UNIVERSITY OF WATERLOO

GEOREACH SITES

Goderich, Ontario

GeoReach

FEBRUARY 14, 2025

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Introduction

The GeoReach program is a collaboration between the University of Waterloo (UW) and various municipalities, conservation authorities, and national and provincial parks across Canada. The purpose of the GeoReach program is to increase the monitoring of dynamic landscapes such as coastlines (CoastReach), glacial valleys (GlacierReach), and rivers (RiverReach) through a citizen science based image submission platform. Within the CoastReach program, continuous photographic monitoring at a location creates a timelapse of coastal erosion and recovery processes, increasing the understanding of coastal dynamics taking place at each associated site.

When a CoastReach image is taken at a station, it can be directly uploaded to the GeoReach website through a QR code or link located on an interpretive panel nearby. This image is verified for validity by researchers, and the shoreline position can be subsequently analyzed using a MATLAB script, as part of the broader CoastSnap global program[1] [2]. By measuring ground control points visible through the picture stand, researchers are able to identify those points in each image and georectify the image (transform the portrait photo into a top-down view). This allows researchers to delineate the shoreline position, and measure change through a series of images over time. Other areas of interest include vegetation loss or recovery, presence or absence of winter sea ice and location of beach safety hazards (such as rip currents). Researchers and conservation authorities can also use these images to inspect biodiversity, monitor invasive species or examine algal blooms. Partnered organizations are given access to image repositories in the form of a Research Analytics Portal (RAP) to view and download image submissions at GeoReach locations across Canada.

[1] https://github.com/Coastal-Imaging-Research-Network/CoastSnap-Toolbox

[2] Harley, M. D., Kinsela, M. A., Sánchez-García, E., & Vos, K. (2019). Shoreline change mapping using crowd-sourced smartphone images. *Coastal Engineering*, *150*, 175–189. https://doi.org/10.1016/j.coastaleng.2019.04.003

Station Setup

Stand Installation

Each stand is 0.914m (3 feet tall) and made of aluminum, weighing in at 2.5kg (5.5lb). Stands are generally affixed to wooden posts or pre-existing boardwalk infrastructure. In the event that there is no pre-existing infrastructure, the recommended approach is to affix the stand to a 4" x 4" post secured in the ground to reduce movement and continue capturing the same field of view through time. A small platform is located on top of the stand, with a square aperture to place the camera through, and two barriers on the left and front sides, to hold the phone in place. Interpretive panels (discussed in more detail below) can either be affixed to the posts themselves, or on another structure directly nearby.

Figure 1: Photos of example stand

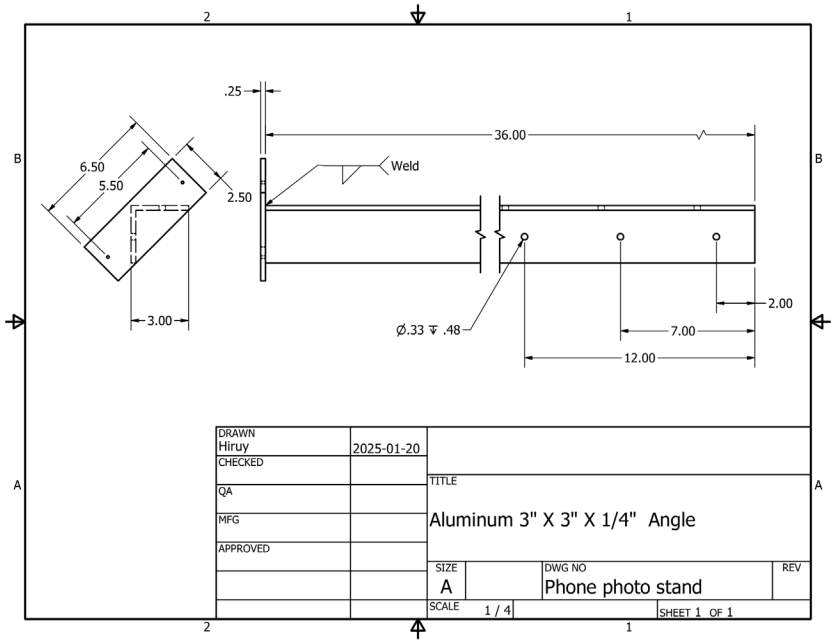

Figure 2: Schematics of the stainless-steel post

Figure 3: Example of a CoastReach stand installed at Point Pelee National Park.

