

**CIVL4120 ADVANCED HYDRAULICS**  
**HYDRODYNAMICS AND WATER QUALITY OF AN ESTUARINE SYSTEM**  
**2010 FIELD WORKS & PROJECT**

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Mid-estuary zone of Eprapah Creek at low tide (Left) and high tide (Right) during king tide conditions - View from Site 2 looking downstream on 1 February 2010



Upper estuary zone of Eprapah Creek at low tide (Left) and high tide (Right) during king tide conditions - View from the right bank at Site 3 looking downstream on 2 February 2010

## 1. Presentation

The purpose of the field work is to introduce undergraduate students to the complexity of an unsteady waterway (i.e. an estuarine system), the difficulties associated with field experiments and the interactions between hydraulic engineering, water quality, biology and ecology. The students will (1) survey the creek cross-sections, (2) monitor the water quality and hydraulics in the estuary of a small creek, as well as the bird and fish habitats during the same period, and (3) perform some numerical modelling of the creek estuarine zone. They will process and analyse their data, and compare these with the theory (CIVL3140, CIVL4110, CIVL4120 & CIVL4140). The assignment will highlight practical details which must be considered during the study of a system : e.g., tidal effects, ecological issues, public access, impact of a sewage plant. The creek system is located **in the Redlands shire** close to Brisbane QLD (Table 1-1, Fig. 1-1 & 1-2).

This field work will be some group work to emphasise **team work, collaborative efforts and communication**. A total of 2-3 sites will be considered within the estuarine zone (Table 1-1, App. III). Each site will be surveyed, analysed and investigated continuously by a **group of 6-7 students** from **Friday 13 Aug. 2010 (6:00am) to Friday 13 Aug. 2010 (6:00pm)**. The project will be concluded by an oral presentation on **Tues. 24 August 2010** and a report submission on **26 August 2010** (Table 1-2). The oral presentations will be assessed by both lecturers and peers.

Table 1-1 - Main sampling site locations on Eprapah Creek

| Ref. No. | Description   | Location UBD 2001 | Coordinates                     | Comments  |
|----------|---|-------------------|---------------------------------|---|
| 1        | Point Halloran Conservation Area  | 206 G/H 17        | 27°34'12.87"S<br>153°17'24.67"E | Right bank.<br>Access via Orana St. Walk along the Conservation area. Take the left branch. At boundary between forest ad mudflat, turn left toward the river bank. |
| 2        | End of Beveridge St   | 206 F 19          | 27°34'37.16"S<br>153°17'30.30"E | Left bank.<br>Access via Beveridge St. At end follow foot track until platform.   |
| 2B       | End of Beveridge St   | 206 F 19          | 27°34'38.45"S<br>153°17'34.07"E | Left bank.<br>Access via Beveridge St. At end follow foot track until platform. Turn right and continue for 150m.   |
| St       | Footpath off Aspect Dr (concrete stairs)  | 206 H20           | 27°34'43.17"S<br>153°17'37.60"E | Right bank.<br>Access off Aspect Drive. Follow footpath towards park until concrete steps on the river bank   |
| 2C       | End of Beveridge St   | 206 F 19          | 27°34'40.60"S<br>153°17'31.78"E | Left bank.<br>Access via Beveridge St. At end follow foot track until platform. Turn right and continue for 80m. Turn right and cut meander.                        |
| 3        | Eprapah Environmental Training Centre Platform (d/s) end Boardwalk                | 206 E 20          | 27°34'48.16"S<br>153°17'9.57"E  | Right bank.<br>Access from Eprapah Environmental Training Centre.   |
| 3B       | Eprapah Environmental Training Centre Platform [4] Intersection Blue/Green trails | 206 D 20          |                                 | Right bank.<br>Access from Eprapah Environmental Training Centre.<br>Narrow creek section.  |
| 4        | Eprapah Environmental Training Centre Platform [15] Platypus pool                 | 206 D 20          |                                 | Right bank.<br>Access from Eprapah Environmental Training Centre.   |

