

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program
Student Research Report

Accessibility and Diversity Mapping and Infographics

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Executive Summary

I partnered with SEEDS Sustainability program, which is a resource on campus that advances campus sustainability by creating partnerships between students, operational staff, and faculty on innovative and impactful research projects. The particular project that I worked on was part of the Accessibility and Diversity Mapping and Infographics. The main purpose of these projects is to develop resources for UBC Access and Diversity to enhance campus accessibility.

There are three mobility groups with different needs; those who use electrical wheelchairs, those who use non-motorized wheelchairs, and those who don't use either form of wheelchair but still have some form of mobility or accessibility impairment (for example those on crutches, the elderly, or people with other physical disabilities). The goals of this map were twofold: the first was to assist people from all groups in making decisions about what route they can take and two, to make visible and known the improvements to universal accessibility that have been made around UBC campus.

My specific role in the Accessibility and Diversity Mapping and Infographics was to highlight the increased Universal Accessibility around the new Ponderosa buildings. In the project proposal it was suggested that:

“This should include indoor mapping, public realm, grade, stairs, parking, gender-neutral washrooms (map available on access and diversity website), among other features. Include how students with limited mobility can travel from Totem and Vanier to access Main Mall via Ponderosa. There are multiples audiences for this project – as a wayfinding tool for campus community members who

require accessible routes and as a communication tool to highlight the accessibility features of this site.

It was established that the deliverables for my project would be a mix of static maps and infographics. This would allow the maps to be posted online but also so that users can print out the maps on a standard 8'11" pieces of paper if needed. A key consideration in creating these maps was ensuring they were suitable for those with colour blindness, those on the legally blind spectrum, or those with any other visual impairments. Most good cartographic principles also help those with visual impairments view maps so I just had to take extra care when choosing colours/contrasts, type faces, shapes, spacing, etc.

After the meeting with the various SEEDS Stakeholders, hearing about the context and goals of this project, and establishing what the deliverables would be, I began working on my maps.

I started out with two very simple maps that simply showed the outlines of roads and UBC buildings. I printed these out so that I could write what features to include and things to change once I had my first meeting with the director of Access & Diversity. I oriented the buildings differently; one aligned correctly with the North direction but the other was aligned so that the buildings were parallel and perpendicular to the edges of the page. After consulting with the director and many of my peers, it was established that the latter map (where orientation was adjusted away from the north direction) was more user friendly and intuitive.

The next map I created was one that showed Ponderosa's accessible routes. This involved cleaning up the line work of the first sample maps and representing the size of the roads in

comparison to the buildings and each other by fixing their proportionality. I wanted to represent the best routes for users travelling from Lower Mall or West Mall up to Main Mall. Taking an inevitable incline and breaking it up into smaller paths was a key accessibility feature implemented when constructing the Ponderosa complexes. To represent this, I used dotted lines to really differentiate these paths from the others.

In my next map I added in some of the key accessibility features, such as gender neutral/spacious washrooms, accessible entrances, stairs, benches (for rest/and or sociability), and location of the nearest parkade. I couldn't represent everything in this map as there were some features that were more difficult to represent visually such as the rubbed cement to indicate to someone with visual impairment that they are approaching stairs. Thus I included these features in my infographic.

In my infographic, I included a description of universal accessibility and how this was implemented in Ponderosa. I included concise text descriptions next to pictures taken from Google images to represent the features I couldn't include as easily in the other maps.

In my last edit of the maps, I decided to add colours to the accessibility routes. I used light green to represent the best path to take and a dark red to represent the portion with a very steep slope. I ensured the tones were appropriate so that if the map were printed out in black and white or if people with visual impairments used it, they would still be able to differentiate the good vs. bad paths. By adding this pop of colour, I hoped that it would make a quick visual

impression in the viewers mind and get the message across clear. This colour also adds to the visual hierarchy.

