**Tasman Bay Oceanography**

**Introduction**

Water clarity (sometimes called turbidity) is a measure of how clear water is; specifically it is a measure of how far down light penetrates through water. Reduced water clarity is caused by particles (living and non-living), suspended in the water column, which can limit the amount of light available for photosynthesis.

For this assessment you will design and carry out an investigation into water clarity in different locations in Tasman Bay and the factors that impact on water clarity.

You will keep a research logbook as you conduct the investigation and you will write a report on your findings. Both the research logbook and the report will be handed in for assessment.

You will be assessed on how well you have:

• planned the investigation, processed, interpreted, and drawn valid conclusions

• justified how your method allowed you to collect valid and reliable data

• explained the Earth and Space Science related to your investigation.

**Task :**

**Conduct background research and develop the method**

*(You may do this in small groups or individually and/or as part of a class discussion.)*

You will need to conduct research into water clarity, how we might measure it and why it is important. Include referenced copies of any material you use in your research logbook.

Refer to Student Resource B for web links to get you started.

Write a **purpose** for your investigation that is related to the background material

Write a **method** for your investigation that relates to the purpose, by describing:

• the valid range for the key variable

• the valid measurement of the key variable

• how other variables will be managed

• control of potential sources of error

• management of sampling bias

• how reliable raw data will be collected.

**Collect data**

*(This part may also be done in groups or individually.)*

Collect a wide range of reliable raw data by following your method.

You may change the original method if required. Make sure that you record in your research logbook any changes to your method and the reasons for them.

Record the raw data in your research logbook.

***Write report***

***(This part must be done individually)***

Include the following items in your report:

• an introduction including a statement of the purpose for your investigation linked to the background research (approx. 1 page)

• your final method, which describes:

– a range for the key variable

– how the key variable was measured

– how other variables were managed

– how you controlled for other potential sources of error

– how reliable raw data was collected

– how you managed sampling bias

• the raw data you collected consistent with the final method as recorded in your research logbook (hand this in as an appendix to your report)

• the processed data (tables, graphs, etc)

• your interpretation of the processed data (a valid conclusion related to the purpose )

• a justification of how the method allowed you to collect valid and reliable raw data

• an explanation and evaluation of the Earth and Space Science ideas related to the investigation, this should link back to what you covered in the introduction.

*What format will this report be?*

*A Word doc?*

*A SnackTools flipbook?*

*A PowerPoint?*

*Any other ideas?*

**Student Resource A: Research logbook**

You need to keep a logbook that should contain:

• notes on how you developed your method

• the results of any trialling of the method and any changes made (with reasons for change)

• the unprocessed raw data that is collected

• a record of the contribution you made to any group work

• working notes on:

– what you did to ensure the validity and reliability of the results

– any factors beyond your control that affected the method and results

– any errors made in the method that may have affected results

– science ideas that can be used in the report.

**Validity** of data means that the method is designed carefully enough so that all realistic sources of error are managed, the key variable(s) to be manipulated (changed) has a valid range, and there is accurate measurement of the relevant key variable(s), within realistic tolerance limits if necessary.

**Reliability** of data means that the results are repeatable, and that the same (similar) results are obtained each time. This doesn’t necessarily mean that the results are accurate or correct, just repeatable and consistent.

**Student Resource B: Web links related to Tasman Bay & water quality**

<http://en.wikipedia.org/wiki/Secchi_depth>

<http://serc.carleton.edu/microbelife/research_methods/environ_sampling/turbidity.html>

<http://www.stuff.co.nz/nelson-mail/3246181/Dora-to-explore-Tasman-Bays-depths>

the following link is the bestest and we will be basing a lot of our discussion on this (NIWA report for TDC)
<http://www.envirolink.govt.nz/PageFiles/98/30-Tsdc5TrawlingEffectsInTasmanCma.pdf>

<http://www.stuff.co.nz/nelson-mail/communities/7955657/Too-much-mud-in-Tasman-Bay>

