2. The Province of British Columbia website, CBC radio, Observer, municipal websites, Facebook, other media outlets.

Layout

This will be a press release template for each community/municipality in Haida Gwaii to use to share about the project and when they are planning on implementing it in their communities.

The press release templates can be found in Appendix E.

SECTION 4: RECOMMENDATIONS

1. **Further research: Tsunami inundation modeling for all communities on Haida Gwaii**.

   Considering the safe zones and hazard zones in Haida Gwaii are based on estimates and there are no tsunami inundation models to refer to for accuracy, it is recommended that an expert is hired to create tsunami models for each community.
   In order to complete tsunami inundation models, each community will need all possible earthquake scenarios, along with bathymetry and topography of the area (T. Lado Insua, personal communication, December 12, 2016). Tania Lado Insua, an Ocean Analytics Program Manager with Ocean Networks Canada is running a model for Port Alberni that uses nested grids. A grid for the bathymetry is used that starts out very coarse and is then refined bit by bit at each step until a grid size of 12m is reached (T. Lado Insua, personal communication, December 12, 2016). Ocean Networks Canada is working on providing the Village of Queen Charlotte with a quote on the cost of getting inundation modeling completed. Possible funding streams to have the tsunami inundation modeling completed include: the National Disaster Mitigation Program through the federal government and the Municipalities for Climate Innovation Program (MCIP) through the Federation of Canadian Municipalities.

2. **Implement the project in each community before or close to Tsunami Preparedness Week in April.**

   Tsunami Preparedness Week occurs in the second week of April every year. Having the project implemented before this week may help with promoting the project as it is rolled out and could encourage residents to join in on the "High Ground Hike" during Tsunami Preparedness Week.

3. **Disseminate the pole project infographic immediately after and possibly during implementation.**

   The pole project infographic will describe the project and encourage residents to follow the signs on utility poles to safety. Disseminating this

infographic during and immediately after the poles are painted will assist in public awareness of the project.

4. **Disseminate the Haida Gwaii Preparedness survey before the project is implemented and again after with about a year in between.**

   Disseminating the survey before the project is implemented will provide a more accurate picture of the community's preparedness levels. Moreover, the survey provides an avenue for community members to contribute and provide input on emergency programs; when people are consulted and feel as though they are a part of something, they are more likely to support it and take ownership of it.
   After the project has been implemented for approximately one year, disseminate the survey again to gain an accurate picture of how the project has impacted tsunami preparedness and risk perception.

5. **Disseminate the quick facts infographic during Tsunami Preparedness Week in April and after the Haida Gwaii Preparedness Survey is completed for the first time.**

   The quick facts infographic aims to increase tsunami risk perception in Haida Gwaii. It would be strategic to utilize Tsunami Preparedness Week in April to disseminate this document. It can also be handed out to people doing the High Ground Hike.

6. **Disseminate community specific press releases within a few weeks before the project is implemented in the community.**

   The press releases will inform the community about the project and when it will be implemented. It is important to do this before the project is implemented so the community is well informed and ready for the change before they start seeing the signs being painted in their community.

For safety recommendations, see the implementation manual in Appendix B

SECTION 5: CONCLUSION

The tsunami pole project is an innovative approach to tsunami preparedness in Haida Gwaii. This project aims to reduce the risk of injury and/or fatality in the event of a tsunami and increase tsunami preparedness by painting visual indicators of hazard and safe zones on utility poles.

This report details Haida Gwaii's tsunami risk and the recommended safe planning levels, the research and development of the project including technical specifications, community maps, a communications strategy, recommendations for project implementation, an implementation manual, and community specific budgets. This project was community driven and involved a steering committee that consisted of Haida and municipal Chief Administrative Officer's or their delegates, Emergency Management BC, BC Hydro, and TELUS.