I had three recommendations for future changes to this map. The first would be to create a map for each of these buildings so that more detail and multiple levels can be displayed. The second recommendation is to implement a GIS layer that shows all the paths' slopes, and then categorizes these into either easy/accessible (<5% grade), moderate (10% grade and still to building code), and difficult (>10% grade). Lastly, I recommend increasing signage in the actual Ponderosa buildings, such as having more directions to washrooms, more wayfinding maps, and signage directing users to accessible paths or elevators.

Theoretical Essay

I partnered with SEEDS Sustainability program for my community partner, which is a resource on campus that advances campus sustainability by creating partnerships between students, operational staff, and faculty on innovative and impactful research projects.

The particular project that I worked on was part of the Accessibility and Diversity Mapping and Infographics. The main purpose of these projects is to develop resources for UBC Access and Diversity to enhance campus accessibility. The project context is that there have been many improvements made with respect to accessibility and public space at UBC, but what has been done has not been communicated well to others. There are three mobility groups with different needs; electrical wheelchair users need a smooth path from location a to location b. The grade of the ramp, rest areas, etc. are not necessary for this group. The second group is wheelchair users and grade does matter to this group, as well as distances, rest points, and having shelter. Lastly, the third group does not use wheelchairs but cannot go long distances or climb stairs and this may be due to either chronic illness or physical disability. Thus, the goals of this map were twofold: the first was to assist people from all groups in making decisions about what route they can take and two, to make visible and known the improvements to universal accessibility that have been made around UBC campus. The contribution to sustainability at UBC is that this project will contribute to wellbeing and accessibility on campus by ensuring the campus community and guests have resources to assist in selecting routes.

My specific role in the Accessibility and Diversity Mapping and Infographics was to highlight the increased Universal Accessibility around the new Ponderosa buildings. In the project proposal it was suggested that:

“This should include indoor mapping, public realm, grade, stairs, parking, gender-neutral washrooms (map available on access and diversity website), among other features. Include how students with limited mobility can travel from Totem and Vanier to access Main Mall via Ponderosa. There are multiples audiences for this project – as a wayfinding tool for campus community members who require accessible routes and as a communication tool to highlight the accessibility features of this site. Base Maps, Grade, Stairs, Parking information, Floor Plans (TBD) will be provided. Indoor spaces and elevators will require fieldwork, or may be on floor plans.”

Also included in this specific project proposal was information on action items to take and deliverables. The two students working on the Accessibility mapping project, the program and policy planner of SEEDS, and the respective community partners were all present to determine the objectives, clarify the goals and aims of the project, discuss a timeline, and agree on what deliverables were to be present. It was determined that the deliverables for the Ponderosa Accessibility maps would be a mix of infographics and static maps. About two weeks after the initial meeting I presented my community partner with a few drafts of maps and infographics I had worked on and then incorporated their feedback into the final maps. The last steps in the project were to give a presentation to the GEOB 472 (Research in Cartography) class with various community partners present, submit the final maps and infographics, and submit an executive report.

Before I dive further into my processes and decisions, I'll give a little more context on the term "Universal Accessibility." As per the UBC Vancouver Campus Plan, improvements are being made all around campus to support a pedestrian and bicycle friendly campus and to create more spaces for informal learning and socializing. Universal Accessibility has been a key part of these campus-wide improvements. Despite being a beautiful campus, there remains several inherent challenges to the equal participation by persons of varied and reduced abilities. The UBC Vancouver Campus plan "aims to create a barrier-free environment, as part of creating an exceptional learning environment that is mutually respectful and fosters equity among all people regardless of their physical, sensory or cognitive abilities, backgrounds or experience." To ensure equal participation by people of all abilities in the future, The Campus Plan goes beyond basic compliance with accessibility standards. "It seeks to create a barrier-free campus by encouraging the application of universal design principles in planning and designing new facilities, major renovations and retrofits to facilities and the public realm". The barrier free campus environment plan relies on three interrelated strategies; land use changes, pathway and connectivity improvements, and facility and design retrofits. Since the Ponderosa complex is one of UBC's most recently completed projects and was designed with these universal accessibility features, my role was to map this out for the public to see and learn, but most importantly so that people with disabilities can engage with these maps and use the space with increased freedom.

