# Zoos Victoria Visitation Data Analysis
An Interactive Qualifying Project
For the Melbourne Project Center

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1. Informal Education
2. Visitation
3. Zoos

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# Abstract

The following project is an in depth analysis of visitation data for the Discovery and Learning department within Zoos Victoria. The analysis includes investigation into several variable comparisons identifying trends and supporting the findings with statistical analyses as necessary. In addition to the numerical analysis, research and interviews of teachers and zoo staff were conducted to qualitatively discuss and explain the observed trends. In conclusion, a set of recommendations has been provided in the areas of future data collection, analysis, and program development.

# Executive Summary

Discovery and Learning is a division of Zoos Victoria that deals with educational programs primarily for schools on classroom excursions. The program has attracted more than 100,000 visitors to the zoo for educational experiences each year since 1969 (Zoos Victoria). This has made educational trips a vital part of the zoo's success. In fact, educational visits coordinated by Discovery and Learning have made up an average of 17% of visitors each year over the past six fiscal years. Discovery and Learning provides Discovery Sessions led by professional zoo educators, close-up animal encounters, and helpful online resources. These services have made Discovery and Learning one of the top providers of informal education in Victoria (Zoos Victoria).

Discovery and Learning has six fiscal years of booking data for visiting school groups and requested a detailed analysis of the data to determine visitation trends (Ekinsmyth[1]). The team was provided with a set of research questions addressing several different variables and comparisons. The ultimate goals of this project were to provide Discovery and Learning with data sets for future research, development, and reporting needs, determine the possible explanations for the trends found, and make recommendations for future analysis and data collection. In accomplishment of these goals, the project team has:

- Determined which variables to analyze and comparisons to make to answer the research questions posed by Discovery and Learning staff;
- Extracted and manipulated the necessary data in Microsoft Access and Microsoft Excel;
- Statistically analyzed the data for different comparisons;
- Continued research through literature, interviews of Zoos Victoria staff, and questionnaire distribution and collection to teachers visiting on excursions;
- Qualitatively discussed and explained trends and patterns found in the data;
- Created visual and numerical data sets for Discovery and Learning future use;
- Provided recommendations for future data collection, research, and development.

Data analysis carried the most importance within this project and as such was where the greatest emphasis was placed. The following summarizes the comparisons and variables the team chose to investigate in response to the research questions posed by Discovery and Learning staff at Zoos Victoria. Each type of analysis was done for each of the Zoos Victoria

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[1] Andrew Ekinsmyth is the Learning Technologies Coordinator for Discovery and Learning Schools, Zoos Victoria.

properties (Melbourne Zoo, Healesville Sanctuary and Werribee Open Range Zoo) as appropriate.

- Overall student visitation both yearly and monthly as well as compared to overall general visitation to Zoos Victoria;
- Independent vs. educator-led visitation both yearly and monthly;
- Visitation by student year level sorted by individual year levels, lumped into the categories of kindergarten, primary, and secondary; yearly and monthly;
- Visitation by different school types analyzed by total students, total number of schools, and by school year levels;
- Visitation by location including geographical visitation distribution and analysis of the possible effect of travel time;
- Repeat visitation across multiple campuses, each campus individually, as well as comparing independent and educator-led visits across each calendar year and all six school years.

Upon completion of the above analyses it was found that overall, across the past six fiscal years, student visitation at the Melbourne Zoo and Werribee Open Range Zoo has increased whereas at the Healesville Sanctuary student visitation has remained relatively constant. In comparison to general visitation, the percentage of Discovery and Learning visitation out of the total visitation for all of Zoos Victoria has also risen across the past six fiscal years accounting on average for approximately 17% of total visitation.

In terms of independent and educator-led visitation, it was found that the percentage of independent visitation out of total student visitation has risen in Melbourne from 30 to 45 percent, decreased significantly at Werribee from 24 to 10 percent and remained fairly consistent around 27 percent at Healesville across the past 4 fiscal years. An explanation investigated for the trend in Werribee is that the structure of excursions there encourages an educator-led session for timing and organizational purposes.

