**Fieldwork Data Collection Techniques**

The aim of this document is to provide examples of fieldwork techniques to gather data that can be used for Stage 1 Geography Fieldwork. Many of these techniques can be used across a wide range of different fieldwork topics and locations.

The data collection techniques have been organised into techniques for:

* Measuring
* Counting
* Mapping
* Surveying
* Sketching
* Interviews and questionnaires

**MEASURING**

Measuring can be a major component in a wide range of fieldwork activities. The following are a selection, some of which can be applied across a wide range of topics and others which are more specific to particular areas of investigation.

**Coasts, beaches and sand dunes**

* Measuring beach profiles and sand dune transects:
  + Profiles use measurements of slope angle and distance to show the shape of the beach.
  + Preliminary secondary research into metro coastline, for example at [www.environment.**sa**.gov.au/files/sharedassets/public/coasts/no32.pd](http://www.environment.sa.gov.au/files/sharedassets/public/coasts/no32.pd)
  + Select sampling points for beach profiles.
  + Use ranging poles to mark the start and end points of the transect, and note the main changes in slope angle, break in slope, as these will delineate the sections of the profile.
  + Use ranging poles and a clinometer; you can make one, see the instructions at <http://www.instructables.com/id/Basic-Clinometer-From-Classroom-Materials/> to measure the slope angle at each section of the profile. To do this, a student should stand at each end of the section with a ranging pole and the angle between the same markers on the ranging poles is measured using the clinometer. The distance between the ranging poles is measured using a tape measure. These steps should be repeated for each break in slope along the profile.
  + The slope angle and distance data can then be fed into a software program such as that available at <http://www.bluesquarething.co.uk/geography/beach.htm> or can be drawn by hand using trigonometry.
* Sand dune ecosystems:
  + A sand dune profile is carried out in the same way as a beach profile. The vegetation species along the dune system from the embryo and fore dunes to the climax vegetation is recorded at intervals along the profile.
  + Along the sand dune profile a quadrat is used to measure the percentage of vegetation cover and the coverage of different plant species. If you don’t have access to quadrats then instructions to make them can be found here <http://limpets.org/rocky-intertidal-monitoring/ri-equipment/make-quadrat/> or <http://www.rgs.org/OurWork/Schools/Fieldwork+and+local+learning/Local+learning/Fieldwork+in+the+local+area/Make+your+own+fieldwork+equipment.htm> .
  + The amount of vegetation cover for each species can be recorded using the ACFOR scale, a version can be found at <https://rgsbio09.wikispaces.com/10+Field+Study+Techniques> .
  + Other measurements along the profile can be recorded, for example: soil pH, soil moisture content, these techniques can be found in the soil measurement section below.
* Beach processes, longshore drift and management strategies:
  + Preliminary secondary research into metro coastline, for example at [www.environment.**sa**.gov.au/files/sharedassets/public/coasts/1984\_review.pdf](http://www.environment.sa.gov.au/files/sharedassets/public/coasts/1984_review.pdf)
  + Quadrats can be used to select beach sediment for sampling; alternatively ten pebbles touching your foot can be selected at each location.
  + Measure the longest and shortest axes of each pebble in the sample, using callipers or a tape measure.
  + To record the shape of beach material, measure the angularity of each pebble using power’s index of roundness, for example <http://www.earthstudies.co.uk/Geography/Individual%20Research%20in%20Geography%20G3/Powers%20Scale%20of%20Roundness.html>
  + Longshore drift can be measured in different ways:
    - Measure, with a tape measure, a 10m section close to the water and mark off the start and finish points using ranging poles. Place a float (rubber duck, orange, piece of cork) in the breakwater at the start point and time how long it takes to move across the 10m section and reach the end point.
    - More complicated: spray paint 100 pebbles and place them in the breakwater at a pre-determined point. Mark this starting point on an appropriate scaled map. After 7 days return to the beach and locate any spray painted pebbles. Measure their distances from the starting point and plot their locations on graph paper.
  + The effect of management strategies such as groynes on beach processes can be investigated by measuring the height of beach sediment on each side of the groyne. Measure the distance from the top of the groyne to the surface of the sediment and repeat at the same point on each groyne along the beach.

**Water Quality**

Investigating water quality can be done in the field or, in a simulated environment in the classroom, using educational kits such as Waterwatch which may already be in your school or is available to download at <http://www.vic.waterwatch.org.au/education-resources/208/>. There are different elements that can be tested to measure water quality.