Interpretive Panel

Every CoastReach station comes with an interpretive panel, affixed either to the post or directly nearby. These panels contain a QR code, allowing visitors to scan their cameras and be taken directly to the CoastReach home page (see Figure 6 below). Each panel also contains a link to the GeoReach site, allowing visitors to both learn more about the GeoReach program, and submit photos following the visit, under the event of limited internet access. Additionally, interpretive panels have the added benefit of teaching visitors the importance of coastline monitoring, and how exactly their pictures will help to further our understanding of coastal dynamics (see Figures 4 and 5 for example panels).

Figure 4: Example of a basic CoastReach interpretive panel.

Figure 5: Example of a more informative GlacierReach interpretive panel developed by BC Parks and Parks Canada.

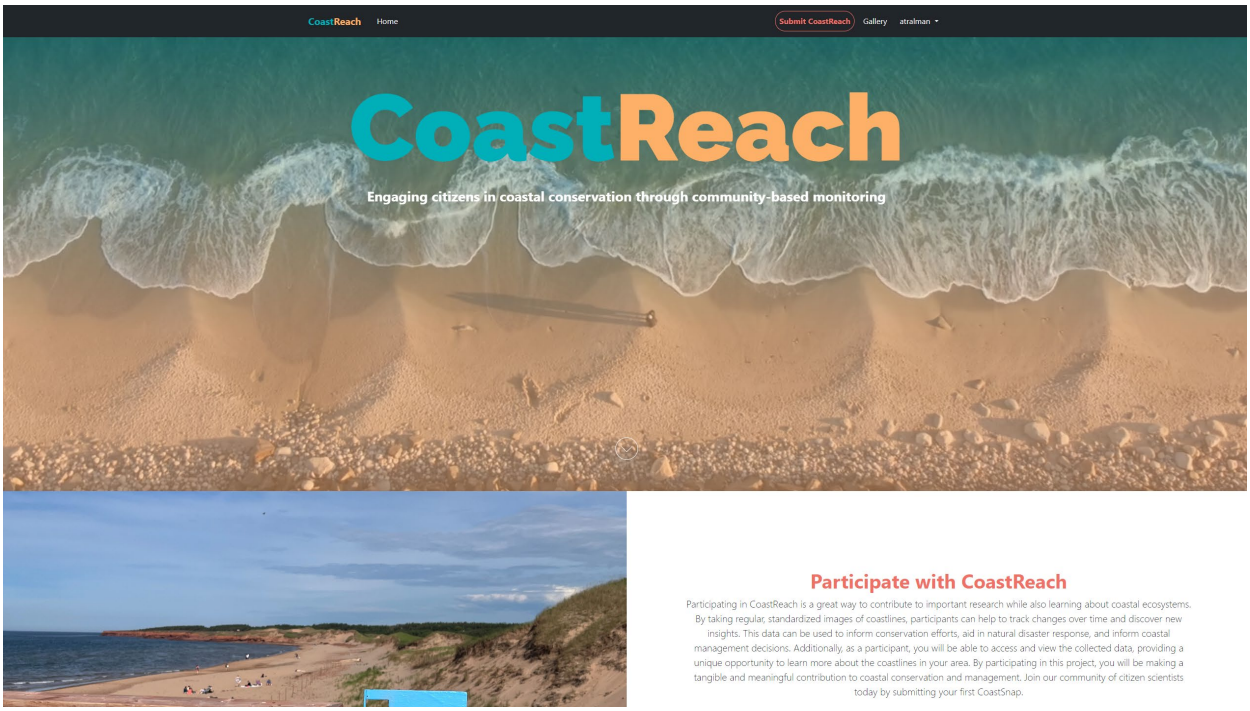

Figure 6: CoastReach landing page, which the stand QR codes take visitors to.