Student year level visitation distribution has been consistent across the past six fiscal years for all three properties. In addition, there has been high visitation from years prep, 7, and 11 students across all three campuses and high visitation from early primary students at Healesville and Werribee. For school year groupings of kindergarten, primary and secondary, the number of primary and secondary school students is nearly equal at the Melbourne Zoo whereas in Healesville and Werribee approximately twice as many primary students visit as compared to secondary students. For monthly analysis investigating the possible effect of the

new AIM standardized testing, it was found that the testing has not yet made a significant impact on visitation.

Schools were classified into Government, Catholic, Independent, and other and as such the school type analysis yielded results showing approximately two-thirds of visiting schools and students come from Government schools across all three campuses, Catholic and Independent sharing the remaining third with slight variations across the three campuses. Schools in the other category represented a very small percentage of visitation.

Visitation by location yielded very intuitive results in terms of geographic distribution. Percentages of students visited out of total students enrolled in a region were calculated and those regions closer to a particular campus generally had higher percentages of visitation. Travel time analysis shows that the rise in fuel and transportation costs over the past six years does not appear to have affected visitation from further distances.

Finally, the repeat visitation analysis showed that schools repeat most frequently to the Melbourne Zoo followed by the Healesville Sanctuary and finally the Werribee Open Range Zoo. In addition, schools repeated more frequently as educator-led visitors than as independent visitors. For the Melbourne Zoo and Healesville Sanctuary, approximately 15% more schools repeated educator-led visitation than independent whereas in Werribee approximately 30% more schools repeated educator-led visits as opposed to independent.

In conclusion, a set of recommendations was provided in two main categories. The first set has to do with the methods and content of the bookings database. Changes in these areas will improve the consistency and accuracy of the booking information as well as allow for more complex analysis in the future. The second set recommends areas for future research and development in terms of visitation data analysis and programming changes.

In completion of the stated goals, the team has provided Zoos Victoria with a set of analysis that can be used in several ways in the future. The completed analysis answers a set of research questions and in doing so has raised many more. The following research and analysis will act as a stepping-stone to continued research in the future. Furthermore, the variables and trends identified will allow Zoos Victoria to alter and improve their offerings in such a way as to broaden their reach in Victorian schools providing more students with informal education experiences.

# Acknowledgements

The Melbourne Zoo 2007 IQP team would like to take this opportunity to thank all of those who have provided valuable insights and assistance in completion of this project. First, we would like to thank everyone at the Melbourne Zoo for welcoming us as a part of the team and making us feel at home here at the zoo. Specifically we would like to thank Andrew Ekinsmyth and Guy Pritchard who have been our main liaisons both in the states and while in Australia. We would also like to thank all of the Zoos Victoria staff that has shared their valuable time to speak with us and give their input, an important resource for completion of our project.

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# Nomenclature

AIM: Achievement Improvement Monitor- standardized testing that the State of Victoria uses to evaluate student knowledge.

CoVis Project: Collaborative Vision Project- The goal is to incorporate various multimedia tools into the classroom in order to strengthen learning methods in the field of science. High schools throughout the United States are participating in this program including California, Florida, Illinois, Indiana, New York, Ohio, Texas, etc.

CILS: The Center for Informal Learning and Schools. Participants include the San Francisco Exploratorium, Kings College (London), University of California, among others.

Informal Education: In this document informal education is defined as non-conventional teaching or learning methods which take place outside the classroom at institutions such as museums or zoos. This is also referred to as non-traditional education.

NSF: National Science Foundation: Government funded agency which supports the advancement of science in the United States.

POGIL: Process Oriented Guided Inquiry Learning program. Sponsored by the National Science Foundation, this project investigates the effectiveness of hands-on, project-based learning.