I first started out with a very simple map; it had a title, a short blurb about Ponderosa's increased accessibility, a map outlining the buildings and roads around

Ponderosa, a legend and an inset map of UBC campus. I had the map in two different orientations. In the first, the map was aligned with true North and the campus inset map. In the second, the orientation was rotated so that the Ponderosa buildings and the roads were aligned with the edges of the map, and this rotation was then highlighted in the campus inset map to give users an idea of where North was. I brought these maps with me to my first meeting with the director of Access & Diversity. We walked around the Ponderosa complex as they pointed out all the various accessibility features that had been implemented. I noted these all down and drew over my maps so I would know where to go back and make changes later. Upon my meeting with the director and asking a number of peers, the overwhelming response was to go ahead with the map where the buildings were parallel and perpendicular to edges of the map rather than use the one in which North was pointing to the top of the page. This decision was based on user-centred design; having the buildings and roads aligned with the page was more intuitive and easy to understand for users. In the other map where the buildings are aligned with north, the user has to tilt their head and has a harder time orienting themselves. This idea of user-centered design aligns with Ben Fry's emphasis on "knowing your audience" and thinking about who and for what purpose people will be viewing your work (2007).

Next I began working on a new map. The purpose of this map was to show the best and most accessible routes for those with mobility impairments travelling from Lower Mall (this can include anyone coming from Totem Park, Place Vanier, & Marine Drive residences, St. Johns college or the West Parkade) up to Main Mall. I also wanted to clean up the line work from the GIS layer I imported to Adobe. I adjusted a lot of the

roads to be wider so that they better proportionally reflected size as compared to buildings and other paths. Having main roads be thicker than small pathways helps with visual hierarchy and helps the user see comparisons, contrasts, and differences (Tufte, 2006). Paths have the smallest width, roads that both pedestrians and cars use are thicker, and roads that are mostly for cars are thickest but also have a darker tone. The title has the largest font, major/roads and features have bigger text than those containing less important information, and the legend title font is bigger than the text describing each item to help the user understand what is most important. I implemented other general cartographic and design principles, such as the inclusion of a legend, data source, appropriate symbology etc. Tufte also stresses the importance of documentation, that is, “publically attributed authorship indicates to readers that someone is taking responsibility for the analysis” (2006). By including the data source and stating on each map and infographic that this is a “student led collaboration with faculty and staff in the SEEDS sustainability program,” the user can have an understanding of the ways in which my maps may be biased and keep these things in mind when interpreting my work.

Another key consideration in this first map and all the ones to follow was colour/tone. Since this is an accessibility map, it would seem almost hypocritical not to take those with visual impairments into consideration. Thus I designed these maps to be easily understood for people with colour blindness and those who fall along the legally blind spectrum (as many people who are legally blind can still see tones and shapes, to varying degrees). Upon doing research, I realized that a lot of principles one should apply to be considerate to those with visual impairments actually lines up well with most

cartographic principles. For example, contrast helps users differentiate between objects, spacing should be consistent, text should be aligned to the left margin, black and white are clearest easiest for showing contrast, and large fonts are helpful (Cairo, 2012). Other tips I gathered for creating the most effective maps for those with visual impairments are to use clear print, sans serif is best, highly stylized type faces are unhelpful, one should avoid italics and underlining as much as possible, and break text up into smaller paragraphs. I also wanted these maps to be easy to print out; considering a lot of printers on campus print in black & white (and this is also the cheaper option), I wanted to ensure colours/tones would still work if printed out in black and white.

In my next map I wanted to highlight all the accessibility features that have been implemented. This included elevators, accessible entrances, accessible and gender-neutral washrooms, benches, stairs, and the parkade. I added lines to the box representing the elevator to differentiate this feature from the other buildings on the map. The dotted path showing recommended routes also helps the user see this pattern and differentiate it from the other paths around it.