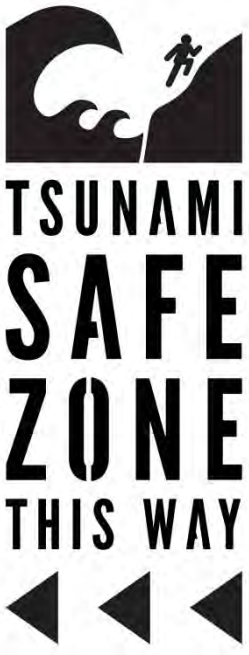
This report provides an overview of the project and it is up to each individual community to utilize the information in this report and implement it. This project hopes to build a more resilient and prepared Haida Gwaii in the event of a tsunami.

APPENDIX A: STENCIL GRAPHICS

Stencil 1.R

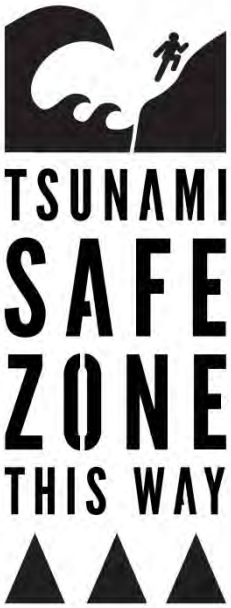
Stencil 1.R. Graphic by Kim Hayhurst, Northern Development Initiative Trust. This graphic will be used on poles located in intersections where the traffic would be turning right to head to the tsunami safe zones. The dimensions of the stencil for this graphic are 12'' by 30''.

Stencil 1.L



Stencil 1.L. Graphic by Kim Hayhurst, Northern Development Initiative Trust. This graphic will be used on poles located in intersections where the traffic would be turning left to head to the tsunami safe zones. The dimensions of the stencil for this graphic are 12'' by 30''.

Stencil 1.F



Stencil 1.F. Graphic by Kim Hayhurst, Northern Development Initiative Trust. This graphic will be used on poles located in between intersections where the traffic would be going straight to head to the tsunami safe zones. The dimensions of the stencil for this graphic are 12'' by 30''.

Stencil 2

Stencil 2. Graphic by Kim Hayhurst, Northern Development Initiative Trust. This graphic will be used on poles in the safe zone to indicate you are now in a safe zone. The dimensions of the stencil for this graphic are 12'' by 30''.

Stencil 3

Stencil 3. Graphic by Kim Hayhurst, Northern Development Initiative TrustThis graphic will be used on poles in locations where there is no street going up. The dimensions of the stencil for this graphic are 12'' by 30''.

Appendix B: Implementation Manual

Supplies and Equipment

You will need:

1. Protective eyewear
2. Painting smock or clothing that can get paint on it
3. Paint sprayer
4. Paint- white and blue elastomeric paint
5. Stencils- 5 different stencils
6. Measuring tape
7. Chalk (one piece)
8. Sandblaster
9. Glass beads
10. Sheets of drop cloth or plastic
11. Compressor
12. Generator
13. Thumb tacks
14. Nails and hammer
15. Extension cord
16. Ratchet straps (at least 2)
17. Tsunami pole map
18. Step ladder and/or ladder fly

Painting the poles

1. Use the tsunami pole map for your community to determine which poles to paint. This map is to be used as a guide only. Some poles may not be possible to paint depending on their placement in the bank or may not be visible due to trees. If a pole has a large red circle painted on it, do not paint this pole; instead find another pole nearby that could be painted. The red circle is an indication that BC Hydro has condemned that pole and will soon be replacing it.

2. Measure the pole for sign placement. The sign should be between 1.5 and 2 meters above road level and approximately 6 feet from the butt of the pole as long as the sign will not cover any of BC Hydro and TELUS's identity tags. To measure the road level by the pole, 2 workers will be needed. One worker will need to hold the measure at 1.5 meters on the side of the road next to the pole and the other to mark it on the pole with chalk.