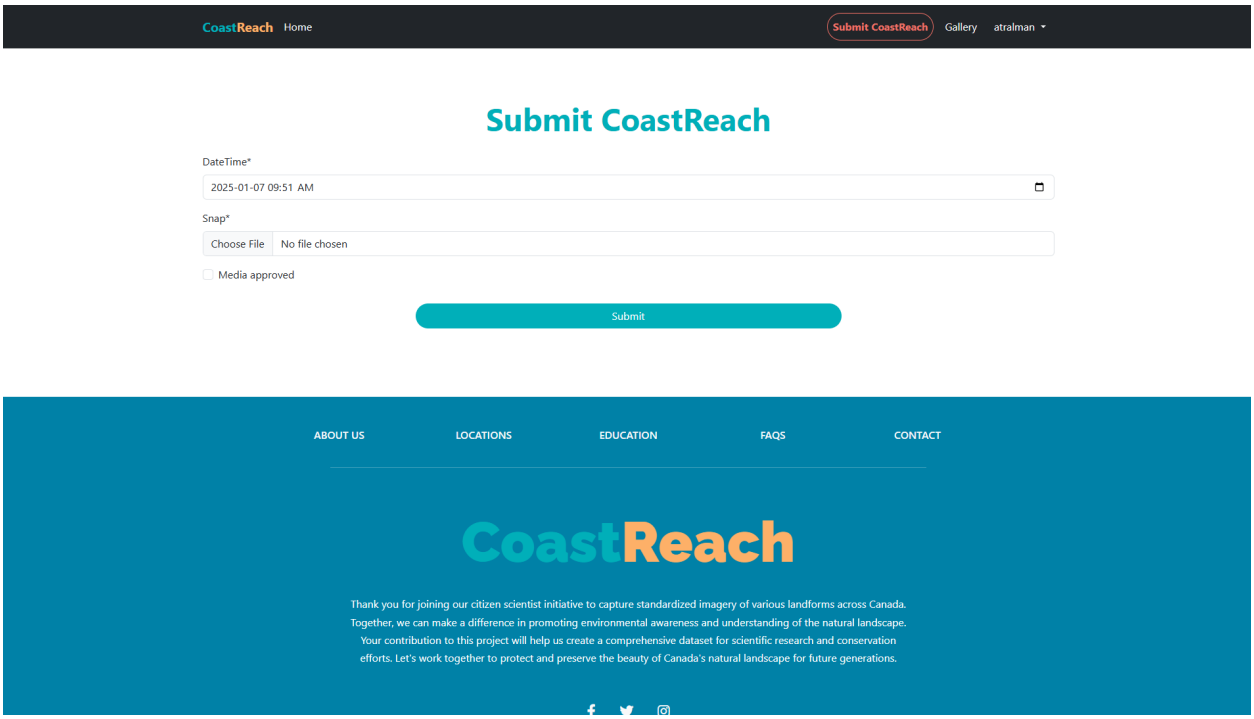

Figure 7: The image submission portal on the GeoReach website, for a CoastReach location. Visitors are able to select the time the photo was taken, as well as checkmark if they are comfortable with the image being used on the CoastReach public gallery.

Data Download

When an image is submitted by a visitor, it is uploaded to the Research Analytics Portal (RAP), where researchers periodically verify submissions, to ensure they are both useful (e.g., clear view of the shoreline) and do not contain any personal information (such as identifiable faces). Staff at partnered locations are given access to the RAP through creation of an account, allowing them to access weekly submission statistics for CoastReach programs (Figure 8), tile overview of submitted images (Figure 9), number of images submitted at each site (Figure 10), and bulk downloading options from the current day, past week, past month, and entire dataset (Figures 11).