Next I decided to create an infographic as there were things I wanted to highlight about the increased accessibility of the Ponderosa complex but there wasn't enough space to represent them on the same maps without overwhelming the user with too many symbols in one place or with too much text. I tried to keep each description as concise as possible which helped in leaving white space on the page. My aim for the illustrations was to be as straightforward and intuitive as possible (in line with Cairo's

originality/familiarity continuum, 2012). I included a smaller and simpler map version of the Ponderosa complex, with each of the Ponderosa buildings presented in a darker (tone) to differentiate them from the surrounding buildings.

In my last map edits, I added some colour to them. I made the recommended/accessible paths a light shade of green and the more than 10% grade slope a dark red (thus ensuring contrasting tones for those with colour blindness). I tested these colours out on black and white printing and there is a discernable difference, so if users print out this map in black and white they will still see the same results. This pop of colour will attract the users eyes to these routes and demonstrates its high importance on the visual hierarchy (Cairo, 2012).

To briefly summarize the process I used and the design choices I made, I will outline some of the main ideas from the cartographic literature. Ben Fry lays out the “data visualization pipeline” which suggests cartographers and graphic designers typically follow the following process: acquire data, parse data (provide structure for the data and order it into categories), filter (remove all but data of interest), mine (apply methods from statistics to discern patterns or place the data in a mathematical context), represent (choose a basic visual model), refine (improve the basic visualization to make it clearer and more visually engaging), and interact. I acquired data from my meetings with the SEEDS director and Access & Diversity partners, I parsed data by figuring out what I would represent on a map and what would be in the infographic, and I filtered the data by deciding what not to include (like plants, heights of buildings, windows, because for the

purpose of this map and the limited space I had to display, these data were less relevant).

Mining was less relevant to my map as I didn't use GIS to compute anything. I chose to represent the data with a mix of static maps and infographics and I then refined the data to make it more visually appealing (i.e. changing contrasts, adding colour, adding stroke (a white layer around lettering) to make it stand out from the buildings it was imposed on, etc.). As Robinson notes, "mapping is basically an attempt at communication between the cartographer and the map percipient. Although there may be fundamental differences between the kinds of "messages" being conveyed by various classes of maps, all maps have as their aim the transfer of images of the geographical milieu" (2013). What I have tried to communicate to those viewing my maps is that Ponderosa has implemented a host of fantastic new universal design features to increase accessibility, specifically for those with mobility impairments. I highlighted good routes to take where slope is minimal, and provided options so that users can travel both on sidewalks and through buildings for days when it's rainy. The goals of this project and my own hope for these maps is that they will inform students, staff, and visitors of the new improvements in the Ponderosa complexes and help those with mobility limitations to move about with increased freedom.

I will end with recommendations & suggestions for future projects or for anyone coming in to edit or update these maps later down the road. I would have loved to implement many of these things myself but due to limited time and resources, these pieces will have to be left for a later date. My first recommendation would be to create a map for each individual Ponderosa building so that even more detail can be shown

visually. For example, the Oak & Cedar house complex was difficult to represent in my maps because I was showing the whole set of Ponderosa buildings and based on the scale I was using, certain things had to be cut out (thus details were compromised). If in the future we could have one map showing the Cedar/Oak house building, it might be possible to represent the two floors, the open study spaces, the accessible washrooms on each floor, and the seating outside classrooms. These details are important and were included in the infographic page I produced but it would be beneficial to have a separate map for each individual building as well.

The second recommendation for future work on this project involves using more GIS. There is layer being produced that shows the exact slopes of roads and pathways at UBC and around the Ponderosa complex specifically. Unfortunately this layer was not produced or given to me in the timeline of this project but it leaves space for anyone wanting to improve upon this project in the future. There was a contour layer for UBC campus but I did not have the technical skills or time needed to produce my own slope layer for the Ponderosa buildings. Through doing field observations around the Ponderosa buildings I know generally what paths could be labelled as easy, moderate, or difficult slope, but for future it would be beneficial to have an official GIS layer showing the actual slope grades around Ponderosa. It would probably be best to simply label these slopes as easy (5% slope – much below building code and accessible to almost all users), moderate (10% slope – meets building code but still may be challenging to some users), and difficult (more than 10% slope – does not meet building code and users with mobility issues will find this difficult or impossible to use). My map shows the best routes to take

from Lower Mall to Main Mall, which was one of the main aims of the project, but by using a GIS layer with the exact slopes in the area, it would further help those with mobility issues see all the roads and paths that are accessible to them.

