Triathlon
Ireland

A Guide to Buoy Laying & Course Measuring

Introduction

The aim of this guide is to provide the basic information to help you install an accurately measured swim course.

The principles covered with the guide can be applied to all types of water (lake, river or sea) and for events or regular swim sessions.

Background Research

Prior to designing your course it is recommended that you get as much background information about the nature of the waterbody as possible. Time invested at this stage will reduce the likelihood of unforeseen challenges during the course build. Local knowledge e.g. from the water owner/operator or sailing clubs that use the venue should be sought where possible.

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1. **WATER DEPT** - Knowing the water depth will give you an idea of how much rope you will need. It will also give you an indication of how much the buoys may move in the wind / tide and how difficult it will be to lay and recover the buoys. Taking depth readings around the course can help identify any sudden depth changes/shelving which can cause difficulty for buoy laying.

Note: If you do not have access to a boat equipped with depth reading capability you can simply measure by using a weighted rope and measuring the length of rope required for the weight to reach the bottom.

2. **TYPE OF SUBSTRATE** - whether a lake, reservoir, river or sea it is important to know what the bed is made of as this help identify what type of weight or anchor to use. It is far harder to secure buoys on a rocky substrate than on a silt or mud substrate.

3. **TIDE/FLOW –** if tide or flow is going to be a factor for your course it is important to know what it is going to be doing at the time of the course laying and the time of the swim event/session which may be some time later. Changes in water depth and/or changes in flow direction will affect the buoys and may necessitate some adjustment prior to the swim.

4. **OBSTACLES** – are there any hazards that may affect laying, adjusting and retrieving the course such as underwater pipes or debris?

5. **OTHER WATER USERS** – Could the course inhibit other water users or cause conflict? Could they accidently damage the buoys or move them?

Note: If there are existing buoys/marks for other activities that may cause confusion please seek permission before removing or relocating them.

6. **WIND DIRECTION** – what is the direction of the wind forecast at the time of the swim? Will it be different to the wind direction at the time of the course laying and therefore potentially affect the buoys and require some adjustment prior to the start?

7. **DURATION** - how long will the buoys be in the water? Is the course going to be in for the season or only for the day? This will affect the choice of equipment to use.

Planning

When planning a course thought should be given to ensuring that:

- The simpler the course shape the less likely it is for swimmers to become disorientated and go off course. Straight line, rectangular, triangular and circular courses are generally easier to follow. Swimming parallel to banks/shores can also help swimmers to maintain a straight line;

- There are enough buoys so swimmers don't get lost but not too many so as to confuse swimmers and, the distance between buoys and their size and colour facilitates easy sighting.

Other factors to take into consideration:

1. **ENTRY/EXIT** - Where will swimmers enter/exit the water? Are their obvious/safe locations which will dictate the start and finish point(s) for the swim?

2. **SUN** - The position of the sun when swimmers are on the course which will impact on the swimmers' ability to sight (and the ability of the safety team to observe swimmers) when swimming towards the sun.

3. **TIDE/FLOW** - Unless specifically designing a challenging course the swim route and direction should favour the swimmers?

4. **FIRST TURN** - For non-linear swims with many swimmers starting at the same time the distance to the first turn buoy should be sufficient to allow swimmers to separate out as far as possible to reduce the chance of collisions. Whilst the time taken for swim waves to separate varies depending on wave size and the mix of swimming ability it is advisable to avoid any sharp turns for a minimum of 200m. If this is not possible limit the wave size?

5. **TURNS** - It is preferable for swimmers to maintain buoys to the same side and where applicable always turn in the same direction? If this is not possible how will you distinguish between a left turn and a right turn?

6. **MULTI DISTANCE COURSE** - If you do need to accommodate different distances based on the same course, how will the different distances be clearly marked? The use of different colour or different size and/or different shape buoys can work well.

7. **COURSE SIZE** - The size of course should be guided by what can be comfortably managed from a safety perspective (and in particular the ability to swiftly recover any casualties with the available safety resources).

8. **CLEAR SIGHT LINES** - As far as possible, natural or man-made obstacles that prevent clear sight lines for both swimmers and the safety team should be avoided.

9. **EXISTING BUOYS** - are there any existing buoys you could use as part of your course?