Fig. 1-1 - Sketch of **Eprapah Creek** estuarine zone

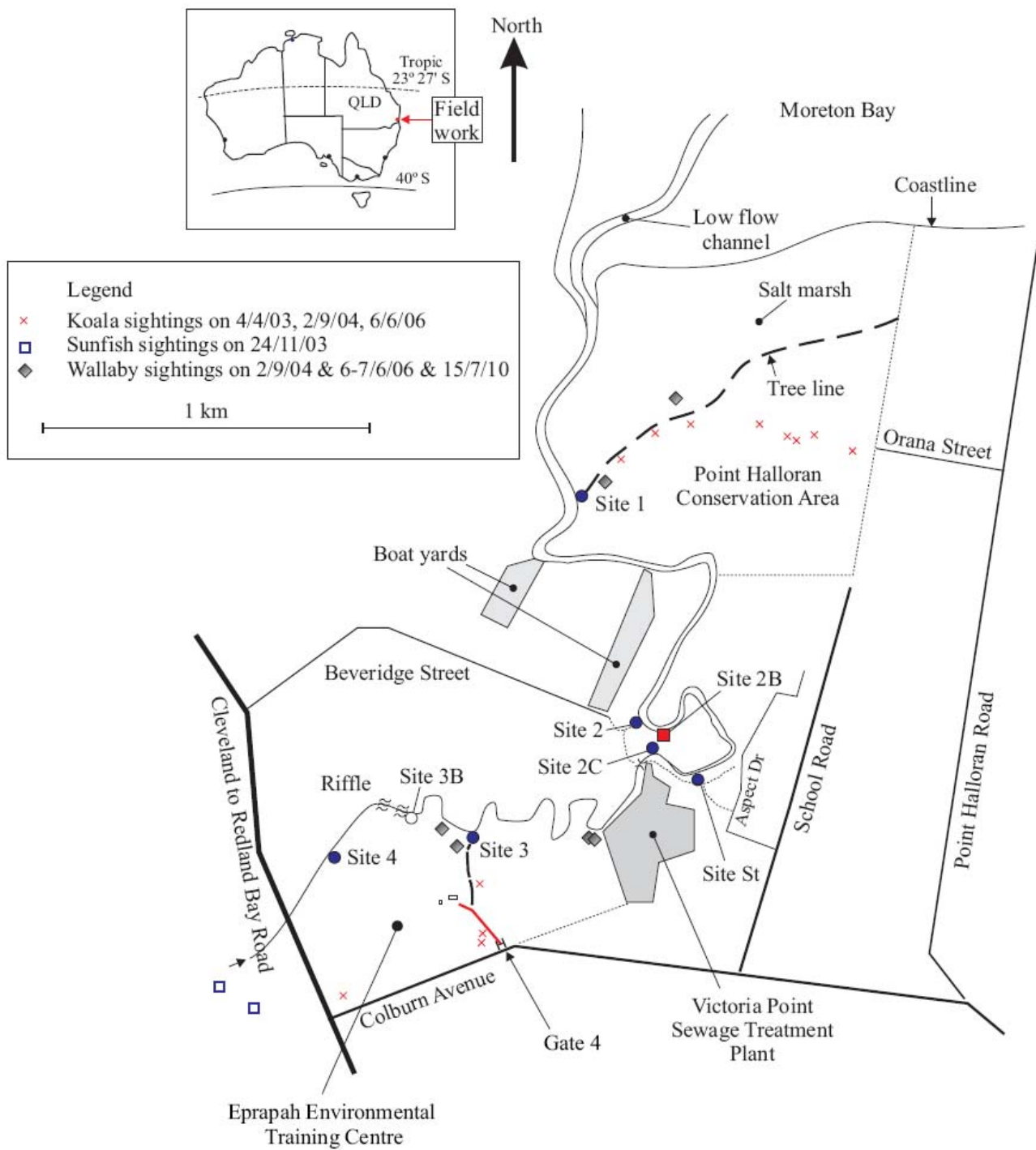


Fig. 1-2 - Sketch of the mid-estuarine zone

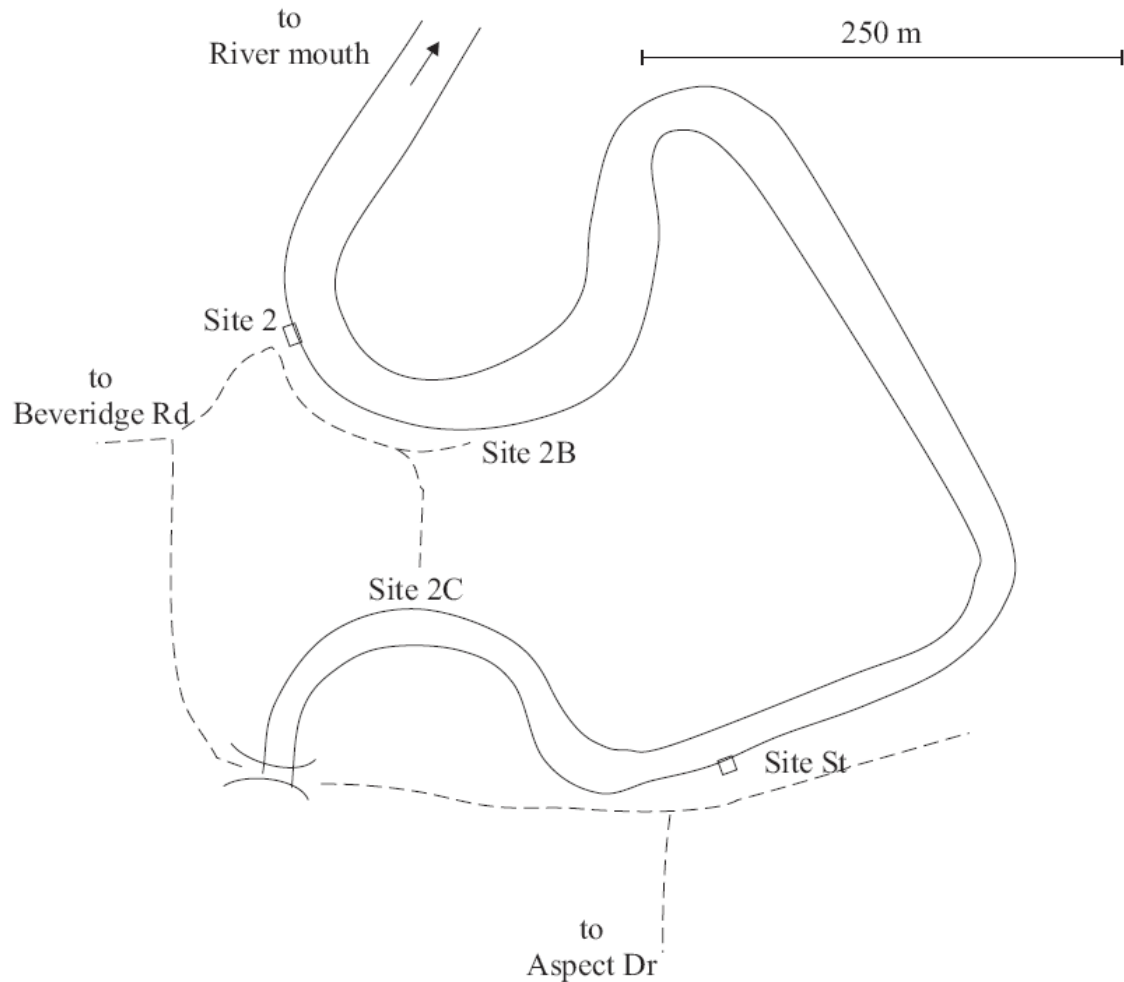


Table 1-2 - Time table

| <u>Week</u> | <u>Date</u>                | <u>Description</u>                                   | <u>Remarks</u>   |
|-------------|----------------------------|--|--|
|             | Mid-July 2010              | Dates and site location posted on the Internet       |  |
| 1           | Monday 26 July             | Preliminary instructions and dates.                  |  |
| 3           | Monday 9 August            | Final instructions.                                  |  |
|             | <b>Tuesday 10 August</b>   | Final day for group organisation.                    |  |
|             | <b>10-12 August</b>        | Preliminary survey                                   |  |
|             | <b>10-15 August</b>        | Surveying.   |  |
| 3           | <b>Thursday 12 Aug.</b>    | Training - Water sampling                            | <b>TAFE (Alexandra Hills Campus (Windemere Road), G block Chem. Lab.). All students must attend.</b> |
| 3           | <b>Friday 13 Aug. 2010</b> | Field works  | <b>12 h field work from 13/8/10 6:00am to 13/8/10 6:00pm. Attendance is compulsory.</b>              |
| 4           | <b>Tuesday 17 Aug.</b>     | Lecture. Tutorial. Discussion.                       |  |
| 5           | <b>Tuesday 24 Aug.</b>     | Oral presentations for each group (from 12:00 noon). | <b>Every student must attend.</b>  |
| 5           | <b>Thursday 26 Aug.</b>    | Report submission.                                   | Deadline: 14:00 in Prof. Chanson's hands.  |

## 2. Field works

### 2.1 Field works

The field works will take place on **Friday 13 Aug. 2010 (6:00am) to Friday 13 Aug. 2010 (6:00pm)**. Measurements shall be conducted from a low tide to the low tide on the next day: i.e., between **6:00am and 6:00pm** to make use of the daylight for setting up and dismantling each sampling site (Tables 2-1, 2-2, 2-3 & 2-4). Some readings will be taken every 15-20 minutes while others may be taken every 30 minutes or every hour possibly (see below, Table 2-3).

Table 2-1 - Tide times (Brisbane bar)

| Day                          | Time  | Height (m) |
|------------------------------|-------|------------|
| <b>Thursday 12 Aug. 2010</b> | 23:20 | 0.18       |
| <b>Friday 13 Aug. 2010</b>   | 05:57 | 0.19       |
|                              | 11:51 | 2.14       |
|                              | 18:01 | 0.30       |
| <b>Saturday 14 Aug. 2010</b> | 00:01 | 2.32       |

Notes

Tide predictions

{<http://www.bom.gov.au/oceanography/tides/>}

Correction for Victoria Point tides

{<http://www.msq.qld.gov.au/Tides/Tides-times-for-secondary-ports.aspx>}

{<http://tides.willyweather.com.au/qld/brisbane/victoria-point.html>}

Australian tide manual

{[http://www.icsm.gov.au/icsm/tides/tides\\_msl.html](http://www.icsm.gov.au/icsm/tides/tides_msl.html)}

Related informations:

{<http://www.msq.qld.gov.au/Tides.aspx>}

{<http://www.msq.qld.gov.au/Charts/Faqs-charts.aspx>}

{<http://www.msq.qld.gov.au/Tides/Tidal-planes.aspx>}

{[http://www.derm.qld.gov.au/environmental\\_management/coast\\_and\\_oceans/index.html](http://www.derm.qld.gov.au/environmental_management/coast_and_oceans/index.html)}

Prof. Hubert CHANSON, a number of Civil Engineering School staff and a number of volunteers will be in the Erapah catchment on **Friday 13 Aug. 2010 (6:00am) to Friday 13 Aug. 2010 (6:00pm)**. They will circulate among groups to provide advice. A headquarter will be based in the Mungara building, Landcare Group, Erapah Environmental Training Centre (corner of Colburn Ave and Cleveland-Redland Bay Rd, Victoria Point). A safety officer will be on site with a first-aid kit from **Friday 13 Aug. 2010 (6:00am) to Friday 13 Aug. 2010 (6:00pm)**, and he will be contactable by phone (see paragraph 2.5).