My third recommendation to further enhance and make the increased accessibility known around Ponderosa would be to increase signage. Signage pointing to where accessible washrooms are and to the fact that you can walk inside, take an elevator up one floor and head out another entrance to avoid the steep slope (like the one outside the Audain Art Centre for example) would help highlight the fantastic features and considerations that have gone into the designs of the Ponderosa Complexes.

Works Cited

- Cairo, A. (2012). *The Functional Art: An introduction to information graphics and visualization*. New Riders.
- Fry, B. (2007). *Visualizing data: Exploring and explaining data with the processing environment*. "O'Reilly Media, Inc.".
- Robinson, A. H., & Petchenik, B. B. (2013). The map as a communication system. *The Cartographic Journal*.
- Tufte, E. R. (2006). Beautiful evidence. New York. Pp. 122-139.



Ponderosa's Increased Universal Accessibility

As a part of UBC's Campus Plan for universal accessibility, the Ponderosa buildings were built with a number of key design features to meet these goals. An excerpt from section 4.3, Universal Accessibility, states the "Campus Plan goes beyond basic compliance with accessibility standards. It seeks to create a barrier-free campus by encouraging the application of universal design principles." This is done through three key interrelated strategies: land use changes, pathway and connectivity improvements, and facility design and retrofits. It is hoped that the changes implemented around Ponderosa will set a positive standard and precedent for future development on campus.



Washrooms

Physical Accessibility: increased space in washrooms to facilitate mobility for those with aids such as wheelchairs, crutches, etc.

Gender Variance/Social Accessibility: implementation of single stall/subtle gender neutral washrooms with baby change rooms so that either parent can enter regardless of their gender or their infant's gender and so that those who are transgender can use the space freely as well

Seating

Increased seating in the Ponderosa buildings so that students can sit as they wait for class to begin and lots of study space so that one could study and have a break in between classes

Outdoor seating – many places to rest around the Ponderosa buildings to allow people a place to rest in between commuting and to foster increased social interactions



Google Images



Google Images

Stairs & Elevators

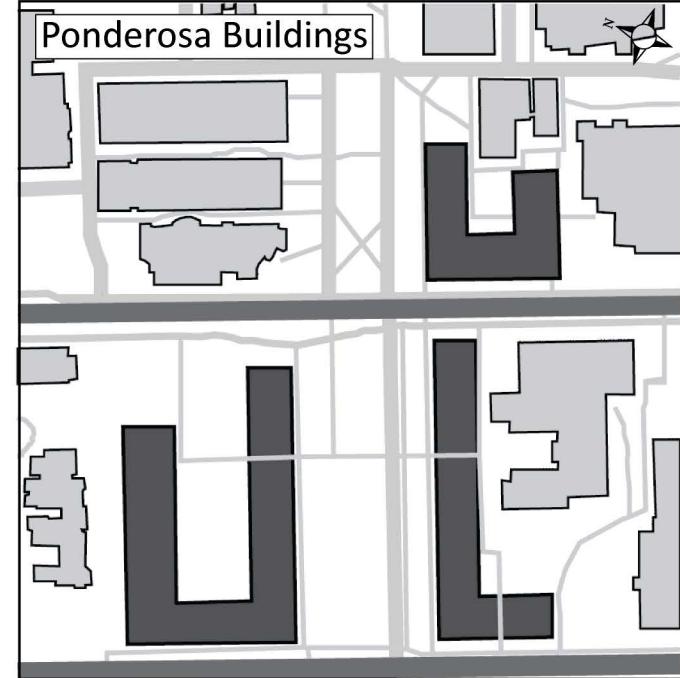
Stairs have rubbed/indented cement to provide physical/touch and alert one that they are approaching stairs