3. Once the placement of the sign is measured and marked, the pole should be protected from overspray. To do this, sheets of plastic can be tacked to the pole with thumb tacks. One large sheet should go around the butt of the pole to catch any glass beads and overspray; a sheet of plastic about a foot wide can be wrapped around the top of where the sign will go (32 inches from the bottom piece of plastic); two strips of plastic 1 foot wide by 32 inches long can be tacked vertically along either side of where the sign will go (13 inches apart).

4. First, put on protective eye wear. Then using the paint sprayer, paint the base for the sign with the white paint. Wait 24 hours before doing a second coat. Apply a second coat of white paint and immediately after paint is applied, quickly spray on the glass beads using the sandblaster. The compressor connected to the sandblaster needs to be at a low PSI- no more than 70 PSI. It is imperative to only lightly press the trigger on the sandblaster so the beads come out softly. Apply beads generously.

5. Wait another 24 hours and apply the stencil. The stencil can be strapped on to the pole using a ratchet strap on the top and bottom of the stencil. Use the ratchet to pull the stencil as tight as possible around the pole. Once the stencil is in place, use a hammer and nails and hammer a nail through the nail holes on either side of the stencil so that the top of the hole rests on the nail. When you are finished painting, remove the stencil but leave the nails in place; this will help in re-anchoring the stencil in the same place for applying the second coat. It is important to note that the nails cannot be left in the poles for long (maximum of 24 hours) due to safety concerns and must be removed immediately after painting the second coat.

   Once the stencil is in place, use the blue paint in the paint sprayer to paint over the stencil. Wait 24 hours before applying a second coat.

   When you are ready to apply a second coat, place the stencil on the pole using the nails as markers and re-strap it securely with the ratchet straps. Once the stencil is neatly in place over the first coat of paint, apply the second coat. Immediately after applying the second coat, promptly apply the glass beads as in step 4 above.

6. Clean up. Be sure to <u>remove all nails and tacks</u> from the poles. Nails can be a hazard for BC Hydro and TELUS workers. Remove all plastic and leave area

clean. Stencils should be sprayed clean to avoid paint buildup. Clean all tools and equipment according to their manufacturing instructions.

Safety Recommendations for Implementation

1. **Wear protective eyewear as detailed in section 8.14 of the *Occupational Health and Safety (OHS) Regulation*** (Work Safe BC, 2003).
   The application of spray paint and glass beads using a sandblaster may be dangerous if the materials bounce off the poles using high pressure settings.

   Section 8.14 of the *OHS Regulation* states:
   (1) A worker must wear properly fitting safety eyewear appropriate to the conditions of the workplace if handling or exposed to materials which are likely to injure or irritate the eyes (Work Safe BC, 2003).

2. **Test poles using a voltage detector.**
   While it is rare, utility poles may hold a charge if any wires have malfunctioned or become loose due to a storm, strong winds, or other causes. For this reason, workers painting the poles should always test the poles with a voltage detector before touching them. A voltage detector may be provided by TELUS for workers doing the painting.

3. **Use caution when using a step ladder.**
   The stencils need to be placed above 6 feet from the butt of the pole and between 1.5 and 2 meters above the edge of the road. A step ladder may be needed to properly paint the pole and strap on the stencils. The ground surrounding the pole may be uneven and/or on a slope, which could make using a step ladder unsafe. In these cases, consider using a ladder fly that is first strapped to the pole securely before it is mounted.

APPENDIX C: HAIDA GWAII PREPAREDNESS SURVEY

The Haida Gwaii Tsunami Preparedness Survey is being conducted to measure individual and family tsunami preparedness in communities across Haida Gwaii. The information collected in this survey will assist with evaluating emergency preparedness programs and seeking community input on areas we can improve. The information collected will be documented in a report that will be shared with the community including councils. This survey is expected to take 2-3 minutes. Participation in this survey is voluntary. Consent to use the information collected in this survey as per the purposes above is obtained by virtue of survey completion.

