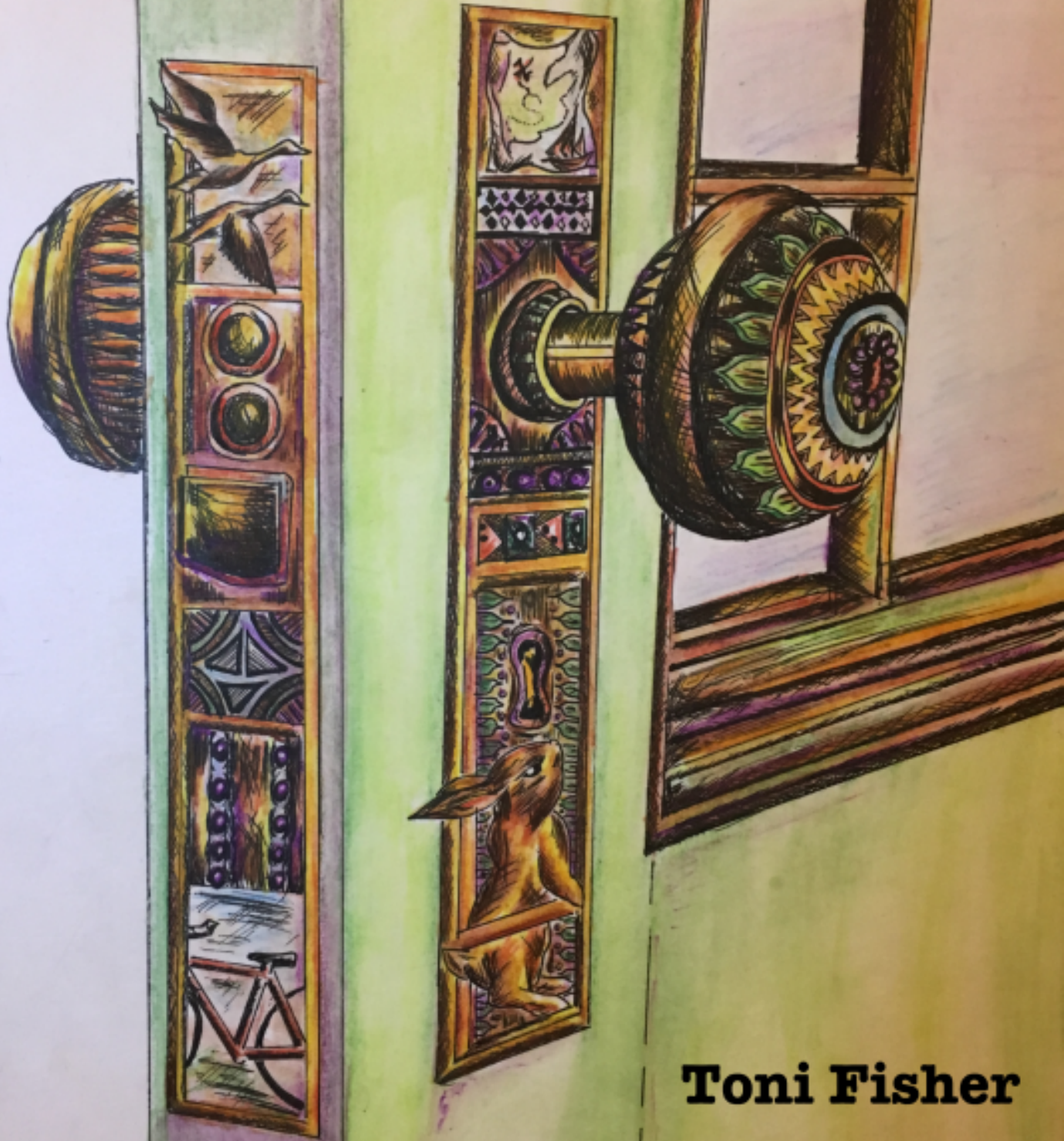


Open the Door to GIS



Toni Fisher

**Teacher's
Edition**

OPEN THE DOOR TO GIS

Teacher's Edition

TONI FISHER

locate
PRESS

About this Sample

This sample contains Chapter 4, *Treasure Hunt*, from *Open the Door to GIS*.

The Teacher's Edition of the book contains two extra sections:

- Foreword to Teacher
- Supplementary Reading

All other chapters in the book, including *Treasure Hunt*, are the same in both the Teacher and Student editions.