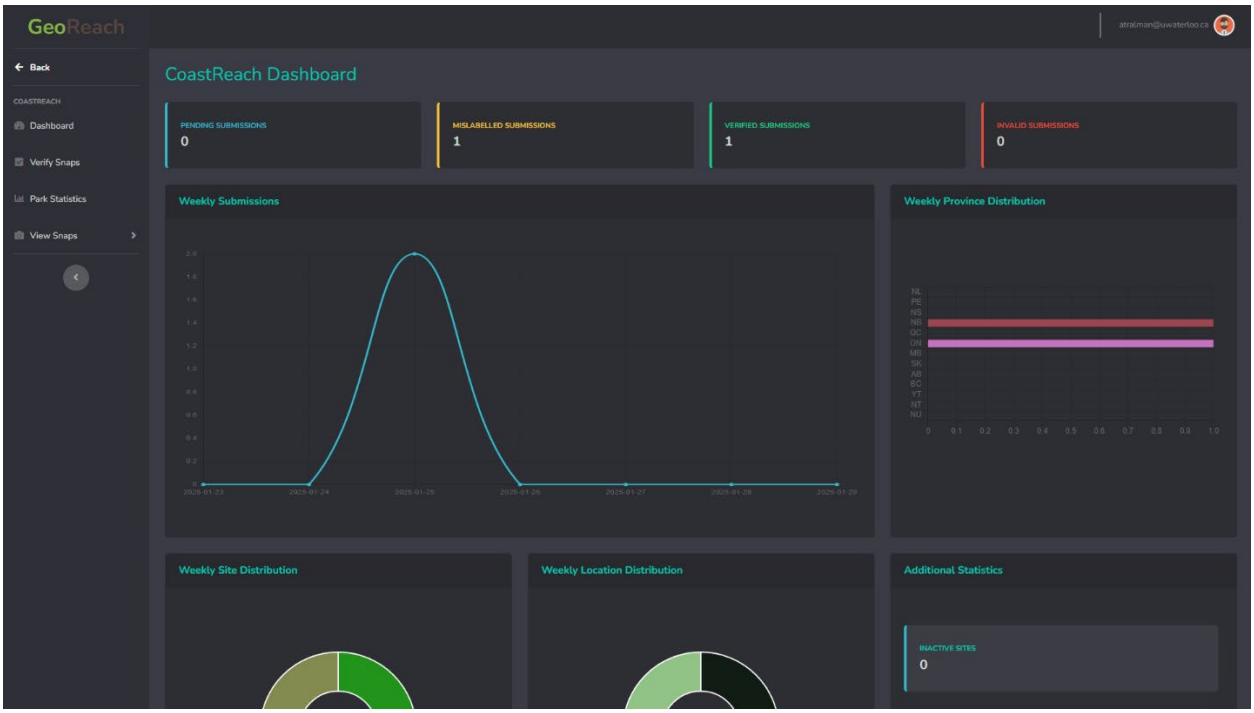

Figure 8: Dashboard showing statistics on the entire CoastReach program for 2025.

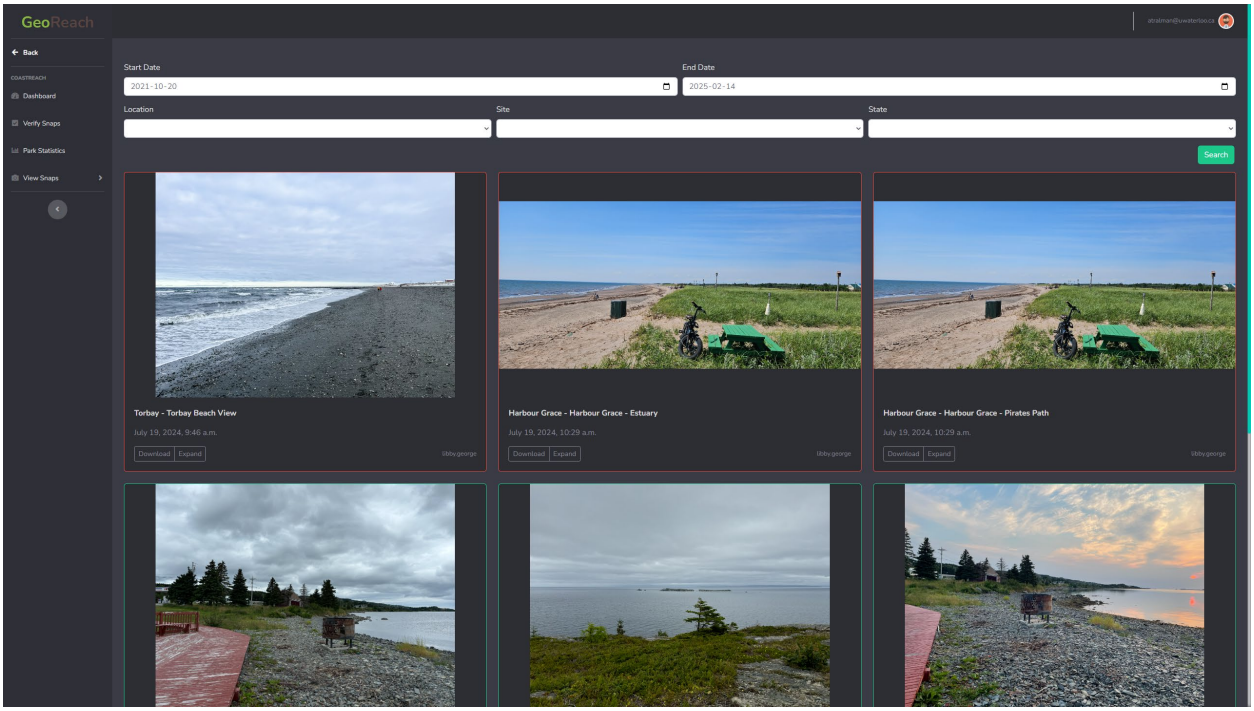

Figure 9: Tile overview of CoastReach images submitted at each site.

