Drawing your base map

If you're close enough to do so, take your field map home, create an accurate base map and then return to the site to record other site information. However, if you're having to create your field map *and* do the whole survey in just one visit, try to make your map as accurate as you can and use plenty of tracing paper for overlays. If this is the case, skip ahead now to 'Recording site information' (p56) and return here afterwards.

Decide your map scale

Taking our field map, we first need to determine the *scale* of our more accurate base map. This we decide by identifying the longest dimension of the site and the size of the paper we are intending to use for our drawing. In my mobile home design – the rough field map example (p38), the approximate site dimensions were 25m by 12m. As the longest dimension was significantly bigger than the shorter one, I used this to guide my choice of scale. On that occasion I decided to draw my base map onto A3 paper (420mm x 297mm). As my design was eventually to be scanned and displayed online, A3 seemed big enough. If you need it to be bigger to show to a group of people and you won't have access to a projector, A1 (flipchart size) paper would be more appropriate.

Useful mapmaking tools

- Drawing board
- Paper, tracing paper
- Pens (pref. technical drawing), pencils, including colours
- Eraser, sharpener
- Pair of compasses (for drawing arcs)
- Protractor, set square
- Ruler (ideally one with a selection of scales on it)
- Set of stencils
- Or for the technologically minded, Computer Aided Design combined with data points from a hand held GPS unit.

Normally I might have divided the longest measurement (25m) into the longest side of the paper (420mm), but I noticed that I could fit the longest dimension onto the page *diagonally*, if I chose a scale of 1:50 (25m into 500mm). Interestingly, this also allowed my north arrow to point to the top of the page, always a good convention to follow to avoid confusion. Then having decided upon a scale, I divided the real life distances by the scale ratio (in this case 50), to calculate the measurements on my drawing.

It's very easy to forget to scale down one or more measurements if you do them one at a time. In my case, forgetting to divide 10m by the scale of 50 might leave me plotting a 10cm line instead of the 20cm it should be. So I recommend that you take your field map and do all the scale calculations first, writing them in a different coloured pen to distinguish them. Alternatively, a scale ruler allows you instead to plot everything using your original site measurements.

Draw in your chosen baseline

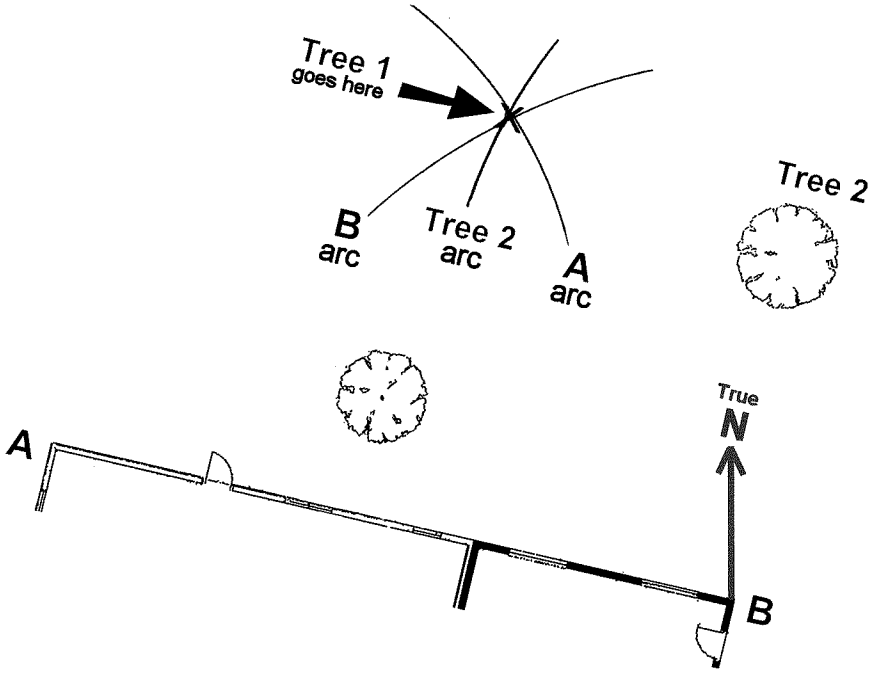
Next we need to create a reference from which all our other measurements can be plotted. Having calculated the scaled-down length of your baseline and the best place for it on your map, draw it in. Ideally, at this point you'd align your paper to true north first (this is convention), even though most of your measurements will be plotted from your baseline.