Field equipments (see Table 2-2) will be available from Mr Clive BOOTH ([Hydraulic Lab.](#)) between **Tuesday 10 August 2010** and **Thursday 12 August 2010** between 10:00am and 3:00 pm. ALL the equipments must be returned un-damaged and cleaned no later than **Monday 16 August 2010 before 3:00pm** to Mr Clive BOOTH ([Hydraulic Lab.](#)). (Lateness in returning the equipment and damage to any equipment shall be heavily penalised.)

The **DO titration kits** and the fish nets and traps will only be available between **Tuesday 10 August 2010** and **Thursday 12 August 2010** between 10:00am and 3:00 pm.

A training session will take place on Thursday 12 August 2010 between 14:00 and 16:00 at TAFE Alexandra Hills. The training session will be conducted by Mrs Lynn ROBERTS who will be on site during the field works on Friday 13 August 2010.

Note that some equipment was kindly lent by other departments and institutions. It must be returned undamaged.

*PLEASE clean all equipment before returning all the gears undamaged.*

Further the field works will be conducted in Conservation Parks and Environmental Centre. Students are requested to take great care to the environment during the field works. **(All refuse, waste and litter generated by the activity MUST BE REMOVED from the reserve areas.)** Any damage attributable to the use of the reserves shall be heavily penalised.

Table 2-2 - List of equipments provided to the University of Queensland student groups

| Equipment  | Purpose  | Remarks  |
|--|--|--|
| Thermometer/Conductivity meter (1 unit)                      | Temperature and conductivity measurements              | The range of conductivity is limited. Water samples may need to be diluted with freshwater for conductivity measurements of saline waters. |
| Thermometer for air temperature reading                      | Air temperature measurement                            |  |
| Secchi disk (1 unit)   | Turbidity  |  |
| Fish trap (1 unit)   | Fish habitat and behaviour                             | <b>Bait (cat food) must be obtained by students.</b> Equipment provided by UQ Zoology & Entomology.  |
| Fish net (1 unit)  | Fish habitat and behaviour                             | To be used in water no deeper than waist height. Equipment provided by UQ Zoology & Entomology..   |
| Fish key (1 unit)  | Fish recognition chart.                                | Laminated. To assist with fish sampling.   |
| <i>DO DR890 colorimeter</i>                                  | <i>dissolved oxygen measurements by colorimetry</i>    | <i>Equipment provided by TAFE.</i>   |
| <i>DO consumables</i>  | <i>dissolved oxygen measurements by colorimetry</i>    | <i>Chemicals to be used with care for DO colorimetry only.(Provided by TAFE.)</i>  |
| Conductivity/pH meter  | Water conductivity<br>pH                               | <i>Equipment provided by TAFE.</i>   |
| Disposable gloves  | for DO colorimetry chemical handling and fish handling |  |
| Level, tripod, spirit level, measuring tape and staff picket | Survey   | 1 per group. Survey conducted at low tide, preferably <b>prior</b> to the field measurement day  |

## 2.2 Field measurements

Each group will conduct a series of hydraulic, water quality and ecological measurements **with the first reading at 6:00am and the last reading at 6:00pm**. Some readings will be taken every 20 minutes while others will be taken at longer intervals (Table 2-3).

In addition, students may keep an eye open with regards to **special features** like saltwater/freshwater fronts, water level surges, boat passages, bird fishing activities, surface slicks, pollution runoff, ... and record these details (incl. photographs). Interesting flow features might also occur around high/low tide slack ...  
**Students should further record atmospheric events including air temperature, rainfall (time, amount), sun light conditions, wind, wind waves ...**  
 Further you are encourage to observe and document aquatic plants, benthic vertebrate and invertebrate fauna. These would be reported in your report.

Table 2-3 - List of measurements to be conducted **between 6:00am to 6:00pm** by each group

| Measurement                        | Timing                  | Remarks  |
|------------------------------------|-------------------------|--|
| Air Temperature                    | Every 15 minutes        |  |
| Water Temperature                  | Every 20 minutes        | Take a water sample near the surface and one near the bottom.<br>Thermometer/conductivity meter.   |
| Water level                        | Every 15 minutes        | At low tide, install a pole with graduation, from where the reading is taken. (Accuracy must be within 1 cm.) The graduation must be readable for all day including at high tide |
| Conductivity (water)               | Every 20 minutes        | Take a water sample near the surface and one near the bottom.<br>Thermometer/conductivity meter (compare two instruments)  |
| pH                                 | Every 20 minutes        | Take a water sample near the surface and one near the bottom.<br>Conductivity/pH meter   |
| Turbidity                          | Every 20 minutes        | Secchi disk  |
| Water surface velocity             | Every 20 minutes        | By timing suitable floats over a known distance. Using floating matters (e.g. branch, orange).   |
| Climatic conditions                | Every 20 minutes        | Use water quality survey form (App. IV) based upon the EPA survey form.  |
| <i>Dissolved Oxygen content DO</i> | <i>Every 30 minutes</i> | <i>Use a bucket full of water (closed bucket) for colorimetry tests, or a sealable container with no air inside.</i>   |
| Fish number and type               | Every 30 minutes        | Fish trap installed for 20 minutes. Account for 10 minutes to count (and release) fish, clean trap and install bait. Use fish survey form (App. IV).                             |
| Fish number and type               | Every 30 minutes        | Fish net. Water depth must be less than waist height. Use fish survey form (App. IV).  |
| Bird numbers and types             | Continuously            | Visual observations. May need binoculars. Use bird survey form (App. IV).  |
| Fauna/wildlife numbers and types   | Continuously            | Visual observations. May need binoculars. Use bird survey form (App. IV).  |

#### *Practical considerations*

**ALL THE DATA shall be recorded in writing.** These data will constitute a key component of the final report and of the groupwork assessment. Students are very strongly encouraged to think beforehand how they will record the data and to prepare relevant books and notepads. Any loss of field data is not acceptable. Use carbon copies (e.g. accounting books) to backup your data regularly.

Field observations will include some hydraulic, environmental and ecological measurements.

Hydraulics measurements will include (1) the surface velocity by timing suitable floats over a known distance, and (2) the water level using a pole with graduations from where the reading is taken. Importantly, the flow direction shall be carefully recorded and unusual flow patterns at slacks shall be recorded.

Water quality measurements will include (1) air and water temperatures, (2) water conductivity, (3) pH, (4) turbidity, (5) **dissolved oxygen concentrations**.

Ecological observations will include (1) fish habitat and behaviour observations using fish trap and net, (2) bird survey from a fixed point and (3) wildlife/fauna observations from a fixed point as well as in the surroundings of the group site.

The freshwater runoff flow shall be estimated on the day at the Redland Bay/Cleveland Road bridge. This flow will be an input for the numerical modelling works.