You can purchase the ebook (PDF) for both editions at locatepress.com. The print versions are available through Amazon and Ingram, or you can order direct from us if you need multiple copies. See our website for details.

Credits & Copyright

Open the Door to GIS Teacher's Edition

by Toni Fisher

Published by Locate Press LLC

COPYRIGHT © 2017 LOCATE PRESS LLC

ISBN: 978-0998547701

ALL RIGHTS RESERVED.

Direct permission requests to info@locatepress.com or mail:

Locate Press LLC, PO Box 671897, Chugiak, AK, USA, 99567-1897

Editor Gary Sherman

Cover Art Madelaine Dingwall

Interior Design Based on Memoir- \LaTeX document class

Publisher Website <http://locatepress.com>

Book Website <http://locatepress.com/odg>

No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system, without the prior written permission of the copyright owner and the publisher.

Contents

4 Treasure Hunt

7

4. Treasure Hunt

I live in a small town, really small. Having nothing to do is a frequent complaint of people my age. You can watch TV and movies, watch TV and movies with friends, play computer games, or play computer games with friends. Or you can sit in the park at the picnic tables no one uses for picnics and talk with your friends. When it is school holiday times and your friends are gone, choices for something to do are cut in half: watch TV or movies, play computer games, or sit at the picnic table and stare into the distance. Not very appealing. Luckily my town, although small, still has a public library and it's open every day. Not a place to go with friends since laughing and talking are frowned on by the librarian, but a place to go when you are alone. My Mum works and we don't go on holidays very often.

So, here I am, sitting at a table in the public library with a stack of books in front of me. I could search for books that I know of and would be interested in reading, but I can do that anytime. When I come to sit in the library, planning to stay for the afternoon, with rain streaking the window behind me, I prefer to take books from random shelves and see what I can find. Sort of like a treasure hunt. I pretend that the books are calling to me and it isn't chance or coincidence I select them and pull them into the pile growing in my arms, but that it is fate causing me to select them. A fate that will be revealed when I start looking through them. The rules are: any book can be selected, but I am not allowed to read the title or author until I am sitting at the table.

Back at the table I ease the pile from my arms to the table, being careful not to make any loud noises as I lower them onto the wooden surface of the table. I sit on the chair and adjust it to bring me closer to the table. The scraping noise of the chair legs earns me a sharp look from the librarian and I let the hair fall over my face to hide from the accusatory glare.

First book. Nice cover, green leather, smells old, as if it hasn't been read for fifty years, if ever. I open it up to thumb through the pages but it is bigger than I think and the cover knocks against my carefully placed stack of volumes. Over it goes, bang, bang, bang, each book hitting the floor with a clap like thunder. Now the librarian is not just glaring, the librarian's eyes are flaming. Quickly I bend under the table to pick up the books and place them soundlessly on the table. One book is really far under the table and I have to crawl to get it. By the time I can reach it, the library is hushed once again. I fumble my way back into my seat without causing another sound and look at the book in my hand.

A book about 19th century poetry. I don't mind poetry. I rifled through the book and stopped at a page with writing on it. Nearly illegible. Whoever wrote it had messier handwriting than me and that was something I thought would be hard to do. Then I looked at the first page of the book, where the previous owner wrote his name, and saw it belonged to Gordon W. Simpson. I looked again, surprised. Gordon Simpson was my neighbour. When I was little I used to take cakes my mother baked to him. He is alone in the world, said my mother, and he needs to know that someone cares. Mr. Simpson was always kind to me and thanked me for the cakes as though I had baked them myself. He was old when I was seven, now he was ANCIENT. He couldn't even walk anymore. Now he used a chair and had a person come by to visit each day to give him special care. Once though, he had been part of the world and he had been a university professor, dashing off to the university and all over the world, according to what my mother had told me.

I decided to check the book out and to try to decipher the notes on the page. I was curious about what Mr. Simpson had written. I put the book under my coat to protect it from the rain and walked home through the gloomy streets.

Next day, after spending quite some time working with the book, I showed it to my mother and she laughed at Mr. Simpson's writing.

"The only person who could translate that is the writer," she said. "Why don't you take it over to him? You can take him this tin of cake at the same time."

I thought it was a good idea and knocked on the door, only to be answered by the caregiver. She took the tin and thanked me, but told me Mr. Simpson was resting.

"Who's there?" shouted a voice as she started to shut the door.

"It's the child from next door," she answered.

"I always want my visitors to be welcome," he said, overruling her.