Tactiles & braille are in the elevator to help those with visual impairments



Google Images

This is a student-led collaboration with faculty and staff in the SEEDS Sustainability Program



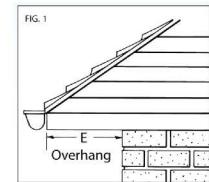
Data Source: <https://github.com/UBCGeodata>

Roads

Does not have an elevation difference, rather there is a slight indent to indicate the transition between road and sidewalk, but it allows users (particularly those with wheelchairs, motorized mobility devices, or crutches) to seamlessly move across them. This slight indent ensures water doesn't pool but still allows human users to easily cross the divide

Covered Areas

All Ponderosa buildings provide a slight overhang so those walking can have rest out of the way of rain or sun



Google Images

Slope

Slope has been kept as minimal as possible (5% grade or less); pathways with steeper grade have been broken up into easier slopes to give anyone with mobility impairments an easier route around campus

Accessibility Routes for Those Travelling by Crutches, Wheelchair, or other Motorized Devices



Legend

- Building
- Ponderosa Building
- Recommended Route
- Elevator
- Path/Sidewalk
- Road

This map demonstrates the best routes to take around the Ponderosa complex for anyone with mobility impairment (i.e. crutches, wheelchair or other motorized devices). It shows the best routes to take for people coming from Totem Park/ Marine Drive or anywhere in the general lower mall area and trying to get up to MainMall through the Ponderosa building complexes. The main consideration is regarding slope; these routes ensure slope is the same as or less than 5% grade (1/20), the easiest and most manageable slope type on UBC campus. It keeps these groups off of major roads as much as possible and aims to provide the quickest route while still maintaining 5% or less grade.

From Totem Park & Marine Drive Residence

Accessibility Routes for Those Travelling by Crutches, Wheelchair, or other Motorized Devices

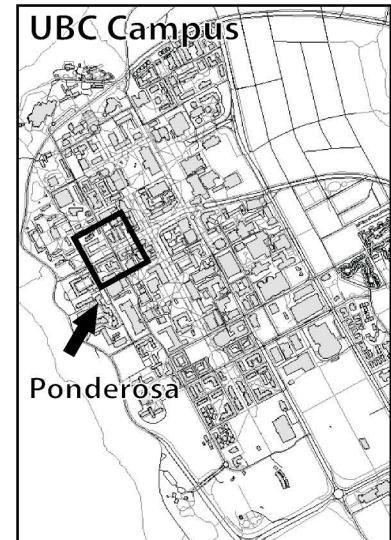


Legend

Building
Ponderosa Building
Accessible Route & Manageable Slope
Elevator
Path/Sidewalk
Main Road & Manageable Slope
Steep Slope

This map demonstrates the best routes to take around the Ponderosa complex for anyone with mobility impairment (i.e. crutches, wheelchair or other motorized devices). It shows the best routes to take for people coming from Totem Park/ Marine Drive or anywhere in the general lower mall area and trying to get up to MainMall through the Ponderosa building complexes. The main consideration is regarding slope; these routes ensure slope is the same as or less than 5% grade (1/20), the easiest and most manageable slope type on UBC campus. It keeps these groups off of major roads as much as possible and aims to provide the quickest route while still maintaining 5% or less grade.

Mapping Ponderosa's Increased Accessibility



From Totem Park & Marine Drive Residence

Mapping Ponderosa's Increased Accessibility



Legend

Building		Washroom
Ponderosa Building		Accessible Entrance
Recommended Route		
Path/Sidewalk		
Road		
Elevator		
Stairs		
Bench		

This map demonstrates accessibility features and routes to take around the Ponderosa complex for anyone with accessibility constraints (ex. wheelchair or other motorized devices). It shows the best routes (considering slope and efficiency) to take from Lower Mall up to Main Mall and shows the new universal accessibility features incorporated into the Ponderosa Complexes.