* Temperature is a useful measurement as it is the basis of other tests such as dissolved oxygen. The temperature should be measured using a sturdy thermometer attached to a length of string and should be recorded at the same site as samples are taken.
* PH can be measured in several different ways, the most accurate way is using a digital meter, however these need frequent calibration. Litmus paper can be used to measure pH; it is easy to use but is less accurate than a digital meter. The third option is pH indicator or reagent, which are liquid drops that change the colour of the water. This comes with a colour chart to match the colour of the water and indicate the acidity or alkalinity.
* Salinity can be measured using an EC meter (Electro conductivity) or more commonly, using the Total Dissolved Salts method (evaporating the water and weighing the remaining salt).
* Macroinvertebrates consume algae and other organic material and so help to remove nutrients from water systems. They are an excellent indicator of water quality. Each type requires particular environmental conditions to survive and some are more tolerant of pollution than others. Macroinvertebrates can be caught using a hand held pond or dip net. Some care should go into the selection of sampling sites, information on sampling can be found at <http://www.waterwatch.org.au/>. Samples should be spread out in trays in order for the macroinvertebrates to be picked out from the sediment and other debris. Identification of the macroinvertebrates can be done using identification keys and a SIGNAL 2 score calculated, more information on this can be found at <https://www.environment.gov.au/system/files/resources/a9ad51d4-a8a2-4e21-994d-c6381f7445ee/files/signal.pdf>

**Soils and Vegetation**

Many of the techniques described here can be used for measuring the characteristics of soils and vegetation in different contexts, including woodland, scrub and bush, and sand dunes.

* The effect of light on vegetation growth:
  + Select a transect from the edge of a woodland (or any other vegetated area) into the centre and mark this out with a tape measure. Use systematic sampling to select points at which to measure the amount of light getting through the canopy. This can be done using a light meter or holding up a quadrat to estimate the percentage cover. There are also several apps available that measure light intensity and luminosity.
  + At each sample point along the transect, vegetation type and abundance are recorded. Students can estimate the percentage of ground covered by each plant species in the quadrat. Alternatively, students can count the number of individual plants in each species that is evident in the quadrat and express this as the number of plants per square metre.
* Soil profiles and properties:
  + Soil pits can be dug to examine soil profiles and descriptions of the structure, texture, colour and, depth of the horizons recorded to help identify the soil type. This can be extended to investigate a soil catena, a series of soil profiles down a slope.
  + Soil pH can be measured using a soil testing kit or electronic pH meter. Simple soil pH kits can be purchased from garden centres.
  + Soil temperature can be measured using a soil thermometer. Measurements should be repeated at each sample site to ensure reliability.
  + Soil moisture content can be measured using a soil moisture meter. Alternatively, by collecting a small sample of soil in a sealed plastic bag and then drying it out slowly in an oven. The soil is weighed before and after heating overnight in an oven set at 100oC, the difference in weight is the amount of moisture lost.
  + Infiltration rates can be measured using an infiltrometer, alternatively a ring infiltometer can be made relatively easily, instructions can be found at <http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/168703/northern-rivers-soil-health-card.pdf> . A plastic fizzy drink bottle can be used rather than more expensive pipe; the bottle will be easier to cut.
  + Soil erosion, for example along a footpath in a woodland area, can be measured by recording the width of the footpath using a tape measure. This is then repeated several times to calculate the increase in the width of the footpath as it becomes eroded. This can be used in conjunction with infiltration measurements as these would indicate the level of compaction of the soil resulting from trampling.

**Weather**

Measuring weather elements can be useful in many different types of fieldwork investigations, particularly those involving soil and vegetation. Microclimate studies can easily be carried out in the school grounds or the local area.

* Wind speed and direction:
  + Homemade instruments can be substituted for wind vanes and anemometers, for example a wind sock to measure direction. There are several ways to make a homemade anemometer and use it to measure wind speed, for example follow the instructions at <http://www.scientificamerican.com/article/bring-science-home-wind-speed/>.
* Temperature, light levels and humidity:
  + Digital or analogue thermometers can be used, perhaps borrowed from the science department if necessary.
  + Light meters or lux meters can be very expensive but garden centres do sell sunlight calculators at a reasonable price or there are a myriad of light meter apps available. Alternatively, cloud cover can be measured using a cloud mirror. Using marker pen or crayon mark out 8 squares on a mirror and lay flat to reflect the unobscured sky (no buildings or trees in the way), each square represents 1 okta of cloud cover.
  + Hygrometers to measure relative humidity can be expensive but can be made quite easily, for example follow the instructions at <http://www.legacyprep.org/userfiles/150/Classes/740/Human%20Hair%20Hygrometer%20Instructions.pdf> .
* Precipitation:
  + Homemade rain gauges are relatively easy to make out of plastic juice bottles, for example follow the instructions at <http://achieve.weatherbug.com/brainstorm/activities/makingaraingauge.pdf>

**COUNTING**

Counting can be used in many fieldwork investigations and is generally a simple technique that doesn’t require expensive equipment.