This survey is anonymous and the collection of personal information provided on this survey is authorized under section 26 of the *Freedom of Information and Protection of Privacy Act* for the purpose(s) set out above. Should you have any questions about the collection of this personal information please contact Lori Wiedeman at cao@queencharlotte.ca

1. Where are you located?
   - ○ Masset
   - ○ Old Massett
   - ○ Tow Hill
   - ○ Port Clements
   - ○ Tlell
   - ○ Skidegate
   - ○ Queen Charlotte
   - ○ Sandspit
   - ○ Miller Creek
   - ○ Lawn Hill
   - ○ Other (please Specify:

     [ ]

2. What is your age?
   - ○ Under 18
   - ○ 18-29
   - ○ 30-44
   - ○ 45-59
   - ○ 60+

- ○ I prefer not to answer

3. What is your gender?
   - ○ Female
   - ○ Male
   - ○ Other
   - ○ I prefer not to answer

4. Do you feel you/your community is at risk of tsunami?
   - ○ Yes
   - ○ No

5. If a tsunami occurred, is your home located in a hazard zone?

	Yes	No	Unsure
Home	○	○	○
Workplace	○	○	○

6. Do you know where the safe zones are in the event a tsunami occurs?
   - ○ Yes
   - ○ No

7. If you had to evacuate, do you know where you would go?
   - ○ Yes
   - ○ No

8. If you had to evacuate, would you have challenges in doing so?
   - ○ Yes, mobility issues
   - ○ Yes, transportation issues
   - ○ No
   - ○ Yes, other (please specify)

   [ ]

9. Do you have an evacuation plan for your family and does it include a plan for pets/livestock?

	Yes	No	Not Applicable
Family	○	○	○
Pets/livestock	○	○	○

10. Do you feel you/your family is prepared if an earthquake and tsunami occurred?
    - ○ Yes
    - ○ No

11. If you have children or other dependants, do you have a plan to connect if you get evacuated separately? ie. Call someone off island to check in.
    - ○ Yes
    - ○ No
    - ○ Not applicable

12. Do you know if businesses and schools in your community have an emergency plan and what it is?

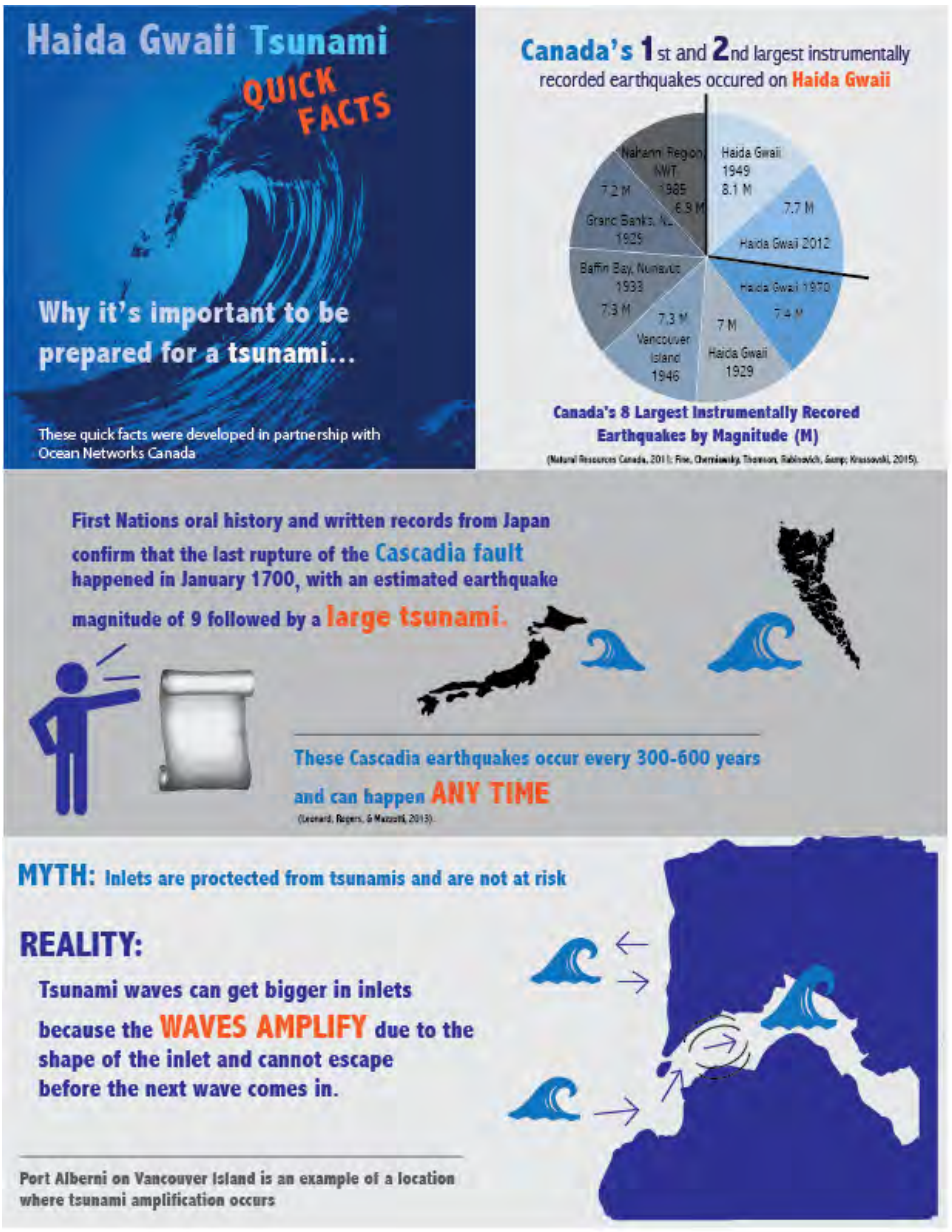
	Yes I am aware of a plan	No, I am not aware	I know there is a plan but do not know what it is
Businesses	○	○	○
Schools	○	○	○

