

## Appendix A

# User Manual

This chapter will detail how to use the application, from installation to reading the resulting data. The application can be accessed in two ways, either from the Vercel deployment by visiting either of the two following links:

- `pipeline-calculator-ng.vercel.app`
- `pipeline-calculator-ng-git-main-jcstrachan.vercel.app`

The application can also be installed and run locally. To install locally, refer to Appendix B.

### A.1 Using the Application

One of the core focuses during development was ease of use, making the application extremely straight forward to use. This section will overview all of the interactions you can have in the application.

The screenshot shows the 'Pipeline Buoyancy Module Calculator' interface. It features a 'Parameter Input' section on the left with a list of parameters and their values, a 'Data Visualisation' section at the bottom left, and an 'Export Data' section on the right. Four red circles are marked: Circle A is around the 'Parameter Input' section, Circle B is around the 'Submit Parameters' and 'Reset Parameters' buttons, Circle C is around the 'Data Visualisation' section, and Circle D is around the 'Export Data' section.

Parameter	Value	Unit
Finite difference subintervals	800	m
Pipeline Outer Diameter	1.22	m
Pipeline Wall Thickness	0.0318	m
Pipeline Elasticity Modulus	210000000000	N/m <sup>2</sup>
Pipeline Density	7850	kg/m <sup>3</sup>
Seawater Density	1030	kg/m <sup>3</sup>
Span Length	200	m
Elevation Gap	0	m
Span Shoulder Length	100	m
Effective Axial Tension	0	N
Seafloor Stiffness	4000	N/m <sup>2</sup>

**Data Visualisation:**

Buoyancy Length ▾

Please submit parameters to display graphs!

**Export Data**

Data:  
Download variable data as JSON: ☐

Graph Data:  
Download graphs as PDF: ☐  
Include graph explanations: ☐

Export data

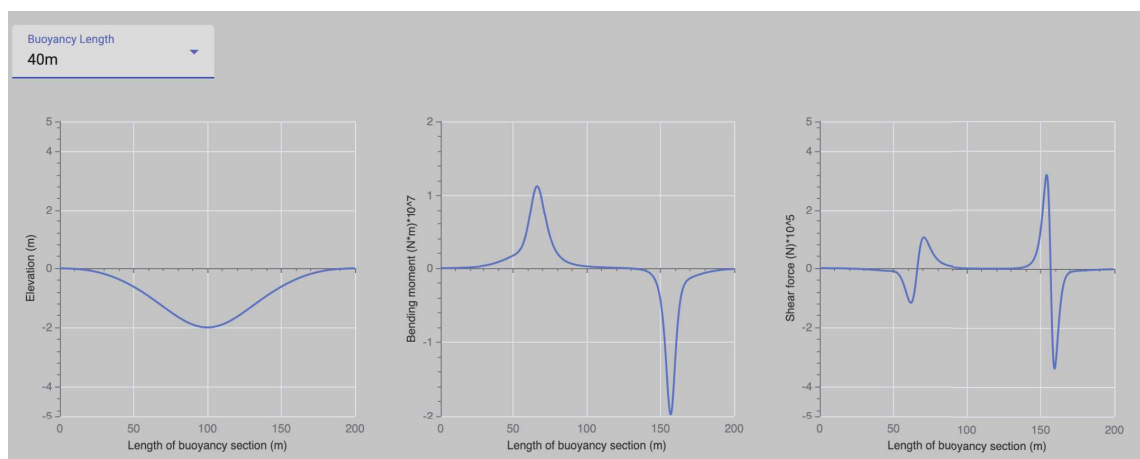
Figure A.1: Interface with marked circles for demonstration.

- **Parameter Input**

- Input your pipeline and environment parameters into in "Parameter Input" section as shown in red circle marked "A" in Figure A.1. (note that the default parameters listed are taken from P.A. Trapper's article (Trapper, 2022))
- Make sure to input the data with the correct units as shown to the right of the input boxes.
- Reset all parameters to 0 by clicking the "Reset Parameters" button in the red circle marked "B" in Figure A.1.
- When ready, submit your parameters by clicking the "Submit Parameters" button in the red circle marked "B" in Figure A.1.

#### • Data Visualisation

- Click the drop down selector in the red circle marked "C" in Figure A.1 to open up a selector for the buoyancy section length
- Once you have selected a length, the charts showing the elevation and forces will appear in the data visualisation section as shown in Figure A.2.
- You can then scroll to zoom and click and drag to move across the x axis.



**Figure A.2:** Example of the graphs in the data visualisation section of the interface.

#### • Exporting the Data

- To export the results of the calculations in a JSON format, check the box "Download variable data as JSON" shown in the red circle marked "D" in Figure A.1.
- To export all the graphs produced with the current parameters, check the box "Download graphs as PDF" shown in the red circle marked "D" in Figure A.1.
- If you wish to have explanations on the calculations included in the PDF with the graphs, check the box below it titled "Include graph explanations" in the red circle marked "D" in Figure A.1.