Smiling and shrugging, she opened the door to me and bade me come in. I went through to the library and greeted Mr. Simpson who smiled happily to see me.

"It's been so long," he said. "So lovely to see you again. I'll bet you've brought something along with you. Mrs. Inglewood, could you serve us some of the lovely baking that my neighbour has kindly delivered, for us all to share?"

Sitting in the book-lined library with a piece of cake and tea in front of us, I brought the book out of my bag and handed it to Mr. Simpson.

"Ah!" he smiled happily. "Cake and a surprise. Wonderful. And it gets better, as you will see." He opened the book and leafed through it until he found the annotated page. "Did you read this?"

I admitted I tried but that the message eluded me.

"Quite right," he said, "I meant it to be cryptic. It is the first clue for a treasure hunt." His voice became very soft and I leaned in to hear more clearly, "Do you want to give it a try?" he asked. "Sailors have not been using latitude and longitude for very long, relatively, to record their location, but once they started, the degrees, minutes and seconds, in both latitude and longitude they used are like exact addresses for every location on earth," he explained. "What I found, on a scrap of map in an old library were some locations and a few words that gave me the idea something of value has been buried on the beach very near here. There are coordinates to show where a ship was anchored, where some people made landfall, and then a list of distances and directions followed before the burial of the 'items' took place."

"Do you know what it was? Didn't you try to find it?" I asked.

He smiled and shook his head. "By the time I found this paper," he said regretfully, "I was too old to go off on a treasure hunt." He showed me the geographic coordinates and then copied over the text that he had found detailing the next steps and handed it to me. "Make the map", he told me. "Find the treasure!"

What is the treasure? Where is it? Follow along, help me make the route and let's see what we find.

Mr. Simpson's instructions started with a set of coordinates. X and Y. I had to get to that place. Since X and Y and the numbers associated with them didn't match any street address or description of my area, I knew I would first have to figure out what my X, Y was and then move to the X, Y where I needed to be. His writing, even though he had taken care, still wasn't that easy to read, but I gave it a try.

I took out a paper map we had at home. I noticed the paper map had markings around the outside, a grid of coordinates.

My location was -227229, 7835647. The latitude and longitude I needed to get to was Latitude 57.319, Longitude -1.979.

The map had a note that said it was using UTM coordinates for the grid. I had to start somewhere and, the Internet was a good place to start. I typed Latitude and Longitude to UTM into the Search on a browser and found that there was a calculator for the conversion. According to the conversion, the X, Y I needed to get to was -220260, 7825569. Let's find out if I can ride my bike to the place from which the people began their walk along the shore. We need to draw in the route.

I don't know much about maps, but I know there is a difference between a map and a globe. Flat maps use projections. They take the round world and stretch it around so it can be drawn on a flat screen or on a piece of paper. When the world is round, the units are geographic units, latitude and longitude, not projected units. Since we are using a piece of paper and a screen to map, we want to work with projections and projected units. How the world is referenced, whether with geographic or projected units is called a *Coordinate Reference System* (CRS).

Read more about CRS and how it works in the *QGIS Training Manual: Module: Vector Analysis, Lesson: Reprojecting and Transforming Data*.

To make the map, first you will need to use the *Project Menu: New*. Save it with a name, perhaps **Treasure**.

Go to *Settings Menu: Options/CRS*, click in the radio button, *Automatically enable on the fly reprojection*. We don't want to have different kinds of units in our map or else things won't line up. From *Always start new projects with the following CRS*, click on the Globe icon and select the one with */Pseudo Mercator, EPSG:3857*. We want to use projected coordinates, a flat map, not geographic coordinates from GPS and a globe.

Use the *Web* Menu Item and select a *Street Map*. You will draw the route on the map, tracing a street, so we have a record of the route while I ride there on my bike. But first, create the start and end points for my journey.

Go to *Layer: Create Layer: New Shapefile* and add a new layer, selecting *Type: Point*, *New Field: Name*, *Location (Type: Text data, Length 10, Add to fields list)* and save it with the name **StartAndEnd**. To start at my location, you will need to find it. Go to *Plugins: Manage and Install Plugins*. Install the *Zoom to Coordinates Tool*. Using X,Y, *Zoom to Coordinates Tool*, type in my starting location (Figure 4.1, on the following page).