13. Do you keep a 72-hour emergency kit in your home/vehicle?
    - ○ Yes
    - ○ No

14. Would you like to sign up to receive emergency communications?
    - ○ Yes (click on link to sign up)
    - ○ No
    - ○ I do not have email or access to the internet

15. Do you have any ideas/suggestions on how emergency preparedness can be improved in your community?

APPENDIX D: QUICK FACTS INFOGRAPHIC



The 2012 magnitude 7.7 earthquake was followed by a

TSUNAMI

on the west coast of the islands with run-ups that measured up to

13 meters high
(Fine et al., 2015; Hyndman, 2015).

Haida Gwaii

will be impacted by the Cascadia earthquake but is also part of its own tectonictsunami -generating regime (called Explorer segment), as seen in 2012.

The tsunami hazard for potentially damaging run-up (at least 1.5 m) of the outer Pacific coastline of Canada is approximately

40–80%
in 50 years (Leonard et al., 2013).

ARE YOU PREPARED?

Do you know where the tsunami safe zones are in your community?

Do you have a household plan?

Do you have a 72-hour emergency kit ready to grab and go?

For more information on tsunami preparedness and building an emergency kit go to www.gov.bc.ca/preparedbc

References:
Fine, IV., Cherniawsky, J.Y., Thomson, R.E., Rabinovich, A. B., Krassovski, M.V. (2015). Observations and numerical modeling of the 2012 Haida Gwaii Tsunami off the coast of British Columbia. *Pure and Applied Geophysics*, 172 (3), 699-718. doi: 10.1007/s00024-014- 1012-7
Hyndman, R. D. (2015). Tectonics and structure of the Queen Charlotte fault zone, Haida Gwaii, and large thrust earthquakes. *Bulletin of the Seismological Society of America*. 105 (2b). doi: 10.1785/0120140181
Leonard, L., Rogers, G., Mazzotti, S. (2013). Tsunami hazard assessment of Canada. *Natural Hazards*. doi:10.1007/s11069-013- 0809-5
Natural Resources Canada (2011). *Canada's 10 largest earthquakes*. Retrieved from http://www.earthquakescanada.nrcan.gc.ca/prev-ppp/publ/GF-GII/GEOFACT_largest-earthquakes_e.pdf