Plot the fixed elements

So, marking lightly at first with a pencil until you're sure your markings are correct, start adding details to your map. The methods are different, depending upon whether you took bearings or measured distances. If you took bearings, you're going to need a protractor. If instead you surveyed the site by taking measurements from either end of your baseline to each element, you'll need a pair of compasses for drawing arcs. If you don't have one, you can achieve similar results by using a long strip of paper. I'll assume you have compasses.

From distances: First identify the scaled-down distance of your first element (let's say Tree 1) from corner A. Open the compasses to that length, anchor the point at A on your map and draw an arc across the approximate location of Tree 1.

Now do the same, only this time for the scaled-down measurement from corner B. If you have done this correctly, the two arcs should cross as in the diagram below.



Once more, the degree of accuracy is greater if these arcs cross at close to a right angle. If this is not the case we can draw another arc in reference to a third known point (Tree 2 in our diagram). However, it would be highly unlikely for these three arcs to cross in exactly the same place. More than likely they will form a triangle. The actual position is probably somewhere in the middle of this. Repeat this same process for all the other site elements you have measured.

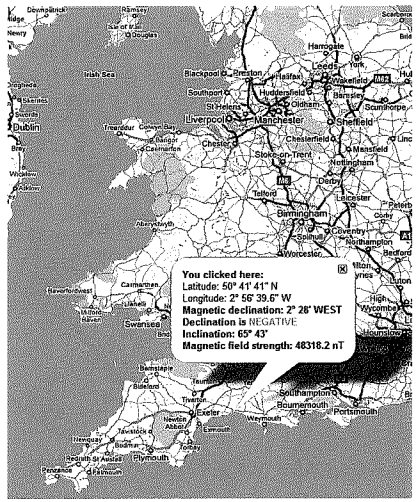
Try to limit your reference points to the ends of your baseline and a third chosen reference if you can. Each new reference point, especially if not being accurately pinpointed from both ends of your baseline, increases the risk of compounded errors.

Hopefully at the end of your plotting process, everything will look proportional. If so, it's time for the next stage.

From bearings: If instead you surveyed by taking bearings, you'll need a protractor for plotting out your points. One key advantage of this method is that once you have scaled-down your baseline, there are no more scaling calculations to do.

Instead the risk of errors comes from drawing bearings in relation to the wrong reference direction. To minimise the risk of error, align your map with north to the top. I'm talking now about *true* north, not magnetic north (which is where a compass points).

Magnetic north moves about over time and its direction also varies depending upon whereabouts you are. In some parts of the world the difference (which is called magnetic declination) can be quite significant.