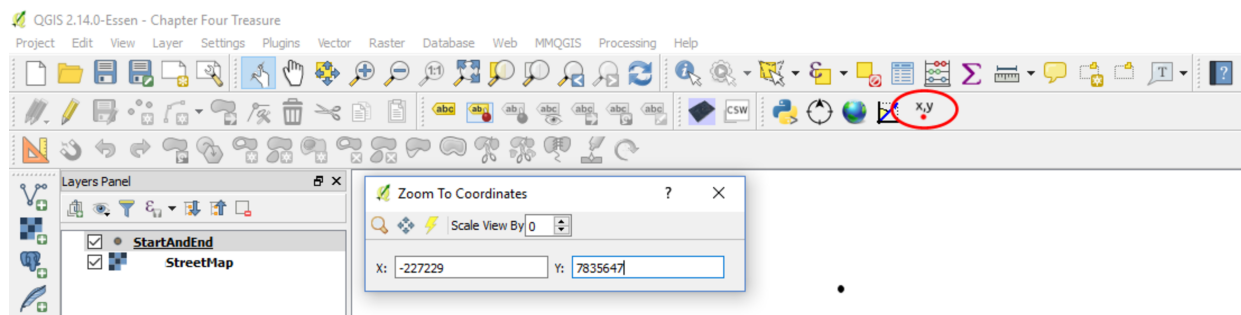


Figure 4.1:

Use the *Flash Point Icon* on the tool to direct you and zoom into my starting point. Make StartAndEnd the *Active Layer* by clicking on it. Use the *Pencil Tool* to start editing the StartAndEnd layer. Put a point where you will start the route as shown by the X,Y Tool. Give it the ID number 1 and the Name, **Start**. Now find the place where we want to be, using the X,Y Tool and the coordinates given above. Use the *Pan To Icon* on the tool and put a point with the ID number 2 and the Name, **End** (Figure 4.2).

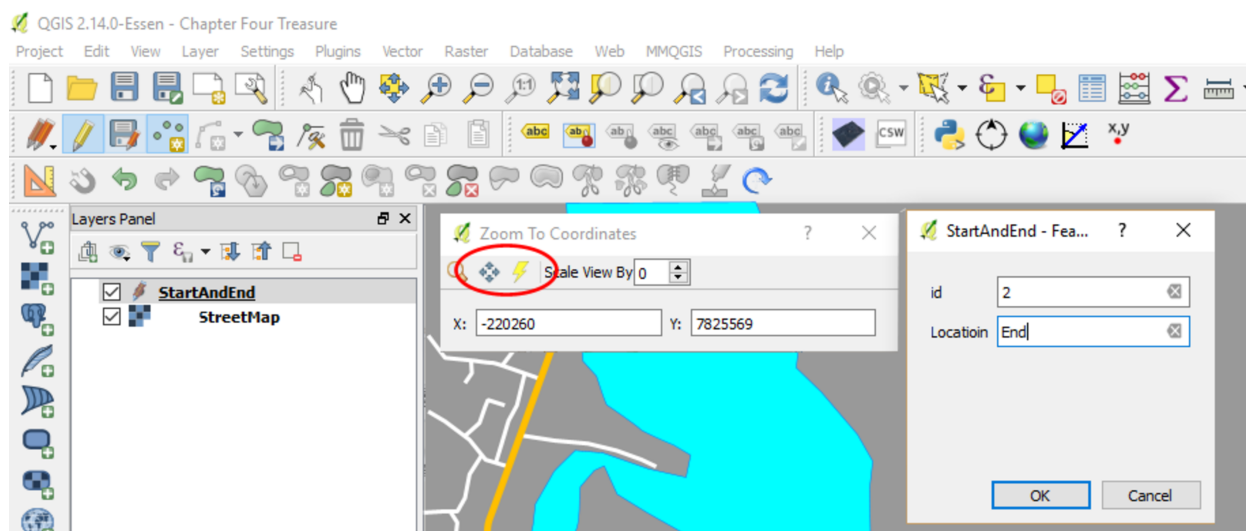


Figure 4.2:

To see the whole route, right click on the StartAndEnd layer and select *Zoom to Layer*.

Now create the route of the journey. Go to *Layer: Create Layer: New Shapefile* and add a new layer, selecting *Line*. Use the *Pencil Tool* to toggle editing, add a new feature clicking along the route you think I should travel. Right click to end. *Save* your work and call it **Route**. You will probably want to change the symbol for the route. Double click on the layer in the layer list. Select *Style: Width* and *Colour*. Now use the *Measure Tool* to measure the length of the route by clicking along it. What do you think? Could I ride my bicycle, or do I need a bus? See Figure 4.3, on the facing page.