APPENDIX E: PRESS RELEASE TEMPLATE

This template was adapted from Prepared BC's High Ground Hike News Release Template

(DATE)

[Community Name] Paints Utility Poles to Direct People to Safety

Over the next few weeks, utility poles across [community name] will be painted with signs to direct people to safety in the event of a tsunami. "Clear visual markings that can direct people to safe zones may save lives if our community experiences a tsunami" said [community leader/local official].

This is a collaborative project with involvement from BC Hydro, TELUS, Emergency Management BC, and community leaders and was spurred on by the need for more signage that indicates where it is safe to go in the event of a tsunami. A tsunami caused by a Cascadia Subduction Zone earthquake could hit the B.C. coast in as little as 15 minutes. Haida Gwaii is also part of its own tsunami-generating regime called the Explorer Segment, which is why preparing for a tsunami is so important.

"During an earthquake, the first thing we should do is "drop, cover and hold on," said [community leader/local official]. "Once the shaking stops, everyone should immediately move to high ground and follow the utility poles to safe areas."

"We know that a prepared community is a resilient community," said [community leader/local official]. "Painting visual markings on utility poles are one way we hope to prepare our community and bring awareness to the tsunami risks that are present – While preparedness truly does start at home – we all need our emergency kits and household emergency plans."

Join us on April [day/year] for the launch of the tsunami pole project during the province of British Columbia's annual Tsunami Preparedness Week, highlighting the importance of tsunami awareness and preparedness in coastal communities. We will be hiking to high ground and following the utility poles to safe zones.

Quick Facts:

- Learn about [community]'s emergency preparedness efforts, by visiting [village/community website] and Facebook page and sign up to receive emergency communications.
- [Village/community] tsunami notification process:

Learn more:

- B.C.'s tsunami notification zones: http://ow.ly/nnSM305jkuK
- PreparedBC: www.gov.bc.ca/PreparedBC
- ShakeOutBC: www.ShakeOutBC.ca

For more information, contact:

(Your organization's media spokesperson with contact information)

Appendix F: Community Budgets

Village of Queen Charlotte

Table 4: Budget Estimates for Implementation in Queen Charlotte

Expense Description	Quantity	Unit	Price Per Unit	Total Price	Amount subsidized	Total Cost to Community
Cost of Supplies						
Glass beads	1	5 gallon bucket	$60.00	$60.00	$60.00	$0.00
White Paint	6	per gallon	$53.85	$323.10	$323.10	$0.00
Blue Paint	4	per gallon	$41.95	$167.80	$167.80	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.R	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #2	1		$36.96	$36.96	$36.96	$0.00
Stencil Design #3	1		$36.96	$36.96	$36.96	$0.00
Cost of Equipment						
Paint Sprayer	1		$223.19	$223.19	$223.20	$0.00
Cost of labour						
Public Works employee*	55	per hour	$25.00	$1,375.00	$825.00	$550.00
Cost of Marketing/ Communication Tools						
Article in Observer	1		$100.00	$100.00	$100.00	$0.00
Total Costs				$2,433.89	$1,883.90	**$550.00**

Table 4. This is the estimated budget for implementation for the Village of Queen Charlotte. In mapping which utility poles to paint, it was determined that there are 44 poles that can be painted with the various stencils. This budget is based on the projected costs of painting 44 poles. The cost of labour is calculated by adding the approximate cost per hour to paint 44 poles. The subsidized amount accounts for $15/hour of labour out of the research and development fund donated by BC Hydro and TELUS. The glass beads were donated by O'Brien and Fuerst.