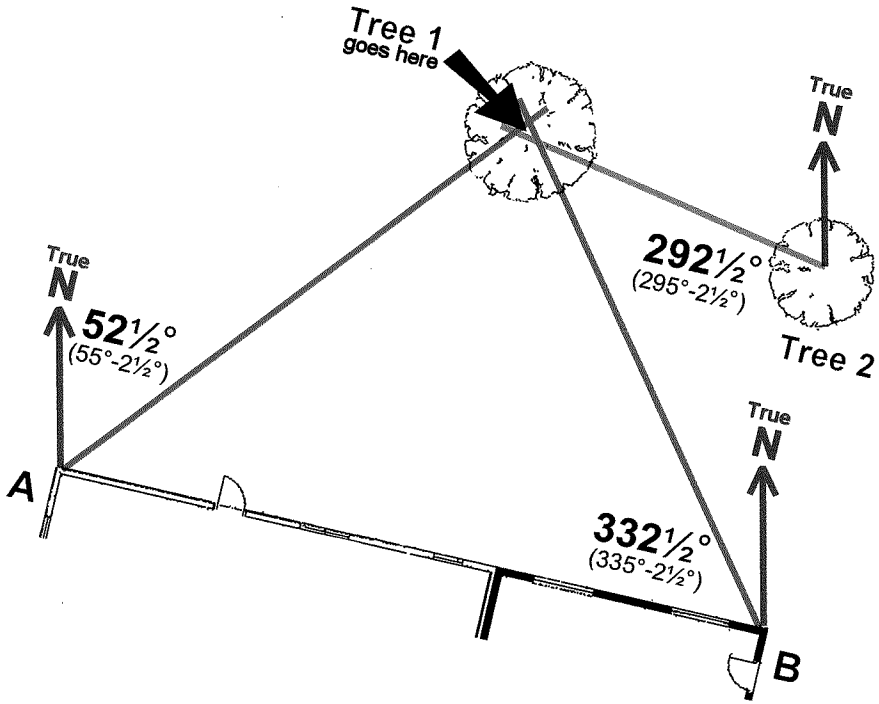
Thankfully, the good old World Wide Web tells you the current magnetic declination for any location.† You just click on a world map and a pop up box tells you the number you need to know. Once you've got this figure, what do you do with it? Well, to turn your magnetic north bearings into true north bearings before plotting them, you'll need to *add* an easterly (positive) declination or *subtract* a westerly (negative) one. So by way of an example, the declination where I'm living now is about 2½° west. With a small declination like this you might just ignore it to simplify matters; if you were somewhere it was 10°, 15°, or even as much as 40°, you'd want to adjust for it.

So in this case where I live, the true bearing from Tree 2 to Tree 1 in the diagram overleaf would be:

295° minus (as it's westerly) 2½° = 292½°

† *The online resources also include links to websites that have such information.*

If you have to adjust for magnetic declination, don't forget to do this sum for *every* bearing you take, or you'll end up plotting things in the wrong places. As before I would write the adjusted bearings in a different colour to limit the risk of this happening.

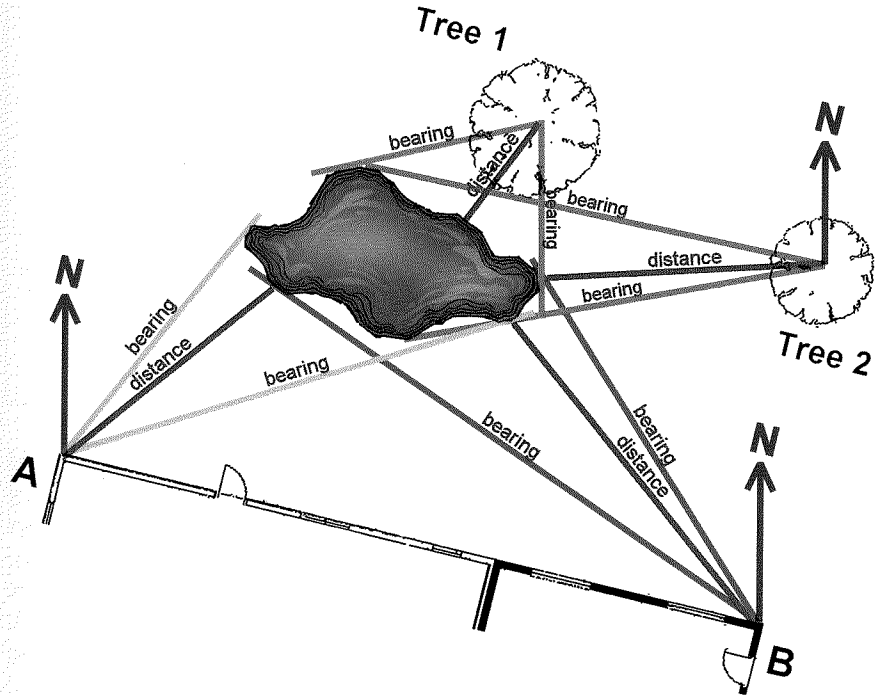


So decide whether a portrait or landscape format suits the site alignment best and use the edges of your paper as the reference for plotting your bearings. Perhaps you can now see another reason why grids on maps are popular? Having aligned true north to the top of the page and adjusted your bearings (as we've done in our diagram), all you need to do is to use the protractor to draw in the bearing directions to each element from points A and B. Calculate each bearing by measuring clockwise around a circle from north, which is at 0°. Mark each element's location where the pairs of lines cross. As before, if you want to be extra sure, you can use a third bearing to create a triangle, inside which you can plot a point.