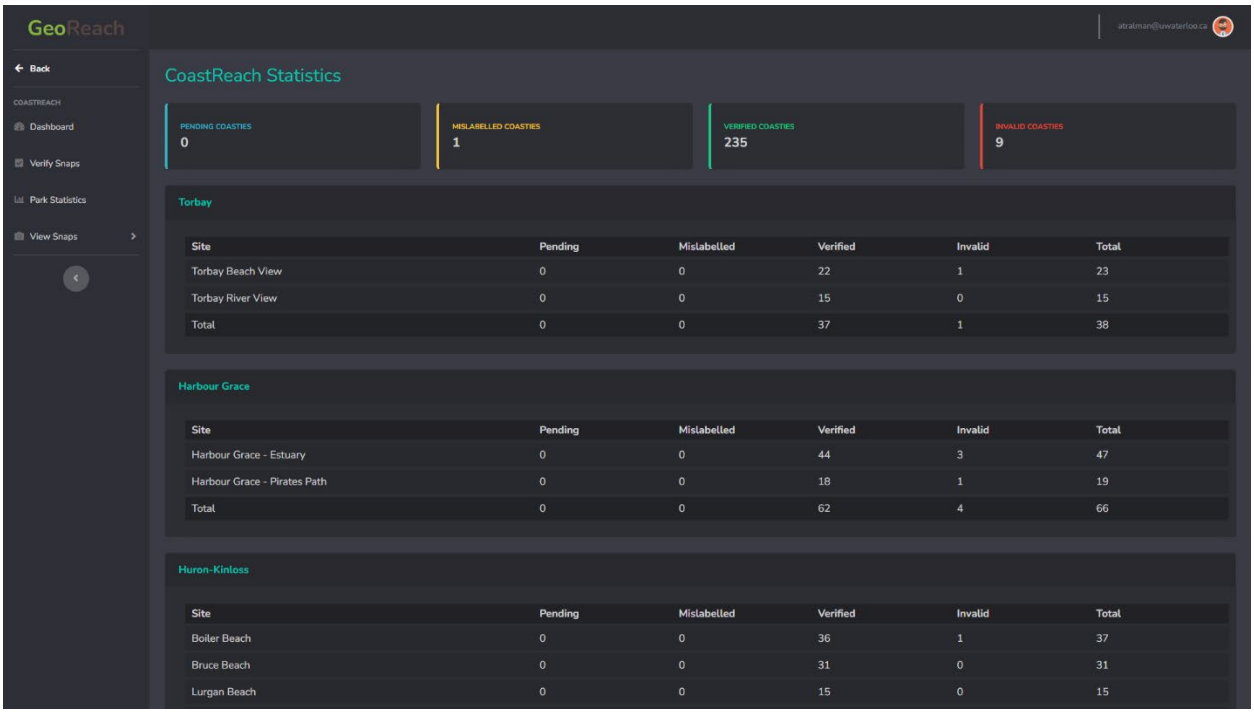

Figure 10: Page showing an overview of pictures submitted for each CoastReach site.