SMLF: School-Museum Learning Framework. A curricular structure involving informal education developed by Janette Griffin following her research into school-museum integrated learning experiences.

SSD: Statistical Sub-Divisions of the state of Victoria used by the Australian Bureau of Statistics of census information collection.

STEM: Science, Technology, Engineering, and Mathematics- A term commonly being used today to summarize these educational subjects.

VCAA: Victorian Curriculum and Assessment Authority

VELS: Victorian Essential Learning Standards.

# 1 Introduction

Education is an entity that can take place many different forms. Contrary to popular belief, learning is not something that takes place strictly in a classroom setting. Classroom learning can be reinforced through informal education occurring at home, at the playground, or with a trip to the zoo. Learning outside the classroom can help stimulate student's interest in their education in a more personally significant way. According to the *Journal of Education and Technology*, "Learning by doing in nature (field education) is one of the oldest and most natural learning methods that help us explore our surroundings and to understand the life on [earth]. We suggest to move a part of science education to the nature and give pupils, the possibility to 'see what they are learning about' in limits of an informal education" (Zoldosova 305).

Although zoos are first and foremost considered to be a form of entertainment, they also serve many other purposes such as raising conservation awareness as well as educating those who visit. One primary goal of Zoos Victoria is to promote and provide informal education in Victoria through their Discovery and Learning department.

Discovery and Learning is a division of Zoos Victoria that deals with educational programs primarily for schools on classroom excursions. The program has attracted more than 100,000 visitors to the zoo for educational experiences each year since 1969 (Zoos Victoria). This has made educational trips a vital part of the zoo's success. In fact, educational visits coordinated by Discovery and Learning has made up an average of 17% of visitors each year over the past six fiscal years. Discovery and Learning provides Discovery Sessions led by professional zoo educators, close-up animal encounters, and helpful online resources. These services have made Discovery and Learning one of the top providers of informal education in Victoria (Zoos Victoria).

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- Provided recommendations for future data collection, research, and development.

Discovery and Learning is an important part of Zoos Victoria as it helps to accomplish one of the zoo's most important objectives, wildlife and nature education. In completing the above analysis and research, the team has delivered an in depth analysis of Discovery and Learning visitation data and recommendations for the future; and in doing so, the team has provided necessary information to assist in increasing future visitation.

# 2  Literature Review

In order to fully assess visitation trends the team has done an extensive literature review. This review discusses the mission, educational programs offered, and history of Zoos Victoria. This is followed by a discussion of the importance of informal education experiences, studies on informal education, and the differences between formal and informal education. The team also made contact with several informal education institutions in the New England area to determine the trends and causes within this region. Finally in preparation, preliminary research into internal and external trends possibly affecting school group visitation was done.

## 2.1  Mission of Zoos Victoria

Worldwide, zoos and aquariums have similar missions focused on education, preservation, and conservation. There are many examples of this ranging from the San Francisco Zoo that strives to "[connect] people with wildlife, [inspire] caring for nature and [advance] conservation action," (San Francisco Zoo) to the United Kingdom where most zoos characterize their missions as "conservation, education, and research, while providing a good day out for visitors," (Bertram 199). Similarly, the mission of Zoos Victoria is to "lead, inspire and empower everyone to connect with wildlife, build knowledge, develop skills and take informed action to conserve the natural world" (Zoos Victoria).  Zoos Victoria achieves this mission through their exhibits, conservation programs, and educational programs such as Discovery and Learning.