## SURVEYING

The channel cross-section shall be surveyed **at low tide**, preferably a couple days prior to the field work (Table 2-4). Sites for the surveys are listed in Table 2-4. The survey shall be conducted during day time and at low tide for safety. In deep water regions, students could consider the use of boat or surfboard.

During the survey of the cross-section, ensure that the survey is conducted perpendicular to the main flow direction.

Record the bed material at each sampling point, as well as the water depth and time (within the minute) of each sampling location.

## TRAINING - Water testing

A training session will take place on Thursday 12 August 2010 between 14:00 and 16:00 at TAFE Alexandra Hills (Alexandra Hills Campus (Windemere Road), meeting point in G block Chem. Lab., Appendix V). The training session will be conducted by Mrs Lynn ROBERTS who will be on site during the field works on Friday 13 August 2010.

The focus of the training session will be the use of the DO Colorimeter and Conductivity/pH meters. Each group will keep the equipment to deploy it Friday 13 August 2010 with the first measurements at 06:00.

## FISH OBSERVATIONS

- Sites of fish trap and dip net must be changed regularly. Ideally, they must be placed at different types of cover and flow conditions. There are 4 basic combinations :

| Vegetation cover | Main flow (Fast)           |
|------------------|----------------------------|
| No cover         | Recirculation zones (Slow) |

Conduct the observations by rotating the sampling sites between 8 locations (i.e. not re-using a site within 2 hours). Each site must be at least 8-12 m away from the previous one.

- Vegetation cover and zones of flow recirculation are very important parameters affecting fish behaviour. Draw maps of instream habitat and micro-vegetation for low tide and high tide.

- Fish trap (bait trap) must be oriented toward the incoming flow. Fish bait is typically cat food (e.g. GoCat, dry bait, prawn flavour). It must be renewed every time.

- Fish net (dip net) are pushed ahead of you, inclined about 60 degrees and close to the bottom. A fish net pass is typically 3 m long (pushing the fish net in front of you).

- Combined use of bait trap and dip net : use bait trap first, then conduct dip netting at that site.

- When handling fish, use wet disposable gloves (e.g. latex gloves) to hold the fish to avoid damaging their mucus. Fish mucus are very sensitive and dry skin may damage these.

- Exotic fish must not be released into the stream system. Place these in a bucket with few drops of clove oil to put these asleep. Later freeze them to kill them.

## NOTES

- Before each water quality reading, rinse once the bucket with creek waters before collecting the water samples.

- Collect water samples about 20 cm beneath the free-surface.

- Each series of measurements conducted every 20 minutes must be reported on a water quality survey form (App. IV).

- Each series of fish observations conducted every 30 minutes must be reported on a fish habitat/behaviour survey form (App. IV).

- + **For fish habitat and behaviour observations, each group is strongly advised to have the reference book ALLEN et al. (2002) [12].**
- Constant monitoring of birds and wildlife must be reported on a bird/wildlife survey form (App. IV).
- + **For bird observations, each group is strongly advised to have a solid reference book** (e.g. [8] SIMPSON et al. 1999; [9] SLATER 1989).

NB: Reference books should be obtained from libraries prior to the field work.

Table 2-4 - Details of field work sites for each group

| Group  | 1                              | 2                                       | 3  |
|--|--------------------------------|---|--|
| Field works on 13 Aug. 2010  | Site 1                         | Site 2B                                 | Site 3   |
| Cross-sectional survey   | Site 1 or Bridge (u/s Site 2C) | Site 2B, at location of previous survey | Site 3 using pole/star picket on opposite bank |
| Numerical modelling of Eprapah Creek estuarine zone (from river mouth to Redland Bay/Cleveland Road) | 13 Aug. 2010<br>00:00 to 24:00 | 12 Aug.. 2010<br>00:00 to 24:00         | 14 Aug. 2010<br>00:00 to 24:00                 |

### 2.3 Preparation

**Groups are advised to visit the site at least one to two weeks prior to the field work and to plan all practicalities associated with the creek survey and the **12-hours** long field study.**

It cannot be stressed enough that field works require a very thorough preparation.

**Surveys of the channel cross-section (Table 2-4) shall be conducted few days before the field trip **at low tide** during daytime, with all appropriate safety measures.**

**You will need to find the nearest permanent survey marker and its coordinate.**

Get a pole/stick and equipment to install strongly a graduated pole/stick for water level readings during the field work. A photograph of the sturdy benchmark (BM) will be included in the report.

Each group must organise a heavy sledge hammer or star picket driver for driving in star pickets and bench mark. The pole/stick must be removed after field works (i.e. after 7:00am).

Prepare freshwater (if needed to dilute the brackish waters) for conductivity readings (<sup>1</sup>). Take a graduated bucket to dilute saltwater samples if necessary.

There is no freshwater available on site. Each group is strongly advise to bring large amounts of fresh/drinking water on site (e.g. 5 L container).

**Deionised water is also required to wash the DO colorimetry kit equipment between each measurement.**

Bring two buckets with a rope (for water collection from a platform and for fish trap/net observations).

Get at least one bucket with a lid (to carry samples for DO measurements).

Bring ropes, and relevant tools and equipments.

Some groups may need to bring a robust ladder to climb down the bank (without damaging it) at low tide.

***Bring Waste Bottles for Dissolved Oxygen Colorimetry Test wastes. The bottle(s) must be **clearly labelled WASTE**.***

***For the 12 hour study, with 2-3 colorimetry tests per hour, up to 7 litres of wastes may be generated. Wastes may be discharged in a sink with a lot of running waters. The bottle(s) must be **clearly labelled WASTE**.***

<sup>1</sup>The range of the conductivity meters is 0-20  $\mu$ S. (Check units in the documentation.) The upper range is less than 50% of seawater conductivity.

Get bait for fish trap (for all the field work duration).

Get also clove oil to put to sleep exotic fish which are not to be released back to the eco-system.

Bring a waterproof stopwatch to record free-surface velocity.

Free-surface velocities are measured by timing suitable floats (e.g. branch) over a known distance.

Bring a camera and films.

Photographic evidence may be useful to support your report and presentation.

Bring permanent marker pens for relevant marking.

Make up clear and waterproof log-in sheets for all the data recordings for all the day. Have a backup system.

**Remember that the data set will constitute a substantial part of the report and assessment.**

Bring gum boots and fishing boots.

Bring any relevant equipment that may be needed. (For example., a ladder to climb down the river without damaging the banks.)

Be prepared for any type of weather (rain, sun, wind, ...).

Bring lights and torches to setup and pack up your site.

Bring binoculars for bird and wildlife watching. Each group must have a least one reference book [8,9] on bird and wildlife in South-East Queensland.

Each group must have at least one reference book on fish [12].

Do not forget sun screen, sun glasses, hat, gloves, insect repellent ....

#### *In Addition*

You will need to find the nearest permanent survey marker and its coordinate.

Include photographs of the field works and of the permanent marker in your documentation.

Groups may consider obtaining aerial photographs.

Find relevant flood and hydrological studies of the area

Photographs of flood events ...

Information on treatment plant operation

#### 2.4 Access

Eprapah Creek is located in Victoria point. The sites 3, 3B and 4 are located in the Eprapah Environmental Training Centre (Fig. 1-1). Site 1 is in Point Halloran Environmental Park (Fig. 1-1). Sites 2, 2B and 2C are on the left bank (Fig. 1-2). Site St is accessible off Aspect Drive (Fig. 1-1).

+ By car, go to Victoria Point.

+ By train/bus : Go to Cleveland train station and take the bus to Victoria point.