Plotting non-point elements

We can use a combination of these two techniques to plot the lake we were mapping earlier. Effectively we are just plotting a series of points that we'll join up to make our shape. If you had the skill to take bearings, plot these on your map first. The diagram below shows how two bearings from each point (the coloured lines) quickly define the space inside which the lake must lie.

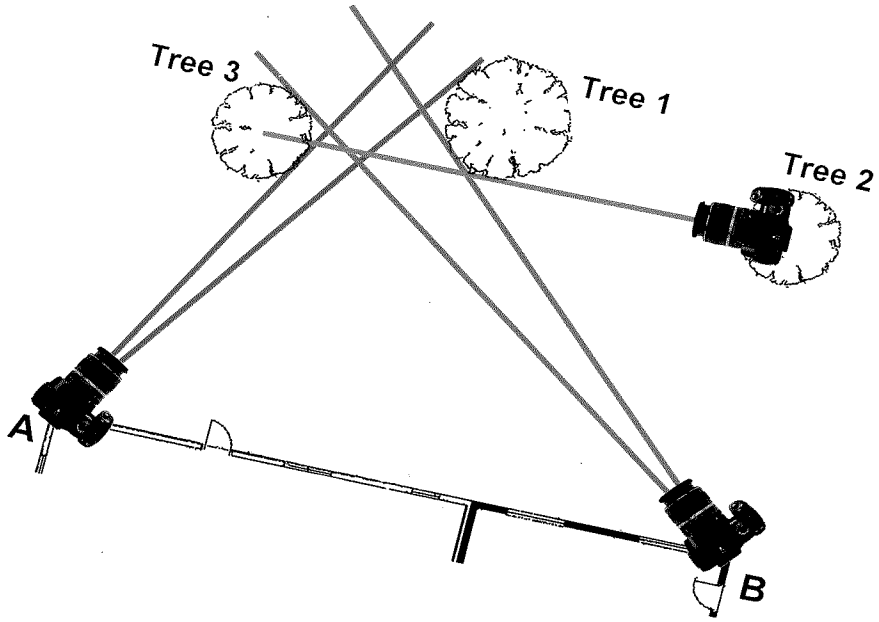
The additional distance measurement that we took from Tree 1 helps us to define how far inside that space the north bank lies and we can do the same with the other measurements we took from our other mapped points. Having sketched an outline on site, we can now transfer that inside this space.



As an extra, you can scale down the circumference that you measured, cut a piece of thread to that length, join its ends together and lay it out on your map until the shape looks right before tracing the outline onto the paper.

What if I forgot to measure something?

Don't worry; making mistakes is the quickest way to learn. This is where our photos help (you did take some didn't you?). In our diagram below, photos taken across the site from our three reference points A, B and Tree 2, can help us pinpoint Tree 3 if we forgot to take measurements or bearings for it.