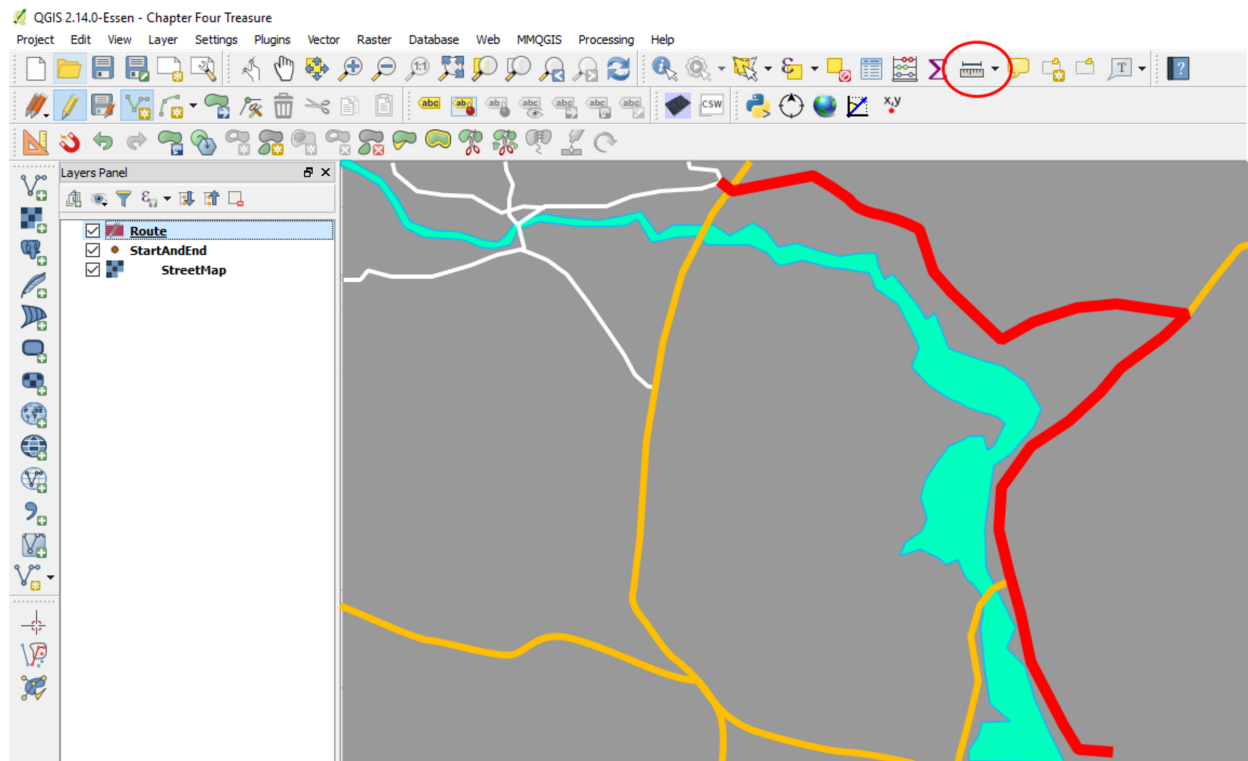


Figure 4.3:

For walking along the beach, roads will no longer be helpful. Add a *Satellite or Aerial Map* from the *Web Menu: Open Layers Plugin*. The new map will draw over the top of the route. Drag and drop it below the two shapefiles you created so they draw over the top of the aerial view (Figure 4.4, on the next page).

