Level of sustainable activity: bottom up vessel traffic management

Robert M. Itami

Abstract — This paper presents a decision-making framework called "Level of Sustainable Activity"(LSA) which is a user-based approach to vessel traffic planning and management of high volume multiple use urban waterways. The method is adapted from the US Federal Highway Administrations "Level of Service" for traffic capacity. However the LSA framework links user estimates of traffic density to quality of service objects and a risk management framework to identify social and environmental risk factors. The results of the method are then used to interpret simulations of existing and projected use for making management decisions. The LSA framework was developed to define traffic capacity to urban waterways, however a spinoff of the method has been improved stakeholder buy-in into the process and a much stronger basis for management decision making. This is a direct result of the "bottom up" approach taken to both developing behavioural simulation models and the methods of obtaining information from users for populating and validating the simulation model. This paper advocates the LSA approach for a wider range of management applications by taking a user-based approach for describing existing conditions, projecting future growth, identifying key issues, and developing management actions. A case study of a vessel traffic management plan for Hobson's Bay in Melbourne, Australia is used to demonstrate the concepts described in this paper.

Index Terms — Vessel Traffic Management, Level of Sustainable Activity, RBSim, Recreation Behaviour Simulation, Bottom Up Decision Making

1 Introduction

Computer modelling and simulation is a useful technology for describing and understanding complex behaviour in recreational environments. The development of RBSim specifically for the purposes of simulating outdoor recreation behaviour over the last 18 years has yielded a wealth of experience in the technical aspects of applying simulation to outdoor recreation environments including software architecture [1], field methods for collecting reliable input data, and statistical techniques for analysing outputs of the simulation. More recently however, the development has moved from the technical implementation of simulation to the integration of simulation methodologies into planning and management frameworks. This has brought us almost full circle to the starting point of our efforts which is how to improve visitor management through the use of new concepts and technologies. This paper presents a decision making framework for developing a vessel traffic management plan for high use traffic in an urban bay in Australia. The framework is based on complementary processes that engage stakeholders and conduct objective analysis of traffic patterns to develop a holistic understanding of the users of urban waterways, the criteria for quality of service, pattern of use, the nature and intensity of traffic conflicts and means of balancing competing interests. The decision making approach has been called "Level of Sustainable Activity" or LSA.

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2 Williamstown vessel traffic management plan

2.1 Study area and Problem

The study area (See fig 1) is the western side of Hobson's Bay which is the north end of Port Phillip Bay in Melbourne, Victoria Australia. The study is a busy urban waterfront bounded on the east by the Williamstown Shipping Channel used by commercial traffic and container ships moving to the container ports and wharves up the Yarra River to the north. Parallel the to the west side of the Yarra River and merging with the mouth of the river is a Newport power station cooling water channel that also serves as the channel servicing a major boat ramp and parking area known as Warmies Boat Ramp operated by the City of Hobsons Bay. Williamstown is a suburb of the City of Melbourne and is a historic port. It hosts six sailing and yacht clubs, businesses including marinas, marine services, boat building, passenger ferries, tourist charters, and commercial fishing vessels.

Parks Victoria is the local port manager for the Port of Port Phillip. It is responsible for the management of boating activities in the local port, with a view to ensuring that those operations are carried out safely, efficiently and effectively. Parks Victoria is also the Committee of Management under the Crown Land (Reserves) Act for a large area of the Williamstown foreshore and water extending from Ann St Pier to the top end of Greenwich Bay. Parks Victoria commissioned GeoDimensions Pty Ltd in 2007 to develop a vessel traffic management plan for the study area. The study brief focussed on the following questions:

- Has the Williamstown berthing area reached capacity?
- Is vessel operator safety at risk currently or will it be in the future?
- Is vessel operator and visitor amenity being affected by the growth in vessel traffic?
- To define the fairway capacity in terms of safety and vessel operator expectations and amenity.
- To assess the management implications of proposed developments on fairway capacity.