+ All the sites are accessible on foot. (Be careful of flooding during rain storm periods and storm surges). During the survey and field works, be aware of local residents. Do not trespass on private properties. Be aware of the risk of bush fires.

Remark : There is a shopping centre (incl. a Bi-Lo supermarket, a chemist) at the corner of Colburn Ave and Cleveland-Redland Bay Rd, Victoria Point.

## 2.5 Safety

**Safety is uppermost important during all the field works.**

+ **Students will be working in groups of no less than 3 people at any time on site.**

+ Students shall have at least two mobile phone on site and switched ON at any time. Each group will provide the lecturer with two contact mobile phone numbers by Tuesday 10 August 2010. These phone numbers shall be operational on Friday 13 Aug. 2010 (5:00am) to Friday 13 Aug. 2010 (7:00pm) at all times and may be used by the Police, the Emergency Services, the Redland Shire Council and the University of Queensland in case of emergency (e.g. bushfire, storms).

**Do make sure that your batteries are charged. Take spare mobile phone batteries for emergencies.**

+ No work shall be attempted into water more than waist deep. Persons going into the water must wear a life line secured to the bank. Only confident swimmers are to do the work in the water.

+ Good common sense is recommended to avoid any injury : e.g., do not jump from walls, watch your steps.

+ It is strongly advised to wear adequate shoes or boots. Strong clothing is recommended, incl. shorts and trousers.

+ Hat, sunglasses and sun screen are strongly advised. Bring also mosquito/insect repellent.

+ During or immediately before the field works, DO NOT consume alcohol or other intoxicating substances.

+ Drive safely to and back from the field work.

### *Contact phones*

A safety officer will be based **in the Mungara building with a first aid kit, for the duration of the field works from 6:00am to 6:00pm. In emergency, he will be contactable at the following number :**

**Mobile Phone Number: 04129 54163**

**SAFETY OFFICER**

For emergencies, dial 000.

Hospital (07) 3488 3111 Redland Hospital, Weippin St, Cleveland

Doctors (07) 3401 9555 Victoria Point Medical & Dental Centre, Town Centre, East Building, Cnr Redland Bay-Cleveland Rd, Colburn Ave, Victoria Point QLD 4165

Ambulance 000 Emergency calls.

To get Cleveland Police Station (Middle St, Cleveland), dial (07) 3824 9333.

To get Brisbane Police Headquarters (200 Roma Street Brisbane QLD 4000), dial (07) 33 64 64 64.

Prof. Hubert CHANSON will be on site all the day and contactable at: 0421 634 666.

## 2.6 Environmental issues

All field works will be conducted in Conservation Parks and Environmental Centre. Staff and students are requested to take care to the environment during the field works.

+ **All refuse and litter generated by the activity MUST BE REMOVED from the reserve areas.**

Wastes incl. *Dissolved Oxygen Colorimetry Test* wastes must be removed.

+ Noise and disturbance associated with the field works must be kept at a level which has no negative impact upon the environment (e.g. birds, fish) and surrounding properties.

- + Damage to the banks is not acceptable.
- + Any damage attributable to the use of the reserves will be rectified at cost and the relevant group(s) shall be heavily penalised.
- No vehicles are to access the reserve area.
- During fish observations, exotic fish must not be released into the stream system. Place these in a bucket with few drops of clove oil to put these asleep. Later freeze them to kill them.
- When handling fish, use wet disposable gloves (e.g. latex gloves) to handle the fish to avoid damaging their mucus. Fish mucus are very sensitive and dry skin may damage these.

### 3. Assignment

An estuary is a water body where the tide meets a river flow and where mixing of freshwater and seawater occurs. Estuaries may be classified as a function of the salinity distribution, and density stratification (CHANSON 2004b). That classification does not express however the unique feature of each estuary, and it does not account for seasonal changes, nor for differences between neap and spring tides. The study of mixing in estuary remains a complex process (IPPEN 1966, FISCHER al. 1979, LEWIS 1997, CHANSON 2004a,b).

Eprapah Creek is a small system in the Redland Shire. The estuary was subjected few years ago to major pollution. The problem was dealt with. The estuarine zone is characterised by two environmental parks (Eprapah Environment Training Centre and Point Halloran Conservation Park), some marinas and boat yards, and a sewage plant.

Table 3-1 - Internet resources on Eprapah Creek

| <u>Website</u>                                     | <u>Url</u>  |
|--|---|
| Redland Shire                                      | <a href="http://www.redlands.qld.gov.au/">http://www.redlands.qld.gov.au/</a>   |
| Redland Shire, Tourism at Victoria Point           | <a href="http://www.redlands.net.au/redlandstourism/seeVictoriaPt.htm">http://www.redlands.net.au/redlandstourism/seeVictoriaPt.htm</a>           |
| Qld EPA Water Quality Monitoring in Redlands Shire | <a href="http://www.env.qld.gov.au/environment/science/water/redlands.html">http://www.env.qld.gov.au/environment/science/water/redlands.html</a> |
| Field works at Eprapah Creek                       | <a href="http://www.uq.edu.au/~e2hchans/eprapa.html">http://www.uq.edu.au/~e2hchans/eprapa.html</a>   |

Water quality and ecology are closely monitored at Eprapah Creek. For example, the Qld EPA Water Monitoring Group has been surveyed the water quality monthly for years, while Waterwatch and landcare groups regularly monitor aquatic and bird lives. This system and the interactions between hydraulic engineering, water quality and ecology are the topics of the advanced hydraulics field work of the CIVL4120 Advanced Hydraulics subject. Each group will produce (Table 2-4) :

- 1- a detailed data set of hydraulic, water quality and ecological parameters monitored during a **12 hour period on Friday 13 Aug. 2010 (6:00am) to Friday 13 Aug. 2010 (6:00pm)**,
- 2- a comparison of these data with previous observations,
- 3- a surveyed cross-section of the estuary **at the site listed in Table 2-4**,
- 4- a hydraulic modelling of the whole estuarine system for a full day (Table 2-4) based upon St Venant equations, and
- 5- a complete analysis of the experimental and numerical data over a full tidal cycle, identifying clearly key features of the estuarine system, some obvious
- 6- recommendations for optimum environmental management of the system (this is not obvious and it requires an solid understanding of the local environment).

#### Notes

For the numerical modelling, each group will validate its model with the field data collected on **13 Aug. 2010**. Then complete calculations (00:00 to 24:00) will be performed for another day (Table 2-4).

For these calculations, it is essential that the freshwater flow from Eprapah Creek be estimated at the Redland Bay/Cleveland Road crossing for the period **13-14-15 Aug. 2010**.

#### Data analysis

The purpose of the numerical modelling is to assist with the data analysis. Once your hydrodynamic model is validated, you should use your results to discuss the interesting features that you observed on the **Friday 13 Aug. 2010**. For example, the hydrodynamic model may provide some insights into the time-variations of conductivity and temperature during the field study.

The combination of field and numerical data is an unique approach that will allow you to gain a better understanding of the complete system. Herein the system is the Eprapah Creek estuarine zone that interacts with the Moreton Bay, Eprapah Creek riverine system (<sup>2</sup>)

You may wish also to discuss with the DERM expert on the estuarine system, its characteristics and its physio-chemical patterns.

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<sup>2</sup>Remember to measure the freshwater inflow at the bridge beneath the Redland Bay to Cleveland Road on **Friday 13 Aug. 2010** and to get the rainfall record off the B.O.M. website.