**Traffic and pedestrian**

Traffic counts produce information about volume of traffic and also the flow of traffic at different times of the day.

* Sample points are selected on the roadside in a position that is not obstructed by parked vehicles or buildings. Sample points should not be near junctions with other roads. Students count the number of all types of vehicles going in both directions past the sample point for a fixed period of time, 15 minutes is usually sufficient.
* This process should be repeated at different times of the day to analyse traffic flow volumes throughout the day.
* Pedestrian counts can be undertaken using the same methodology as traffic counts.

**Litter**

Litter counts can be used in both urban and rural fieldwork investigations. They are useful when investigating human impact, for example on a sand dune system, and for evaluating management strategies.

* Sample areas are selected according to the nature of the investigation. Sample points may be selected systematically along a sand dune transect and a quadrat used to delineate the sample site. All items of human litter are counted and can be categorised.
* It is also a good idea to take photographs of the litter at sample sites as this provides information about the state of degradation of the litter.

**MAPPING**

Mapping techniques are fundamental to fieldwork and some form of mapping should be evident in all fieldwork investigations. Mapping supports fieldwork and help students to question and understand their primary data, GIS can further enhance the analysis of spatial data. There are many spatial technologies that can be utilised in fieldwork to produce location maps, multilayered maps and 3D representations. Detailed below is a small selection of mapping techniques that can be adapted for use in a variety of fieldwork investigations.

* Land-use transect:
  + Base map (paper or GIS) and land use classification key required (can be devised as a class activity or found on the internet, for example at <http://theses.ulaval.ca/archimede/fichiers/21646/ch02.html> ).
  + The land use classification key should be based on the type of land use and then sub-divided according to age, style, building materials of individual buildings. The land use classification key is used to colour and/or code the buildings shown on the map.
  + It may be a good idea to redraw the map (if a paper one has been used) following data collection to ensure all of the land uses are clearly shown.
  + The land use classification key can be adapted to suit a rural area.
* Distribution of shops and services:
  + Base map (paper or GIS) used to mark on different types of shops and services. Each shop and service is numbered and the distance between each shop and its nearest neighbour is measured (in cm from the map). The measurements are put into a table and the average of all distances is calculated. The total area under study is calculated (in cm and the figures put into the nearest neighbour analysis formula, this can be found at <http://geographyfieldwork.com/NearestNeighbourAlternativeFormula.htm> .
  + The number generated by the formula indicates the degree of clustering, with 0 representing a clustered pattern, 1 indicating random distribution, and 2.15 indicating regular distribution.
* Sphere of influence of a shopping centre or service:
  + Base map (paper or GIS) showing the shopping centre or service, and used to mark on the home location of visitors to the centre or service.
  + Questionnaire used to ask shoppers where they have travelled from, the purpose of their visit and how often they visit the centre or use the service.
  + Mark the home location of visitors onto the map and draw on the sphere of influence.

**SURVEYING**

There are many different types of surveys that can form part of a fieldwork investigation. Survey techniques can be used in a wide variety of contexts, and those listed below are easily adaptable. A number of the surveying techniques detailed also include other fieldwork techniques that will be unpacked further in this document, including interviews, questionnaires and sketches.