2.2 Study method

The Level of Sustainable Activity method has five stages:

1. Interview stakeholders to determine the nature of organisation, pattern of use, and issues relating to traffic management and quality of service.
2. Traffic observations during peak use periods
3. Forecasting traffic to 2013 and 2018.
4. Using a Level of Sustainable Activity framework to:
   - confirm pattern of use,
   - define traffic capacity levels
   - determine current traffic capacity level during peak periods of use
   - impacts of proposed marina expansions by Hobsons Bay Yacht Club and Royal Yacht Club of Victoria.
5. Develop the Traffic Management Plan from the above information

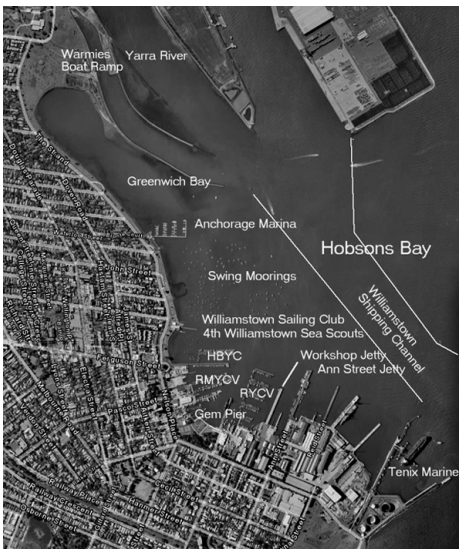

Figure 1 Williamstown Vessel Traffic Management Plan Study area (background image: Google Earth 2008)

Each step of the study method generates new information with the explicit idea of cross checking information in other steps. This idea of cross validation of information between steps of the process is important because, like many consulting studies, there is neither the time nor the budget to collect enough data to generate statistically valid conclusions about recreational behaviour in the study area. In fact, the study method is fundamentally dependent on information from stakeholders. This is the basis of "bottom up" planning and management where information gathered from users drives the process as compared to a top down approach where managers set the agenda with formal planning analysis studies used to characterise the situation with stakeholders used primarily to give feedback to planners on the process.

2 Phase 1: stakeholder interviews

Face to face or phone interviews were conducted with stakeholders identified by Parks Victoria. The list included sailing clubs, commercial ferry operators, commercial charters, commercial marinas, marine services, boat and ship building businesses, Victorian Water Police, Hobsons Bay City Council and Port of Melbourne Corporation. There was generally high interest in the project and all but two stakeholders participated in the interview process out of a total of 33. The interview was structured to gather the following information:

- The purpose of the organization
- For clubs, the membership of the club
- Size of current fleet
- Plans for expansion
- Season of operation
- Scheduled boating activities
- Peak period of use
- Traffic conflicts
- Safety Issues
- Traffic management advice

Interviews lasted on average 1 hour and stakeholders were generally cooperative and eager to volunteer information they thought would be helpful to the process. The process resulted in a detailed list of traffic issues for seven distinct areas in the bay. In addition stakeholders provided detailed information on pattern of use, traffic conflicts, safety issues as well as many suggestions for improving traffic conditions. An unexpected result of the interview process was the high level of dissatisfaction with current management and high levels of animosity between user groups. Key issues include:

- Lack of enforcement of rules
- Conflicts between small boat sailing and large yacht races
- Conflicts between passenger ferries and sail boats
- Poor facilities at Gem Pier for ferries and charters
- Expansion of private marinas into public water
- Insufficient number of public berths
- Increasing traffic
- Lax licensing requirements for recreational boaters
- Aggressive behaviour between commercial operators
- Speeding in the bay
- Recreational boats anchoring in fairways.
- Poor management of swing moorings

On the basis of this information a field observation study was designed to collect objective information about traffic.

3 Phase 2: traffic observations during peak periods

From Phase I it was determined that the peak periods for traffic was during summer weekends, Wednesday evening races, Monday and Tuesday evenings. On site observations were made from three locations in the bay to record all vessel movements. Movements were categorised with a record made of the date, time and type of vessel. The results of the observations confirmed the use patterns reported by stakeholders and provided objective data on intensity of use. In addition to the on-ground observations, aerial surveys

of traffic during the peak periods were also made to photograph traffic during peak periods and to capture the nature of traffic conflicts in a way that ground observations were unable to.

3 Phase 3: traffic projections

From the information obtained in interviews and site observations traffic during peak weekend days was constructed to show hourly traffic for each hour of the day. Based on information on expansion plans by clubs and businesses low and high estimates of traffic growth for 5 and 10 year time horizons were estimated. The results showed natural limits to growth for most clubs and businesses due to the lack of room to expand facilities such as boat storage and marinas, and continued increase in independent motorised boating.