## 4. Assessment

### 4.1 Presentation

The assessment of field works will take place as :

- a group work during the semester (**35% of CIVL4120 subject**), and
- some individual examination at the end of semester examination.

During the semester, the students will work in groups of **6-7 people**. The groups will be finalised no later than **Tuesday 10 August before 14:00**. **Three to six sites** will be investigated at the locations listed in Table 1-1. This gives room for personal preference in the choice of group number (i.e. site number).

Each student has the responsibility to examine the list of sites (Table 1-1, Fig. 1-1 & 1-2), to find his/her preferred group and to sign up in this group. (The composition of a group shall remain un-changed after **Tuesday 10 August before 14:00**, unless exceptional considerations after discussion with and approval by Prof CHANSON.)

### 4.2 Assessment

The group work will be assessed as a combination of report submission and oral presentation. The group report will be assessed by the lecturer. The oral presentation will be assessed by the lecturer(s) and by the other groups.

|                                      |   |
|--------------------------------------|---|
| Group report                         | 65% (Note the penalty for lateness below) |
| Presentation (lecturers' assessment) | 20%                                       |
| Presentation (peers' assessment)     | 15%                                       |

### 4.3 Instructions for report submission

Each report will be assessed upon :

- the field data of the group including the creek cross-sectional survey (33%)
- the data quality and presentation (15%)
- the technical contents, accuracy and soundness, incl. the hydraulic modelling of estuary (37%)
- the presentation style (15%)

#### 4.3.1 Report submission and instructions

For each group, **three copies** of the report & CD/DVD Rom must be submitted in person to Prof CHANSON by **Thursday 26 Aug. 14:00**. The report will be reviewed by the lecturers.

Note that **the report submission deadline is after the oral presentation**. This will give opportunity for each group to revise its report after the oral presentation based upon advice and comments received during the presentation. It is expected that each group will honestly acknowledge any advice received during the group presentation and discussion.

#### + Page Limits

Each report must be complete within a limit of 20 pages including front page, table of contents, main text, figures and references, but excluding appendices and drawings attachments. Reports that exceed this limit will be penalised by **5% penalty per extra page**. Shorter reports of significance will be given preferences.

Each report will be single-sided. Each page must be numbered. The text is to be single-spaced, 12 pt Times Roman or similar. The paper is to be printed on plain A4 size paper. The manuscripts must be typed within the area of 255 mm by 170 mm. With a normal A4 size paper, the distances between the edge of the sheet and the text become as follows:

- top: 2.0 cm
- bottom: 2.0 cm
- sides: 2.0 cm

#### + Layout of Text

The front page must follow the template given in Appendix II.

The report should contain as a minimum :

- the front page (see Appendix II), followed by
- a table of contents,

- an introduction followed by the text,
- conclusions,
- list of references (bibliography),
- the Appendix I containing all the group data.
- the Appendix II containing all the survey forms (App. IV).
- the Appendix III containing all the surveying data.
- the Appendix IV containing the hydraulic modelling results.

#### + Figures and tables

Figures and tables must be placed in the text next to the first reference. These figures and tables would be referred to as "Figure 1" and "Table 1". Titles of figures and tables are to be in 12pt Times Roman.

#### + Format for references

Reference should be listed at the end of the paper and should include the following information: Author's family name, Initials. : Paper title, Journal's title, Volume No., (year), pages.

For example :

APELT, C.J. (1983). "Hydraulics of Minimum Energy Culverts and Bridge Waterways." *Australian Civil Engrg Trans.*, I.E.Aust., Vol. CE25, No. 2, pp. 89-95.

CHANSON, H. (1999). "The Hydraulics of Open Channel Flows : An Introduction." *Butterworth-Heinemann*, Oxford, UK, 512 pages. (Reprinted in 2001)

#### + Digital data

Each group is asked to submit 3 copies of CD/DVD containing all their data set in a digital form. Students should consider either or both digital formats CD-R and DVD+/-R. (Only these formats shall be assessed.)

The CD-ROM/DVD-ROM will also include relevant photographs (JPEG format), some data analysis, the numerical modelling and a copy of the group report (e.g. PDF format).

The digital data must be properly presented. The material may be sub-divided into sub-directories while a text file, acting as map of the CD/DVD-ROM contents, must be placed at the top of the directory tree.

Note : Each group will record a lot of information, (1) on the field work period (**13 August 2010**), (2) during the surveying, and (3) with the hydraulic modelling . All the information needs to be recorded, including relevant handwritten comments, .... (The CD-ROM/DVD-ROM may include a scanned version of the handwritten log-in sheets, relevant photographs, tabulated data sheets, a copy of the report, ...)

The digital informations constitute an integral part of the report supporting material. They will be carefully scrutinised and assessed.

#### 4.3.2 Deadlines

The group reports are due on **Thursday 26 Aug. 2010 before 14:00**. The reports must be submitted directly to Prof Hubert CHANSON who will write down, on the cover page, the submission date and time. (It is the responsibility of each group to find the lecturer and to hand him the report in person.)

Penalty for lateness are 5% per hour of lateness on **Thursday 26 Aug. 2010** and 50% for submission on **Friday 27 Aug.**. Note that no report will be accepted after Friday 27 Aug. 8:00am.

#### 4.4 Instruction for oral presentation

Presentations will take place on **Tuesday 24 August 2010 between 12:00noon and 13:50 in Room 50-C406 (Civil Engineering Seminar Room)**. Each group will be given **15 minutes (maximum) for presentation followed by up to 8 minutes for discussion**. Lecturers and fellow students will contribute to the discussion.

Groups may use Powerpoint presentations, overhead projector transparencies and/or slides. The Powerpoint files must be provided on a CD-ROM to Prof CHANSON no later than Tuesday 24 August 2010 8:30 am. 35-

mm slides must be provided to Prof Hubert CHANSON no later than Tuesday 24 August 2010 8:30am. Group presentations on pen disks/flash drives/USB devices shall not be accepted.

Each group is requested to provide 8 copies of their slides before Tuesday 24 August 2010 8:30am. These will be distributed to each group and lecturers prior to the start of the presentations.

Each presentation will be judged upon :

- the quality of the data set (15%),
- the technical content (30%)
- the presentation style (20%)
- the expertise and ability to answer questions during the discussion (35%)

Notes :

- + The presentations are limited to 15 minutes per group to allow some discussion. Groups which spend longer presentations times shall be penalised for the reduced duration of the discussion time.
- + Each group presentation will be assessed by both lecturers and student peers. Attendance to all the presentation is therefore compulsory.

#### 4.5 Deadlines

**Thursday 16 Aug. before 14:00**  
(in Prof CHANSON's hands)

Complete hydraulic design report

Penalty for lateness :

- 5% per hour of lateness on **Thursday 26 Aug.**
- 50% for submission on **Friday 27 Aug. before 8:00am** (or start of the first oral presentation)
- 100% penalty for submission after **Friday 27 Aug. 8:00am**

**Tuesday 24 Aug. between 12:00 and 13:50**  
Room 50-C406 (Civil Engineering Seminar Room)

Group presentation

Penalty for lateness to start :

- Presentation time and marks reduced accordingly (e.g. 5 minutes lateness = only 18 minutes for presentation & discussion = 22% penalty)
- Presentation cancelled and zero marks for any group not ready 10 minutes after the official start time.