<http://icm.landcareresearch.co.nz/knowledgebase/publications/documents/tuckey_etal_tasman_bay_circulation.pdf>

<http://www.tasman.govt.nz/environment/coastal-marine/coastal-marine-management/oceanography-and-marine-water-quality-in-the-nelson-bays/>

<http://www.royalsociety.org.nz/publications/journals/nzjm/2002/004/>

**Assessment schedule: Earth and Space Science 3.1A Water Clarity (an example… not our Tasbay one!)**

|  |  |  |
| --- | --- | --- |
| **Evidence/Judgements for Achievement**  | **Evidence/Judgements for Achievement with Merit**  | **Evidence/Judgements for Achievement with Excellence**  |
| The student has carried out an independent practical Earth and Space Science investigation. The student report has stated a purpose arising from their research into water clarity and how it is affected by rainfall. For example: *My investigation will look at water clarity at three locations in the Waikato River during fine weather (no rain in last 72 hours) and over time after rain that has fallen for at least two hours.* The student has developed a method that gives: - the range for the key variable(s) - how the key variable(s) is measured For example: using a Seechi disk - the management of other variables For example: *Same person should take readings of Seechi disk, since sharpness of vision varies from person to person.* - management of sampling bias - how valid raw data is reliably collected For example: *Take readings more than once and average results.* The student has collected raw data that is consistent with the method. The student has recorded and processed raw data relevant to the purpose. The student has interpreted the processed data to draw a conclusion related to the purpose of the investigation. The student has explained the Earth and Space Science related to the investigation. For example: *The clarity decreases as rainfall increases because material is entering the river from the surrounding environment.*   | The student has carried out an in-depth independent practical Earth and Space Science investigation. The student report has stated a purpose arising from their research into water clarity and how it is affected by rainfall. The student has developed the original method that gives: - the ranges for the key variable(s) - how the key variable(s) is measured - the management of other variables - management of sampling bias - how valid raw data is reliably collected. And considered the method and refined it where necessary to increase the validity and reliability of collected data. For example: *The glare off the water was a problem so readings were taken on the shady side of the boat so glare doesn’t affect the result.* The student has collected raw data that is consistent with the refined method. The student has recorded and processed raw data relevant to the purpose. The student has interpreted the processed data to draw a valid conclusion related to the purpose of the investigation. The student has explained, in depth, the Earth and Space Science related to the investigation. For example: *The clarity decreases as rainfall increases because material is entering the river from the surrounding environment. This material is mainly silt that has accumulated in the environment during dry spells.* | The student has carried out a comprehensive independent practical Earth and Space Science investigation. The student report has stated a purpose arising from their research into water clarity and how it is affected by rainfall. The student has developed an original method that gives: - the accurate range(s) for the key variable(s) - how the key variable is measured - the management of other variables - management of sampling bias - how valid raw data is reliably collected. And considered the method and refined it where necessary to increase the validity and reliability of collected data. The student has collected a wide range of raw data that is consistent with the refined method. The student has recorded and processed raw data relevant to the purpose. The student has interpreted the processed data to draw a valid conclusion related to the purpose of the investigation. The student has evaluated how the method allowed for valid and reliable data to be collected. For example: *Readings were taken at the same time of the day because the angle of the Sun affects the intensity of light entering the water and hitting the disk.* The student has evaluated the Earth and Space science related to the investigation. For example: *Readings were taken at the same time of the day because the angle of the Sun alters the ratio of reflected to refracted light and therefore the intensity of light entering the water and hitting the disk.* *Observation of the disk from directly above ensured that total internal reflection did not occur. As the angle of observation increases, there is an angle at which total internal reflection occurs and the disk will no longer be visible.* For example: *The clarity decreases as rainfall increases because material is entering the river. This material is mainly silt and has accumulated in the environment during dry spells. It comes from the erosive effects of animals and humans and remains in situ until overland flow removes it. The material is low in clay as clay tends to be removed by the wind, especially in New Zealand where strong winds are a common phenomenon. The time lag between rainfall and clarity decreasing is a measure of the time it takes rain to enter the river*. |