Course Map

Once you have designed the swim course based on the above, developing a course map that can be printed off and used to guide the buoy laying is highly recommended. The easiest way to do this is to use a satellite image of the venue and to mark the buoy positions directly onto it.

The use of Google Maps or Google Earth is useful at this point as they allow you to measure distances between buoys and determine the distance of your course. It also allows you to plan buoy positions and work out visual references. If desired, it can also then be taken a step further with the buoy positions loaded onto a GPS app.
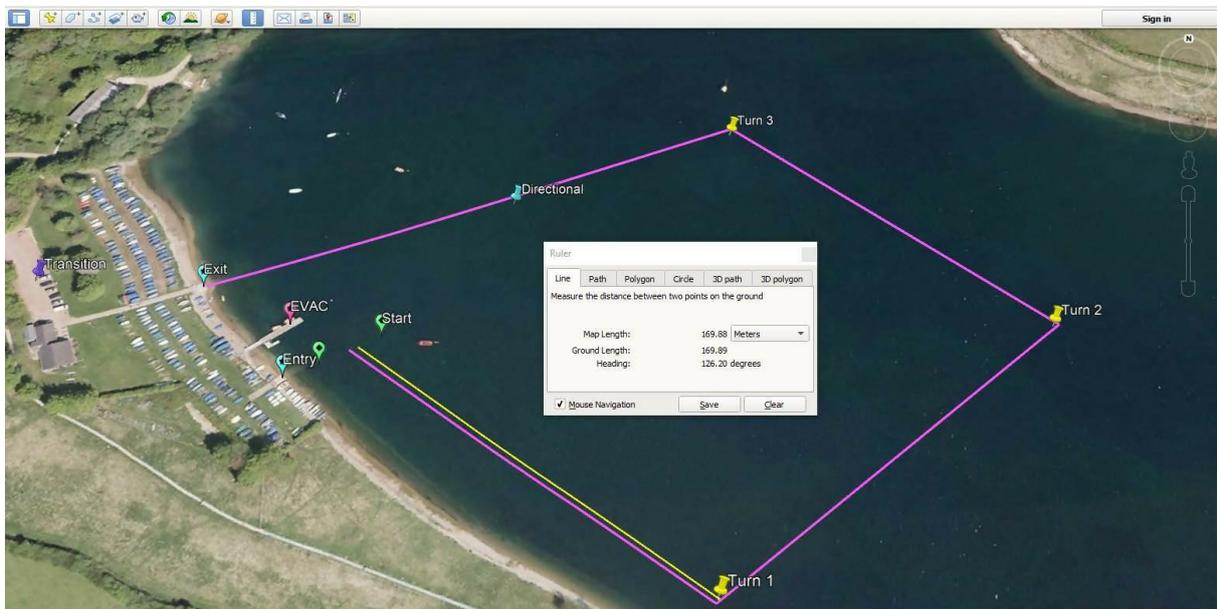
Equipment

Once you have planned out your course it is time to mark the equipment you will need. Some or all of the following items are required:

- **BUOYS** - do you have enough? Are they in good working order?Where applicable and prior to the swim session inflate the buoys overnight to test for any punctures or leaking seals.

- **ROPE**

    – Polypropylene rope is available in different thicknesses. 8mm rope will suffice for the majority of courses but where there is likely to be significant strain on the rope e.g deep water (20m+) it may be prudent to use 10mm rope.

    – Gloves can help prevent rope burns and discomfort when droppng heavy weights attached to polypropylene rope.

    – Before cutting polypropylene rope wrap it with electrician's tape/insulation tape at the point where you are going to cut it to prevent the rope from fraying once cut.

- **COUNTER WEIGHTS** - a counterweight suspended immediately below the buoy will make it stand upright. Not all types of buoy require a counter-weight and the size of the counterweight required will vary depending on the size and shape of the buoy but it is likely to be between 5kg and 20kg.

- **GROUND-WEIGHT/ANCHOR** - this is the weight that will be on the bottom. For tidal water it will need to be an anchor but for inland waters a mud-weight.

Various items can be used to act as mud-weights but for ease try to use something that is easy to secure to the rope such as a hollow dense concrete block, bucket of concrete with a metal eye, a kettlebell weight or a free-weight disc.