SKIDEGATE

Table 5: Budget Estimates for Implementation in Skidegate

Expense Description	Quantity	Unit	Price Per Unit	Total Price	Amount subsidized	Total Cost to Community
Cost of Supplies						
Glass beads	1	5 gallon bucket	$60.00	$60.00	$60.00	$0.00
White Paint	5	per gallon	$53.85	$269.25	$269.25	$0.00
Blue Paint	3	per gallon	$41.95	$125.85	$125.85	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.R	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #2	1		$36.96	$36.96	$36.96	$0.00
Stencil Design #3	1		$36.96	$36.96	$36.96	$0.00
Ratchet Straps	2		$15.49	$30.98	$0.00	$30.98
Cost of Equipment						
Paint Sprayer	1		$223.19	$223.19	$223.19	$0.00
Compressor (260 psi 12 V)	1		$39.99	$39.99	$0.00	$39.99
Sand Blaster (MAZPRO)	1		$139.99	$139.99	$0.00	$139.99
Cost of labour						
Public Works employee	33.75	hours	$25.00	$843.75	$506.25	$337.50
Total Costs				$1,917.80	$1,369.34	**$548.46**

Table 5. This is the estimated budget for implementation Skidegate. In mapping which utility poles to paint, it was determined that there are 27 poles that can be painted with the various stencils. This budget is based on the projected costs of painting 27 poles. The cost of labour is calculated by adding the approximate cost per hour to paint 27 poles. The subsidized amount accounts for $15/hour of labour out of the research and development fund donated by BC Hydro and TELUS. The glass beads were donated by O'Brien and Fuerst.

VILLAGE OF MASSET/ TOW HILL

Table 6: Budget Estimates for Implementation in Masset/ Tow Hill

Expense Description	Quantity	Unit	Price Per Unit	Total Price	Amount subsidized	Total Cost to Community
Cost of Supplies						
Glass beads	1	3 gallon bag	$48.69	$48.69	$48.69	$0.00
White Paint	5	per gallon	$53.85	$269.25	$269.25	$0.00
Blue Paint	3	per gallon	$41.95	$125.85	$125.85	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.R	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #2	1		$36.96	$36.96	$36.96	$0.00
Ratchet Straps	2		$15.49	$30.98	$0.00	$30.98
Stencil Design #3	1		$36.96	$36.96	$36.96	$0.00
Cost of Equipment						
Compressor (260 psi 12 V)	1		$39.99	$39.99	$39.99	$0.00
Sand Blaster (MAZPRO)	1		$139.99	$139.99	$139.99	$0.00
Cost of labour						
Public Works employee	58.75	per hour	$25.00	$1,468.75	$881.25	$587.50
Total Costs				$2,308.30	$1,689.82	**$618.48**

Table 6. This is the estimated budget for implementation The Village of Masset and Tow Hill. In mapping which utility poles to paint, it was determined that there are 47 poles that can be painted with the various stencils (34 in Masset and 13 in Tow Hill area). This budget is based on the projected costs of painting 47 poles. The cost of labour is calculated by adding the approximate cost per hour to paint 47 poles. The subsidized amount accounts for $15/hour of labour out of the research and development fund donated by BC Hydro and TELUS.

Old Massett

Table 7: Budget Estimates for Implementation in Old Massett

Expense Description	Quantity	Unit	Price Per Unit	Total Price	Amount subsidized	Total Cost to Community
Cost of Supplies						
Glass beads	1	5 gallon bucket	$40.00	$40.00	$40.00	$0.00
White Paint	5	per gallon	$53.85	$269.25	$269.25	$0.00
Blue Paint	3	per gallon	$41.95	$125.85	$125.85	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.R	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #2	1		$36.96	$36.96	$36.96	$0.00
Stencil Design #3	1		$36.96	$36.96	$36.96	$0.00
Ratchet Straps	2		$15.49	$30.98	$0.00	$30.98
Cost of Equipment						
Paint Sprayer	1		$223.19	$223.19	$223.19	$0.00
Compressor (260 psi 12 V)	1		$39.99	$39.99	$0.00	$39.99
Sand Blaster (MAZPRO)	1		$139.99	$139.99	$0.00	$139.99
Cost of labour						
Public Works employee	26.25	per hour	$25.00	$656.25	$393.75	$262.50
Total Costs				$1,710.30	$1,236.84	**$473.46**