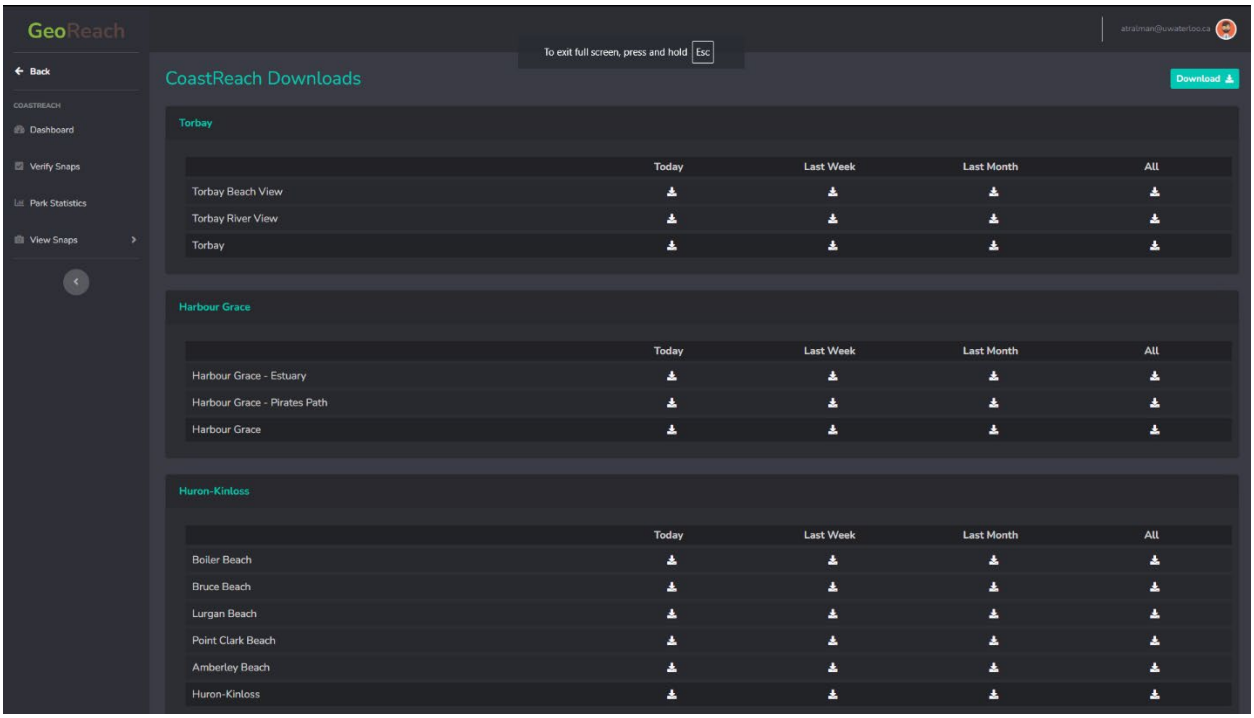

Figure 11: Page demonstrating download options for current CoastReach sites.

Proposed Sites within Goderich

COASTREACH STATIONS FOR GODERICH, ONTARIO

N
W
E
S

Potential Sites

0 500 1,000 m

Data Source: Government of Ontario

Main Beach [3]

The Main Beach of Goderich is a popular area. A CoastReach station on the south end of the beach, elevated towards the trail has the potential to engage citizens, and monitor both beach usage and the foredune recovery project in the backshore. Suggested placement is above the installed bank protection at the south end of the beach, facing north across the beach.

[3] Images taken from Google Street View and Google Earth.

Rotary Cove (North)

The groin structure installed at Rotary Cove has successfully trapped sediment within the Cove in the past, extending the beach width for visitors. This CoastReach station at Rotary Cove would engage visitors, monitor sediment dynamics, and beach visitation within the Cove. The suggested placement is at the south end of the Cove, facing north across the beach.

Rotary Cove (South)

MVCA personnel mentioned potential monitoring of the water treatment outflow site using a second CoastReach station installed at Rotary Cove, which would face south towards the outflow from Rotary Cove, to observe potential erosion and bank stability issues.

Bluffs Location

The bluffs are a site of particular interest, as the municipality and MVCA are investigating possible strategies to recover this area of open coast and reduce the current impacts of sediment starvation. This location presents an opportunity for establishing a visual baseline and monitoring progress on any future strategy implemented. Suggested installation is on the north end of the bank preceding the graded bluff section, facing south across the bluff face.

Potential RiverReach Locations

The old Menesetung Trail, along and over the Maitland River, also serves as a potential location of interest for the expansion of the RiverReach component of the GeoReach program. This trail is well used, and a RiverReach station would allow for municipal and MVCA staff to examine watershed points and monitor sediment influx into the system, which may be altered in the future pending upstream dam removals. This would also allow for the monitoring of seasonal flooding of the river, and its potential effects.

Closing Statement

The purpose of this report was to discuss the CoastReach program component of the wider GeoReach project, and how it can further our understanding of coastal dynamics at shorelines across Canada. Through the installation of these four sites on the coastline of Goderich, we expect these locations to attract significant contributions by citizen scientists due to their accessibility and placement along popular areas. The images we expect to receive will be a substantial asset in broadening our knowledge of coastal dynamics and erosion. Municipal and MVCA staff will also benefit from the submitted images, as their access to these datasets through the RAP will increase monitoring of sediment drift through images submitted at the Bluffs Location. We would like to express our gratitude to the municipal staff of Goderich for reviewing this report, and the staff at MVCA for their valuable time and assistance in visiting these sites and supporting the progression of this project.