* Environmental quality:
  + Base map (paper or GIS) used to mark on locations where environmental quality is measured.
  + Environmental quality index can be devised as a class activity, using a 1-10 scale for each element. The index could include litter, vandalism, green space, graffiti, air pollution, noise pollution, traffic volume or congestion, level of building and housing repair, availability of services, parking, crime levels or safety. Students score each element of the index for each location and compare the resulting average scores (and individual elements using bipolar analysis).
* Proposed new retail development:
  + Base (paper or GIS) map showing the area of the proposed development, shops and services in the area are classified using a key according to their function (colour or codes could be used). Calculate the diversity index by adding up the totals for each type of shop and service and applying the formula which can be found at <https://sites.google.com/site/geographyfais/fieldwork/6-data-analysis/statistical-tools/diversity/diversity-index> and repeat for each type of shop and service. Higher values reflect greater diversity.
  + Questionnaire for local shoppers and residents to gauge perception of the proposed development.
* Closure of a shop or withdrawal of a service:
  + Questionnaires with local residents, interview business owner or a representative from the service provider.
  + Closure of shop could mean mapping of new journey route and time to visit alternative shop, or withdrawal of bus service could mean a mapping exercise of alternative journeys.
* Local issue such as mining:
  + Sketch or photograph the mine site and annotate.
  + Compare with historical photographs to show the extent of change over time.
  + Environmental quality survey of noise and air pollution carried out at various sites around the mine. There are several low cost methods to measure air pollution using everyday items such as milk cartons and Vaseline, a detailed description of the procedure can be found at <http://www.sciencebuddies.org/science-fair-projects/project_ideas/EnvSci_p009.shtml#procedure> Noise levels can be measured using any of the mobile phone apps available, or if your school has a noise meter.
  + Questionnaires to ascertain the perceptions of local residents.
* Quality of services in a rural community:
  + Stratified sampling used to target different groups of residents in a rural community (families, young people, elderly people, and disabled people). Questionnaires devised to ascertain the value of particular services for each sample population group.
  + Historical data, old maps or photographs, or council records could be used to identify changes in the numbers and types of services in the community over a determined period of time.
* Accessibility and car parking:
  + Map and code the types of car parking available in the study area; record the size of the car park, type (under cover, multistorey) and daily charges for each.
  + Count the number of cars at different times of the day, and different days of the week, to determine occupancy levels.
  + Assess the quality of the car parks using a quality index survey with factors such as security, lighting, graffiti, vandalism, charges, proximity to shops and services, smell, litter, layout.

**SKETCHING**

Field sketching and photography are simple techniques for gathering qualitative data that can be applied to all fieldwork investigations. Field sketching can be used to set the context of a study site or to indicate the location of sample sites or transects. The annotation of field sketches is paramount and can be used to indicate, describe and explain important features, and relationships between these features. There are some important considerations for field sketching:

* Scale – large landscape areas can be difficult to sketch and it is sometimes easier to begin with the features that are furthest away. It can also be worthwhile to divide the paper into sections to make it more manageable.
* Purpose – it is essential to decide on the purpose of the field sketch and include the features which are relevant to the field study.
* If the sketch will be compared with older photos or sketches then the framing for the sketch should be consistent

**INTERVIEWS and QUESTIONNAIRES**

Interviews and questionnaires are very useful in the collection of primary data about people’s opinions and perceptions. This primary data from both interviews and questionnaires is unique to the individual fieldwork report. Interviews can provide more detailed information and are more flexible than interviews but questionnaires can be structured in a way that makes the data easier to present in graphical form.

**Interviews**

* Interviews should be kept reasonably short, no more than 30 minutes and the questions should be designed beforehand.
* The major advantage of interviews is the use of open-ended questions to elicit detailed responses. Interviews also enable the conversation to have a natural flow and to go into detail over points of particular interest.
* Particular attention should be paid to the selection of material to analyse and interpret, and methods of presentation of the material in the field work report.
* Students should be mindful if the interview is about an issue that is sensitive or controversial.

**Questionnaires**

* Questionnaires are a very useful tool in gathering primary data about the perceptions and opinions of the population on a range of issues and developments. They can also be used to collect data about the social characteristics of the population itself. The data from questionnaires can usually be used in conjunction with other primary or secondary data.
* Thought should be given to the way answers are gathered, for example a selection of categories to choose from. This will have a great deal of bearing on the way the data can be graphically presented.
* Students should use a combination of questions that include those that have a set choice of responses, scales to measure opinion, and open questions.
* Consideration also needs to be given to the type of sampling, sample size and the number of questions. An initial decision should be made if the sampling strategy is to be random, systematic or stratified and students should aim for 10% of the sample population. Care should be taken to achieve the right balance of questions that don't take up too much time but that garner the relevant information.

**Additional Resources**

There is an abundance of resources for fieldwork techniques on the Internet. The GLOBE Teacher’s guide <http://www.globe.gov/do-globe/globe-teachers-guide> provides detailed, step-by-step data collection procedures for an extensive range of topics. It also provides useful alternatives to expensive fieldwork equipment.