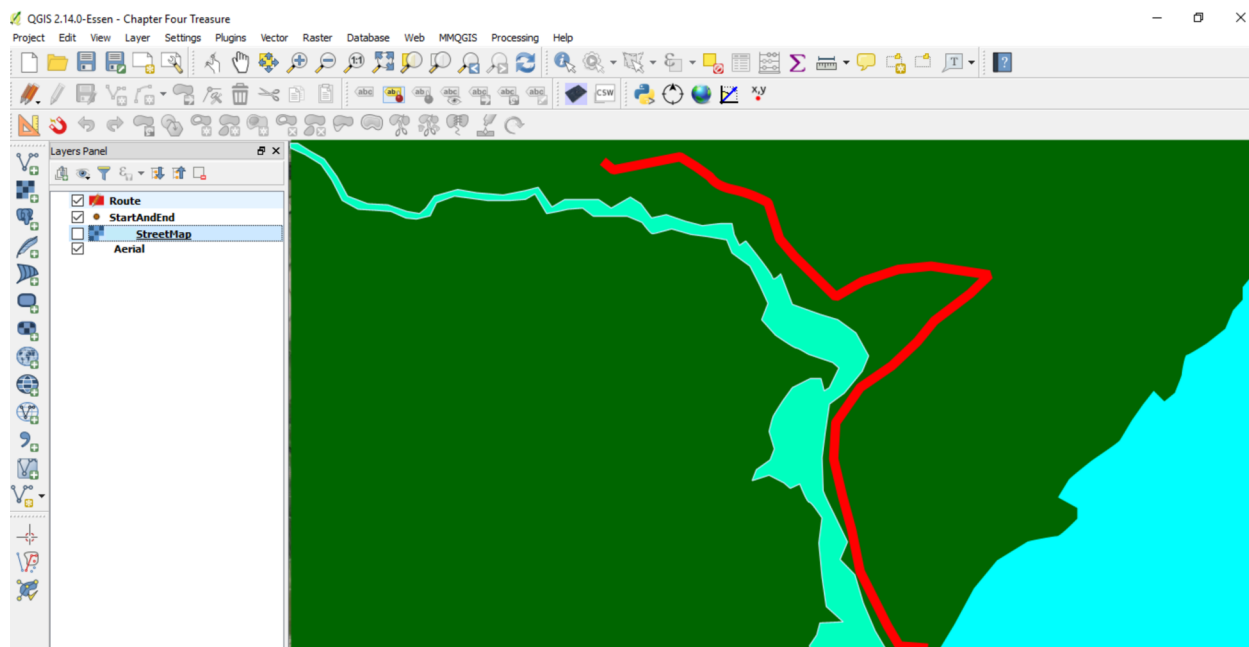


Figure 4.4:

The instructions say that the people who buried the treasure walked certain distances and directions, specifically:

- 1 mile (5280 feet - distance) at 20 degrees (azimuth)
- 0.5 mile (2640 feet - distance) at 50 degrees (azimuth)
- 1000 feet (distance) at 130 degrees (azimuth)

These directions are given from the degrees on a compass. Think of a compass as being a circle. Circles have 360 degrees. Both 0 and 360 are at the top, the north. East is 90, the south 180 and the west 270 degrees. So 20 degrees is towards the northeast, as is 50 degrees, while 130 degrees is between east and south.

You will need to load a plugin to map the distance and direction. Click on *Plugins: Manage and Install Plugins: Azimuth and Distance Plugin* and *Install*. Find and use the plugin from *Plugins: Topography: Azimuth and Distance*.

The Active layer should be the Route line that you made. Click on it to highlight it.

We don't really need to keep the line to find the treasure, but if we are going to add a line, we need a line shapefile to add it to. It won't work to add a line to a point or a polygon shapefile. Click on *Options: Feet*. Click on *Drawing: Starting Point: From Map* and click on the point you created on the map, that is, click where the route line ends. Click *Close* on that popup. Now add the values for the route in the Azimuth and Distance fields, as specified above (20, 5280/50, 2650/130, 1000). After the addition of each pair of numbers, click *Add to Bottom*. After each addition, use the *Pan Hand* icon to pan the map to the next point. See Figure 4.5, on the facing page and Figure 4.6, on page 14.