4 Phase 4: level of sustainable activity focus groups

The above information gives a comprehensive picture of current traffic issues and traffic schedules; however it was apparent from field observations that the pattern of use of the different groups was a key to resolving the major traffic conflicts. In addition it is still necessary to determine the current and maximum traffic capacity of the bay. The stakeholders were organised into four focus groups:

- Small Sailing Clubs
- Large Yacht Clubs
- Commercial Marina operators and marine services
- Commercial tourist operators from Gem Pier

In each case users were first briefed on the issues from phase 1. This ensured that all users had the same information available to them. Next, users were asked to draw on aerial photos, their pattern of use (fig. 2). Third users were asked to indicate Level of Sustainable activity in the bay when they have exclusive use of the bay and during peak periods using the scale shown in Table 1. Table 2 shows the results of this evaluation. It shows that LSA ratings are sensitive to local conditions with Users in the Gem Pier areas (such as the Australian Naval Cadets, Melbourne Seaplanes, Able Fish Charters and Red Engine Group all finding conditions at off-peak periods either level C or level D. Most users find that at peak periods (summer weekends) traffic is already at capacity (Levels D or E). This suggests that future growth in traffic will create greater conflicts, increase risks to safety and lower quality of experience for users. It also suggests that actions need to be taken to reduce traffic conflicts during summer weekends.

TABLE 1

Level of Sustainable Activity definitions

Level	Description
A	Plenty of open water, no conflicts between users
B	Moderate amount of open water, need to look out for other users, but plenty of room to manoeuvre
C	Satisfactory sailing conditions need to watch out for other traffic but safe for sailors with good skills
D	Crowded conditions, need to constantly watch out for traffic in order to avoid collisions requires skill and experience to safely navigate
E	Jammed – frequently have to stop or wait for other boats to pass, many near misses, unsafe for inexperienced sailors.

TABLE 2

RESULTS OF LSA RATINGS

Organisation	Off Peak	Peak
Williamstown Sailing Club	A-B	E
4th Williamstown Sea Scouts	B	D
Australian Naval Cadets	C	E
Hobsons Bay Yacht Club	C	C+
Royal Victorian Motor Yacht Club	B	C-D
Royal Yacht Club of Victoria	B	C-D
Anchorage Marina	B	C-D
Aussie Boat Sales	B	B
Savages Wharf	B	D
C. Blunt Boat Builders	B	D
Williamstown Bay and River Cruises	A	D
Melbourne River Cruises	B	E
Williamstown Charters	B	D
Enterprize	A	D-E
Melbourne Seaplanes	C	D
Able Fishing Charters	D	D
Red Engine Group	D	D

5 PHASE 5: TRAFFIC MANAGEMENT PLAN

The information from the previous 4 phases provides a comprehensive understanding of traffic issues in Hobsons Bay. Insights into the problem and the information needed to make decisions relating to traffic management are largely provided by stakeholders in a "bottom-up" approach to management decision making. Traffic management concepts were developed that represent the mix of views on the future of the Williamstown foreshore with strong stakeholder support for the process. This requires a number of strategies to be successful: 1) Trust in the users and the process. It is important that at the outset management and users "buy into" the process. 2) Cross checking information – this is important to keep people honest and bring confidence to the the conclusions. 3) Transparency – everyone should have access to all information both managers and stakeholders. It should be clear what the criteria for decision making is and who will be making the final decisions.

The LSA framework should be adaptable to a range of mixed use environments and adds considerable value to the management process.

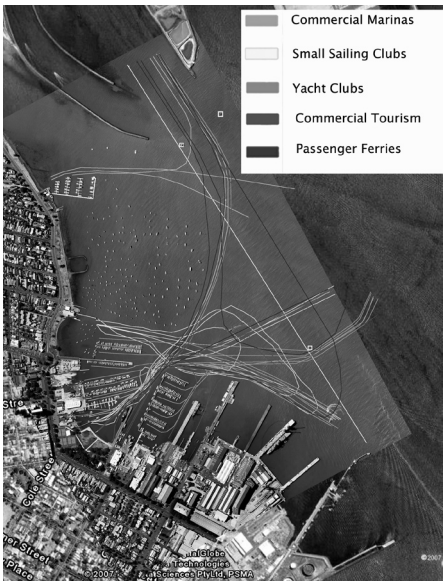

Figure 2 Self reported pattern of use

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