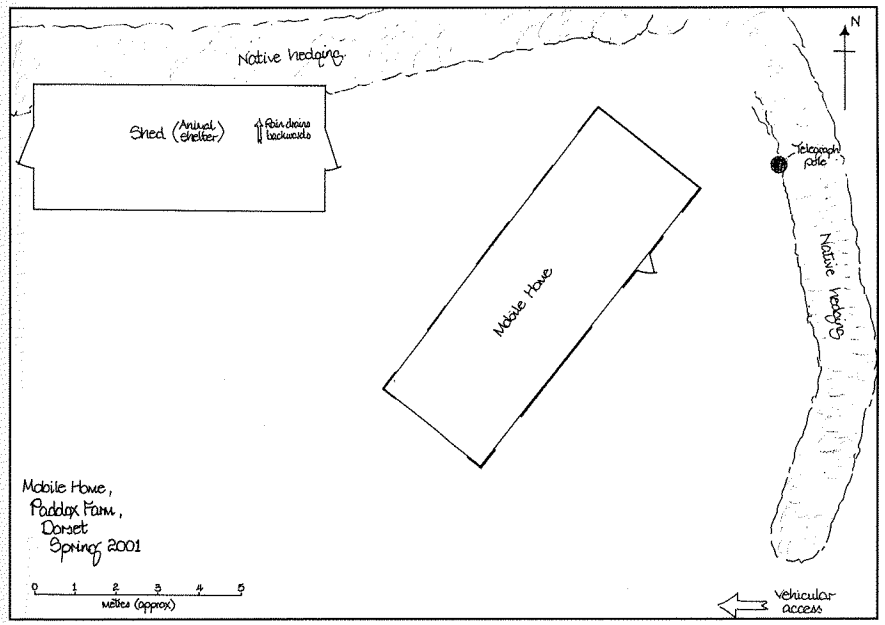


The photo from point A shows us that Tree 3 is to the left of Tree 1, the gap between them along that line of sight being about half the width of Tree 3's canopy. From B, Tree 3 is again seen to the left of Tree 1, but this time the gap is more like the full width of Tree 3's canopy. The photo from Tree 2 shows us that the trunk of Tree 3 aligns with the outside of Tree 1's canopy. Therefore, even without measurements, these photos still help us plot Tree 3 fairly accurately onto our map. Try it!

The same technique can also help us to plot non-point objects like a pond if were unable to take bearings. We can again use sight lines from known points, past its different edges, allowing us to plot points on its boundary in relation to other elements.

Join the dots, finish the base map

If after having plotted all your points out, the distances and angles look correct, join the points together to create your map. It should at this point look correctly proportioned – if not, recheck your measurements, it can be easy to miscalculate when scaling down distances. Once you are happy with your map in pencil, draw over it with a good pen.



Here's the final base map (above) for my mobile home design. It includes only the 'unmovable' elements, the rest of the space being under consideration. All the other site information was plotted onto overlays. Compare it with my scruffy looking field map (p38). As you can see, you don't need an accurate field sketch, as long as you record enough measurements and/or bearings. This design was for my home garden, so photos were less important that time. Remember their great value though when surveying away from home. The cost of travelling back to a site, both in time and money, can be substantial. Prepare well for your survey trip and get what you need first time. Now make *at least one copy* of your base map in case you accidentally ruin the original.

Summary

The key things to remember about creating a base map are:

Surveying the site

* *Observe, but don't start designing yet!*
* *You may only see a site in a particular season. Clients and neighbours may be able fill in the gaps though, so make a note of any questions you have for them.*
* *A friend can offer a different perspective on your own site.*
* *Existing maps can save you a lot of surveying time, so it's even worth paying for one if need be. Aerial photos can be useful too. Be aware that either could be out of date.*

Creating base and field maps

* *Scale up existing maps wherever you can to save time.*
* *Making your own field map is time spent learning a useful skill. Measure distances or take bearings from a baseline.*
* *The degree of accuracy required depends on what you plan to do. 90-95% correct is usually good enough.*
* *Survey slopes where relevant.*
* *The simplest tools are usually the most reliable, though more technological solutions can save you time.*
* *Take photos across the site from key points.*

Drawing your base map

* *A base map shows just the main fixed elements on a site. You can use overlays to record everything else.*
* *Decide on your scale, dividing your longest edge into the long dimension of your paper, but leaving room for a key and other information on your sheet.*
* *Align your map to true north.*
* *Start by marking out the baseline and plot all other points from there. When you're happy it looks right, join the dots.*
* *Don't forget to add a north arrow and scale, address and date.*

Base mapping flowchart