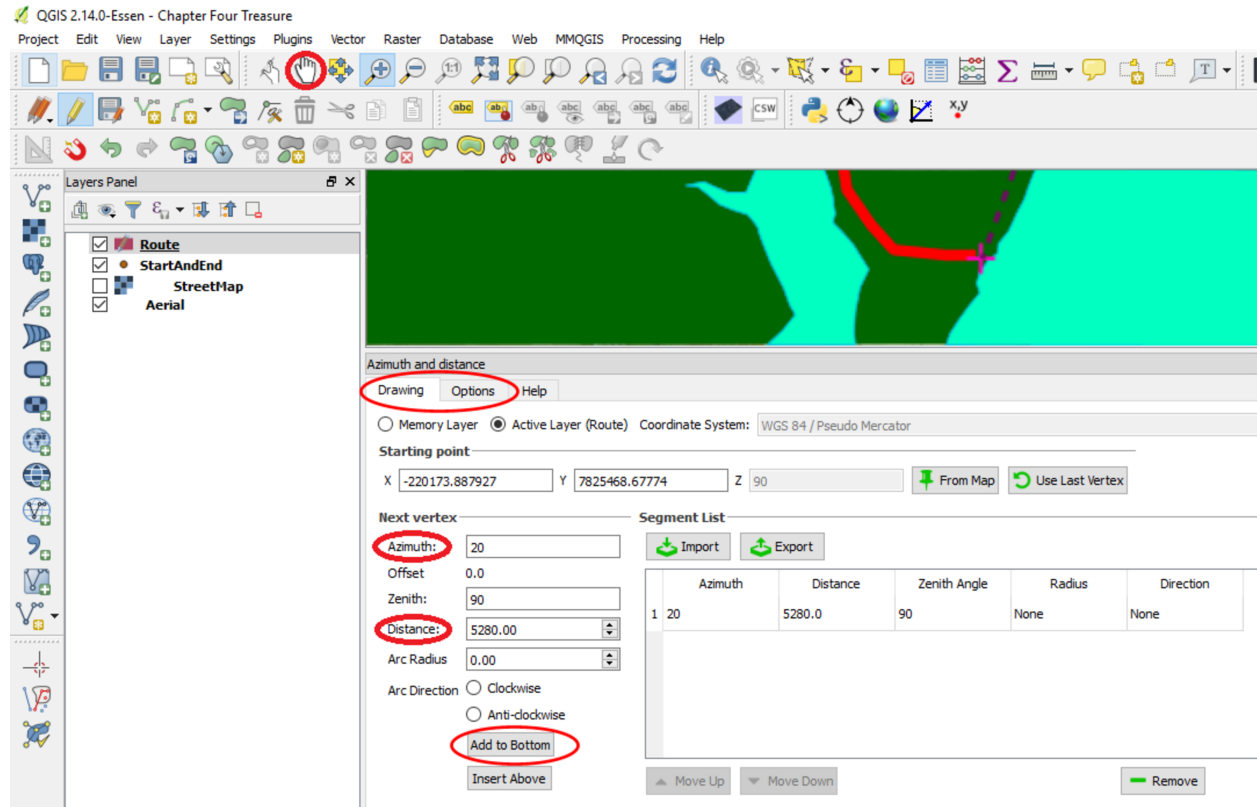


Figure 4.5:

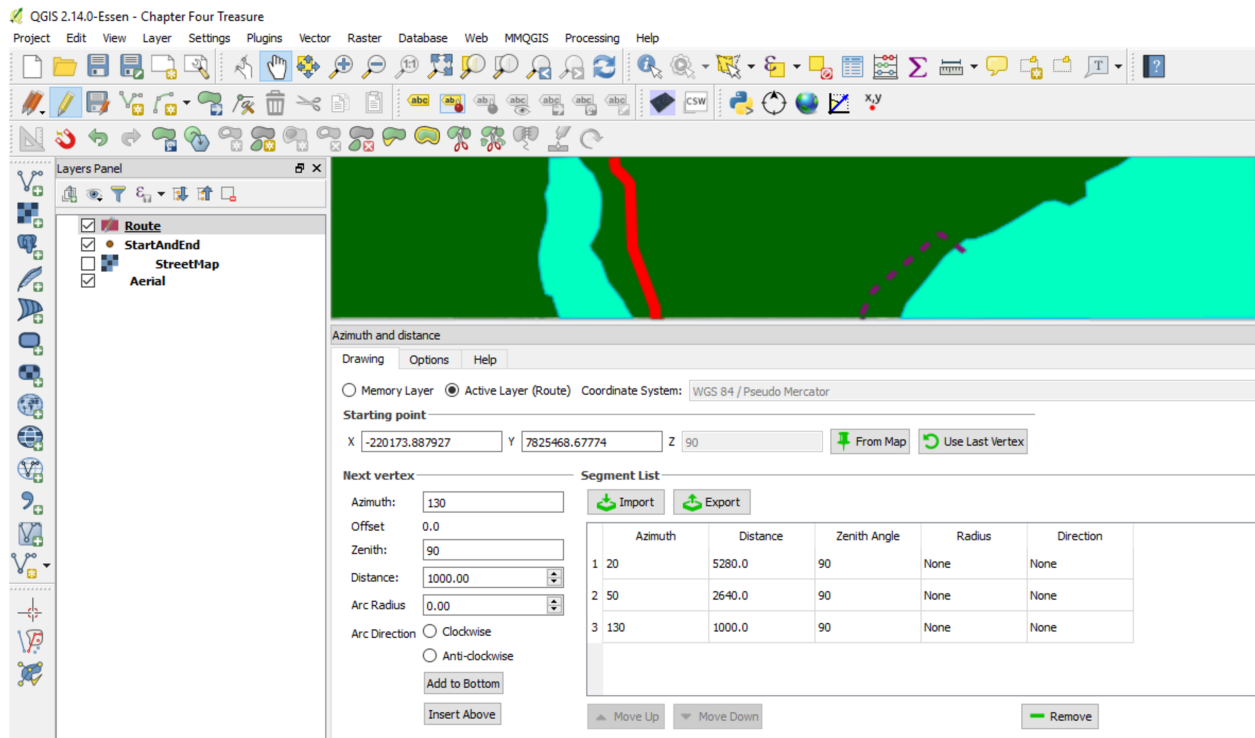


Figure 4.6:

Now click on the StartAndEnd layer and click on the *Pencil Tool* to change the editing layer to the points layer. Click on *Add a Feature*. Put a point right where the end of the new line is. That is where we have to go. Name it **Treasure Site**. *Save* your edits to the points shapefile.

Okay, now we have the map. You might want to print it out. It looks like a very interesting area to explore. I can't wait to show Mr. Simpson and then plan our next steps. Where do you think the treasure could be found? Any ideas?

Books from Locate Press

QGIS Map Design

USE QGIS TO TAKE YOUR CARTOGRAPHIC PRODUCTS TO THE HIGHEST LEVEL.

With step-by-step instructions for creating the most modern print map designs seen in any instructional materials to-date, this book covers everything from basic styling and labeling to advanced techniques like illuminated contours and dynamic masking.

See how QGIS is rapidly surpassing the cartographic capabilities of any other geoware available today with its data-driven overrides, flexible expression functions, multitudinous color tools, blend modes, and atlas capabilities. A prior familiarity with basic QGIS capabilities is assumed. All example data and project files are included.

Written by two of the leading experts in the realm of open source mapping, Anita and Gretchen are experienced authors who pour their wealth of knowledge into the book. Get ready to bump up your mapping experience!

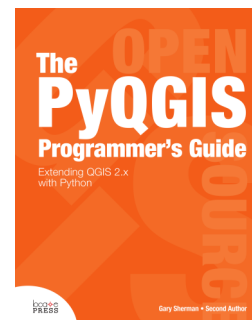


The PyQGIS Programmer's Guide

EXTENDING QGIS JUST GOT EASIER!

This book is your fast track to getting started with PyQGIS. After a brief introduction to Python, you'll learn how to understand the QGIS Application Programmer Interface (API), write scripts, and build a plugin. The book is designed to allow you to work through the examples as you go along. At the end of each chapter you'll find a set of exercises you can do to enhance your learning experience.

The PyQGIS Programmer's Guide is compatible with the version 2.0 API released with QGIS 2.x. All code samples and data are freely available from the book's website. Get started learning PyQGIS today!



Geospatial Power Tools

EVERYONE LOVES POWER TOOLS!

The GDAL and OGR apps are the power tools of the GIS world—best of all, they're free.

The utilities include tools for examining, converting, transforming, building and analysing data. This book is a collection of the GDAL and OGR documentation, but also includes new content designed to help guide you in using the utilities to solve your current data problems.

Inside you'll find a quick reference for looking up the right syntax and example usage quickly. The book is divided into three parts: *Workflows and examples*, *GDAL raster utilities*, and *OGR vector utilities*.

Once you get a taste of the power the GDAL/OGR suite provides, you'll wonder how you ever got along without them.



Discover QGIS

GET MAPPING WITH DISCOVER QGIS!

Get your hands on the award winning GeoAcademy exercises in a convenient workbook format. The GeoAcademy is the first ever GIS curriculum based on a national standard—the U.S. Department of Labor’s Geospatial Competency Model—a hierarchical model of the knowledge, skills, and abilities needed to work as a GIS professional in today’s marketplace.

The GeoAcademy material in this workbook has been updated for use with QGIS v2.14, Inkscape v0.91, and GRASS GIS v7.0.3. This is the most up-to-date version of the GeoAcademy curriculum. To aid in learning, all exercise data includes solution files.

The workbook is edited by one of the lead GeoAcademy authors, Kurt Menke, a highly experienced FOSS4G educator.



See these books and more at <http://locatepress.com>