Penalty for lengthy discussion :

Presentation too long = less discussion time  $\Rightarrow$  discussion marks reduced accordingly (e.g. 17 presentation = only 6 minutes for discussion = 25% penalty on discussion marks)

## 5. References

- [1] CHANSON, H. (1999). "The Hydraulics of Open Channel Flows : An Introduction." *Butterworth-Heinemann*, Oxford, UK, 512 pages (ISBN 0 340 74067 1). (Reprinted in 2001)  
{<http://www.uq.edu.au/~e2hchans/reprints/errata.htm>}
- [2] CHANSON, H. (2004b). "Environmental Hydraulics of Open Channel Flows." *Elsevier*, Oxford, UK (ISBN 0 7506 6165 8).
- [3] CHANSON, H. (2004a). "The Hydraulics of Open Channel Flows : An Introduction." *Elsevier*, Oxford, UK, 2nd edition (ISBN 0 7506 5978 5).
- [4] "Bird of Eprapah" (1978).
- [5] ARTHINGTON, A. (1980). "The Freshwater Environment"
- [6] "The Eprapah Visitors' Booklet" (1997)
- [7] "Flora and Fauna of Eprapah Creek" (1996)
- [71] CHANSON, H. (2003). "A Hydraulic, Environmental and Ecological Assessment of a Sub-tropical Stream in Eastern Australia: Eprapah Creek, Victoria Point QLD on 4 April 2003." *Report No. CH52/03*, Dept. of Civil Engineering, The University of Queensland, Brisbane, Australia, June, 189 pages (ISBN 1864997044).  
{<http://eprint.uq.edu.au/archive/00002487/>}
- [72] TREVETHAN, M., CHANSON, H., and BROWN, R.J. (2006). "Two Series of Detailed Turbulence Measurements in a Small Subtropical Estuarine System." *Report No. CH58/06*, Div. of Civil Engineering, The University of Queensland, Brisbane, Australia, March, 151 pages (ISBN 1864998520).
- [8] SIMPSON, K., DAY, N. and TRUSLER, P. (1999). "Field Guide to the Birds of Australia." (6th ed.) *Penguin Books*, Australia. (UQ Library Call Number : QL693 .B573 1999)
- [9] SLATER, P. (1989). "Field Guide to Australian Birds." (1989 revised edition) *Landsdowne-Rigby*, Willoughby, NSW, Australia. (UQ Library Call Number : QL693 .S63 2001)
- [10] IPPEN, A.T. (1966). "Estuary and Coastal Hydrodynamics." *McGraw-Hill*, New York, USA.
- [10] FISCHER, H.B., LIST, E.J., KOH, R.C.Y., IMBERGER, J., and BROOKS, N.H. (1979). "Mixing in Inland and Coastal Waters." *Academic Press*, New York, USA.
- [11] LEWIS, R. (1997). "Dispersion in Estuaries and Coastal Waters." *John Wiley*, Chichester, UK. 312 pages.
- [12] ALLEN, G.R., MIDGLEY, S.H. and ALLEN, M. (2002). "Field Guide to the Freshwater Fishes of Australia." *Western Australian Museum*, Perth, Australia, 394 pages. (UQ Library Call Number : QL636 .A436 2002)
- [13] Queensland Museum (1995). "Wildlife of Greater Brisbane." *Queensland Museum*, Brisbane, Australia, 340 pages.

Note : the booklets [4], [5], [6] and [7] may be purchased at discount price from the Landcare group/Waterwatch group.

### Internet resources

CHANSON, H. (2002). "CIVL4120 Advanced Hydraulics" *Internet resource*.

Internet address : {<http://www.uq.edu.au/~e2hchans/civ4120.html>}

CHANSON, H. (2003). "A Hydraulic, Environmental and Ecological Assessment of a Sub-tropical Stream in Eastern Australia: Eprapah Creek, Victoria Point QLD on 4 April 2003." *Internet resource*.

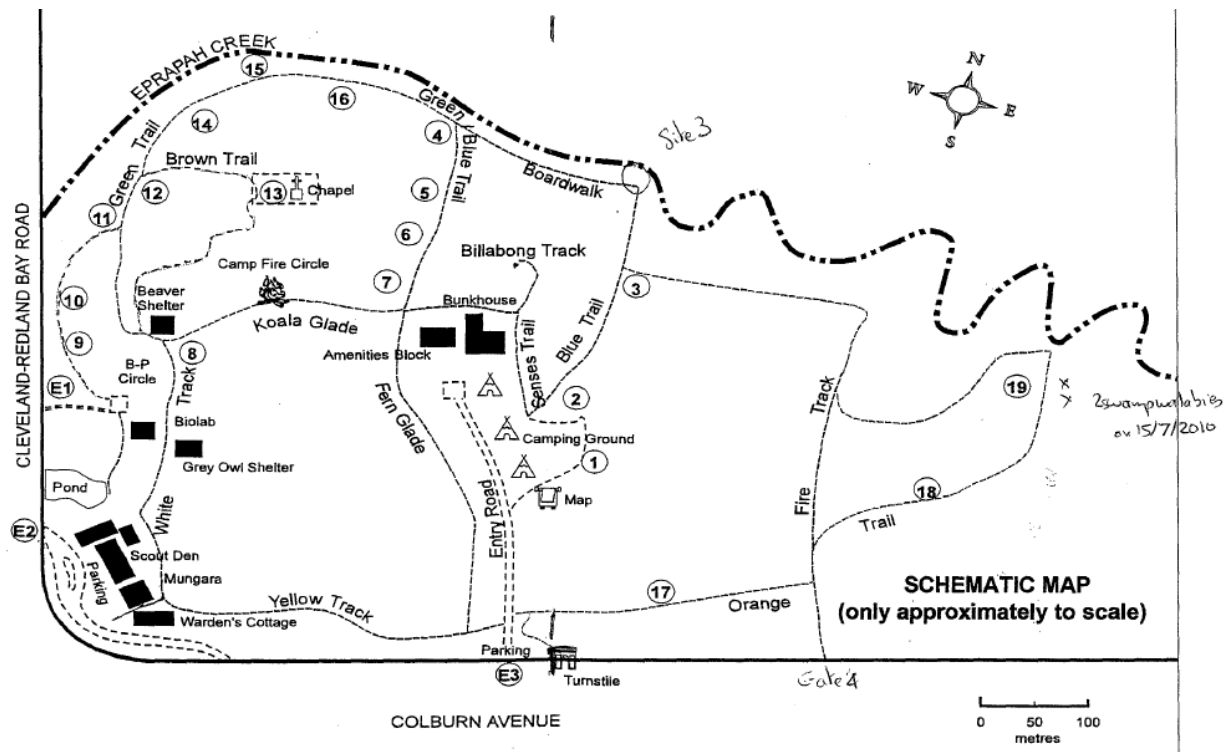
Url : {<http://www.uq.edu.au/~e2hchans/eprapa.html>}