Table 7. This is the estimated budget for implementation Old Massett. In mapping which utility poles to paint, it was determined that there are 26 poles that can be painted with the various stencils. This budget is based on the projected costs of painting 26 poles. The cost of labour is calculated by adding the approximate cost per hour to paint 26 poles. The subsidized amount accounts for $15/hour of labour out of the research and development fund donated by BC Hydro and TELUS.

TLELL/SANDSPIT

Table 8: Budget Estimates for Implementation in Tlell/ Sandspit

Expense Description	Quantity	Unit	Price Per Unit	Total Price	Amount subsidized	Total Cost to Community
Cost of Supplies						
Glass beads	1	3 gallon bag	$48.69	$48.69	$48.69	$0.00
White Paint	9	per gallon	$53.85	$484.65	$269.25	$0.00
Blue Paint	6	per gallon	$41.95	$251.70	$125.85	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.R	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #2	1		$36.96	$36.96	$36.96	$0.00
Stencil Design #3	1		$36.96	$36.96	$36.96	$0.00
Ratchet Straps	2		$15.49	$30.98	$0.00	$30.98
Cost of Equipment						
Paint Sprayer	1		$223.19	$223.19	$223.19	$0.00
Compressor (260 psi 12 V)	1		$39.99	$39.99	$0.00	$39.99
Sand Blaster (MAZPRO)	1		$139.99	$139.99	$0.00	$139.99
Cost of labour						
Public Works employee*	35	hours	$25.00	$875.00	$525.00	$350.00
Total Costs				$2,278.99	$1,376.78	**$560.96**

Table 8. This is the estimated budget for implementation in Tlell and Sandspit. In mapping which utility poles to paint, it was determined that there are 15 poles in Tlell and 13 poles in Sandspit for a total of 28 poles that can be painted with the various stencils. This budget is based on the projected costs of painting 28 poles. The cost of labour is calculated by adding the approximate cost per hour to paint 28 poles. The subsidized amount accounts for $15/hour of labour out of the research and development fund donated by BC Hydro and TELUS.

Table 9: Budget Estimates for Implementation in Port Clements

Expense Description	Quantity	Unit	Price Per Unit	Total Price	Amount subsidized	Total Cost to Community
Cost of Supplies						
Glass beads	1	5 gallon bucket	$60.00	$60.00	$60.00	$0.00
White Paint	5	per gallon	$53.85	$269.25	$269.25	$0.00
Blue Paint	3	per gallon	$41.95	$125.85	$125.85	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.R	1		$36.96	$36.96	$36.96	$0.00
Stencil design #1.L	1		$36.96	$36.96	$36.96	$0.00
Stencil design #2	1		$36.96	$36.96	$36.96	$0.00
Stencil Design #3	1		$36.96	$36.96	$36.96	$0.00
Ratchet Straps	2		$15.49	$30.98	$0.00	$30.98
Cost of Equipment						
Compressor (260 psi 12 V)	1		$39.99	$39.99	$39.99	$0.00
Sand Blaster (MAZPRO)	1		$139.99	$139.99	$139.99	$0.00
Cost of labour						
Public Works employee*	21.25	per hour	$25.00	$531.25	$318.75	$212.50
Total Costs				$1,382.11	$1,138.63	**$243.48**

Table 9. This is the estimated budget for implementation Port Clements. In mapping which utility poles to paint, it was determined that there are 27 poles that can be painted with the various stencils. This budget is based on the projected costs of painting 27 poles. The cost of labour is calculated by adding the approximate cost per hour to paint 27 poles. The subsidized amount accounts for $15/hour of labour out of the research and development fund donated by BC Hydro and TELUS.

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