- **SHACKLES/CARABINERS** - budget zinc ionised shackles are a very useful item to have with you particularly when you are using temporary buoys that need to be replaced quickly.

- **SMALL EQUIPMENT** - knife, insulation tape, tool bucket, gloves, cable ties – there is nothing more annoying than finding you are missing something that means you cannot lay a buoy correctly.

- **GPS OR GOLF RANGE FINDER** - if you have set distances between buoys a range finder is the easiest way to set that distance. If you have a pre-planned course marked out on an app then use that and have faith in the accuracy of the app.

Laying

Before starting to install the course give some thought to the order in which you want to lay the buoys. This may be working backwards from a known point or putting corner marks in first and then putting guide marks in later.

There is no perfect way to lay a buoy and it is worth bearing in mind that there will always be some movement due to water movement or wind.

IMPORTANT: Avoid the temptation to get the line so tight that there is no slack in the line as any change in water height (e.g. due to waves, tide, heavy rainfall) will result in the ground-weight lifting off the bed and the buoy moving.

To lay a buoy you will need:

- A ground weight (and counter-weight if needed)

- Line/rope and,

- The buoy itself

The whole operation is much easier if you pre-prepare the equipment as far as possible. The suggested method for laying the buoy is:

- Connect the ground-weight to the rope (remembering to use a protective strop if the ground-weight is sharp – see above);

- Make sure the rope is free to run, there is nothing worse than the weight getting caught half way down because the rope is twice round your ankle;

- When in position drop the weight and let the rope run until the weight is on the bottom (if you are letting it run through your hands then wear gloves);

- Once weight is on the bottom cut the rope (using insulation tape to prevent fraying) allowing for slack andtying a loop in the rope at surface level;

- Connect the buoy to the loop using a shackle or carabiner;

- Where required, connect a counter-weight on a short line of required;

- Trim the rope to the correct length, leave a short tail after the loop. This is useful to grab later.

If there is wind or flow it can be difficult to hold position to get everything prepared so it is best to work as a team of two minimum where one person drives to the correct position (from down-wind or tide) and holds the boat in position while the other person prepares the ground- weight so it can be dropped as soon as in position. Once dropped work efficiently to get the loop in the rope. If you want to connect a temporary buoy you can come back and connect the counter weight and buoy.

Try to keep the boat head to wind or tide whilst laying the buoy and try to work towards the front of the boat. Once the buoy has been laid drop back away from the buoy as to not catch it with the propeller.

Measuring

Swimmers will never swim in a perfectly straight line from buoy to buoy but they will notice if the course is long or short from their timings and/or their GPS watches, if worn. Therefore the course should be as accurate as possible.

Whether it is due to tide/flow or to a change in wind direction, buoys will move around in the water and it is not possible to stop this from happening. This means that no matter how well you lay your course there will always be a degree of error when it is measured. This will be exacerbated by any deviations from the most direct swim line when measuring the course in a boat. Therefore, when measuring the course the aim should be to get as close to the distance as possible. With careful course laying it should be possible to get within 1 – 2% of the required distance in the vast majority of cases.

RECOMMENDATION: Measure the course more than once and ideally in both directions before working out the average distance.

Removal

When it comes to removing the course, please do so with care. Try to remove all the weights and rope that you have used. This may mean you can re-use them but it also is better for the environment and more respectful of other water users.

If the people who strip out the course differ to the people who laid the course it is important to ensure that they understand how the buoys are connected and what weights are attached so that they remove everything without creating further issues e.g. cutting ropes unnecessarily or not repositioning existing buoys correctly. It may be easier to ask the strip out team to swap the buoys for temporary buoys which can remain in situ until the course laying team are able to complete the strip out and return any existing buoys to their correct position.

Additional Information

Flow

http://www.epa.ie/pubs/reports/water/flows/

Tide

https://data.gov.ie/dataset/irish-national-tide-gauge-network

http://waterlevel.ie/

Weather Forecast – (including wind direction).

https://www.windy.com/?53.334,-6.249,5 .

https://www.met.ie/forecasts

https://www.yr.no/place/Ireland/Leinster/Dublin/