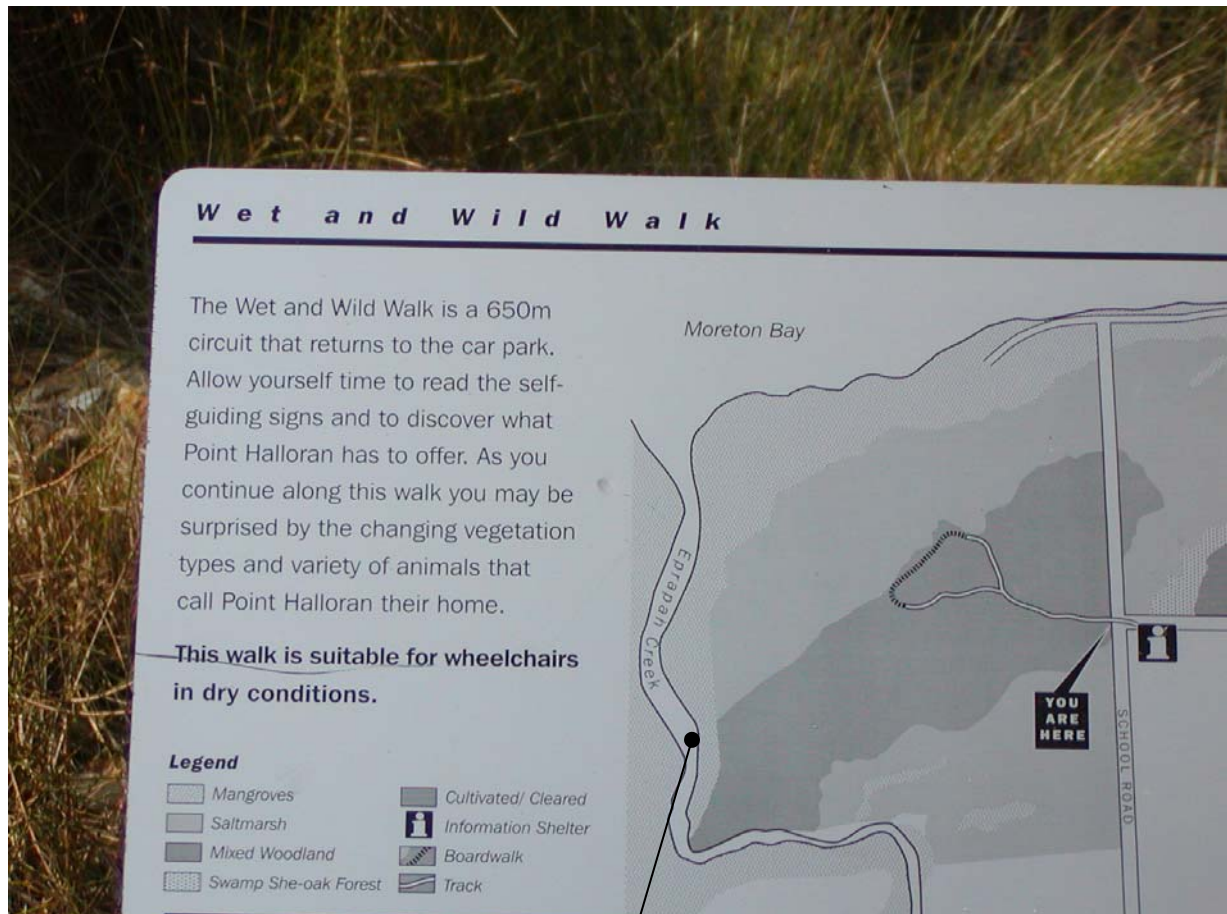
## Appendix I - Maps

I-1 Aerial photograph of Eprapah Creek (Google Earth™)



## I-2 The Eprapah Visitor's Map





## Appendix II - Template of the report front page

Multi-disciplinary study of the **Site ??? (AMTD ???? km)** at **Eprapah Creek** on **13 Aug. 2010**  
**between 6:00am and 6:00pm**

| <u>Site Ref. No.</u> | <u>Description</u> | <u>Location</u> | <u>Comments</u> |
|----------------------|--------------------|-----------------|-----------------|
| 1                    |                    |                 |                 |

|   | <u>Initials</u> | <u>Family name</u> | <u>Student ID No.</u> | <u>Signature</u> |
|---|-----------------|--------------------|-----------------------|------------------|
| 1 | I.R.            | WOOD               | 20021978              |                  |
| 2 |                 |                    |                       |                  |
| 3 |                 |                    |                       |                  |
| 4 |                 |                    |                       |                  |
| 5 |                 |                    |                       |                  |
| 6 |                 |                    |                       |                  |
| 7 |                 |                    |                       |                  |
| 8 |                 |                    |                       |                  |

| <u>Submission date</u> | <u>Time</u> | <u>H. CHANSON's initials</u> |
|------------------------|-------------|------------------------------|
|                        |             |                              |

Note : Each student who did the field works and contributed to the group report must sign the report.  
**Absence of signature shall mean that the person did not contribute to the field works, data analysis or report preparation.**

### Appendix III - Photographs of some field work sites

Fig. III-1 - Eprapah Creek, Redlands, Queensland on 20 Jan. 2003 around 2:30pm - Downstream of marinas on right bank (Site 1)



Fig. III-2 - Eprapah Creek, Redlands, Queensland on 16 Jan. 2003 around 1:30pm - Platform at end of Beverage Rd (UBD 206 G19), downstream of sewerage plant and upstream of marinas (Site 2) - Looking downstream



Fig. III-3 - Eprapah Creek, Redlands, Queensland in 2003 at low tide - Site 2B during a previous survey - Looking from the left bank



Fig. III-5 - Eprapah Creek, Redlands, Queensland on 15 July 2010 at high tide - Site St, looking from the right bank



Fig. III-5 - Eprapah Creek, Redlands, Queensland on 20 Aug. 2004 at high tide - Site 2C, looking from the left bank



Fig. III-6 - Eprapah Creek, Redlands, Queensland on 15 July 2010 at high tide - Looking downstream towards the deck at Site 3



Fig. III-7 - Eprapah Creek, Redlands, Queensland on 16 Jan. 2003 around 1:30pm - View from the platform at Site 3B



Fig. III-8 - Eprapah Creek, Redlands, Queensland on 16 Jan. 2003 around 1:30pm - View from the platform at the Platypus pool (Site 4)



Fig. III-9 - Koala in Point Halloran Conservation park, Erapah Creek, Redlands, Queensland in Sept. 2004



Fig. III-10 - Swamp wallaby at Site 3, Eprapah reek Environmental training center, Redlands, Queensland in June 2006



## Appendix IV - Field work survey forms

### IV- 1 Water quality survey form

The following form is based upon the water quality survey form used by the Queensland EPA Water Monitoring Group in their fieldworks.

{<http://www.uq.edu.au/~e2hchans/civ4120>}

File : TCI402a.pdf

Alternatives :

{<http://www.uq.edu.au/~e2hchans/civ4120.html>} [Field work]

{<http://www.uq.edu.au/~e2hchans/civ4140.html>} [Field work]

### IV-2 Fish habitat/behaviour survey form

The following document was elaborated by Dr Kevin WARBURTON for Waterwatch groups.

{<http://www.uq.edu.au/~e2hchans/civ4120>}

File : Fish\_sampl.pdf

Alternatives :

{<http://www.uq.edu.au/~e2hchans/civ4120.html>} [Field work]

{<http://www.uq.edu.au/~e2hchans/civ4140.html>} [Field work]

### IV-3 Bird/wildlife survey form

*Bird survey*

{<http://www.uq.edu.au/~e2hchans/civ4120/>}

Files : Bird1.pdf

Alternatives :

{<http://www.uq.edu.au/~e2hchans/civ4120.html>} [Field work]

{<http://www.uq.edu.au/~e2hchans/civ4140.html>} [Field work]

*Fauna observations*

{<http://www.uq.edu.au/~e2hchans/civ4120/>}

Files : Fauna1.pdf or Fauna2.pdf

Alternatives :

{<http://www.uq.edu.au/~e2hchans/civ4120.html>} [Field work]

{<http://www.uq.edu.au/~e2hchans/civ4140.html>} [Field work]

## Appendix V - TAFE Alexandra Hills campus map