### 2.1.1  Background and History of Zoos Victoria

Zoos Victoria is a public organization employing a total of 500 people at its three of their campuses: Melbourne Zoo, Werribee Open Range Zoo, and Healesville Sanctuary (see Figure 2-1).  The Melbourne Zoo offers over 300 species of wildlife on display year round in beautiful life-like exhibits all only 4 km away from the center of Melbourne. The Werribee Open Range Zoo gives the visitor an experience much like an African safari, where the animals graze in wide open habitats. The animals live much like they would in their natural habitats but are available only 30 minutes outside Melbourne. The Healesville Sanctuary offers close-up animal encounters and behind-the-scenes experiences in the animal health

centre with a focus on Australian species. Each campus offers its own unique visitor experience into the world of wildlife from all around the globe.



**Figure 2-1 Map of Three Zoos Victoria Locations**

Funding for these zoos comes in large part from the support of organizations such as the State Government of Victoria including the Department of Sustainability and Environment, the Department of Education and Training, as well as the Catholic Education Office. Numerous private businesses such as BHP Billiton, Commonwealth Bank of Australia, and Melbourne Water have also made significant donations over the past few years.

Zoos Victoria opened their first of three parks in Melbourne in 1862, when the city donated an area known as the Royal Park site. Today, the Melbourne Zoo is the eleventh oldest operating zoo in the world. When the zoo first opened it was not very popular due to the small number of exhibits that were limited primarily to native animals and songbirds. The zoo gained popularity in 1870 when Albert Le Souef took control. At this time, he acquired lions, tigers, black bears, and other species that greatly increased the diversity of species on display. He also developed picnic grounds and gardens to improve the visitor experience. Under the new ownership the popularity and renown of the zoo grew dramatically. In 1881

the zoo began charging admission. Ultimately, this was for the better as the zoo was able to invest the additional income in stocks. The zoo immediately benefited from this investment, using the dividends to acquire elephants and orangutans the same year. Rhinos, zebras, and giraffes, among other animals, were added shortly thereafter. Since then, the zoo has continued to enhance the visitor experience by adding new exhibits, train rides, restaurants, and shows. Zoos Victoria continued to expand by adding the Werribee Open Range Zoo in 1975 and the Healesville Sanctuary in 1978.

## 2.1.2  Discovery and Learning

Discovery and Learning is a program within Zoos Victoria focusing on one of the key parts of their mission, to build knowledge. To achieve the objective of education through school group visits, Discovery and Learning has been set up to provide centers and resources for educational programming at each of their three campuses. Each campus offers many different programs available to schools or youth groups planning an educational visit. These programs can be divided into two main categories; visits that include a Discovery Session led by a professional zoo educator, and independent visits when school personnel lead the children through the zoo as they choose.

## 2.1.2.1 Planning an Excursion

Teachers can schedule their independent or Discovery and Learning excursions online or by phone. Like many successful businesses, Zoos Victoria has a home website highlighting important information regarding their exhibits, program information, and admission hours as well as entrance costs.  Within the website is a link specifically designated for the Discovery and Learning programs page which brings the visitor to a plethora of information regarding the different programs available.  These programs are broken down into appropriateness for various age groups and offer a chart evaluating the educational value according to the Victorian Essential Learning Standards (VELS) (See Appendix B).  Each learning program is listed with a description as well as separate links for students and for teachers to explore.  There are also two separate links, one for students and one for teachers to use as a resource to supplement their planned excursion.

### 2.1.2.2 Melbourne Zoo

All three of Zoos Victoria's campuses are individually unique and as a result Discovery and Learning Schools can offer a different experience and Discovery Session for students and teachers at each site.  The Melbourne Zoo can be considered a fairly traditional style zoo with a wide variety of exhibits.  This, in itself is the most important feature of the Melbourne Zoo.  Children come to visit and marvel at over 300 species of animals roaming around in their exquisite, life-like habitats.  One unique feature at this zoo is a centrally located cage leftover from the old-style zoos where all animals were kept in small cages with almost no space to be active. Within the cage is a cardboard model of a tiger, which takes up more than half the length of the cage.  Accompanying this cage is an explanation containing a valuable lesson for students about the importance of keeping animals in their natural habitat even if it means simulating that within the walls of a zoo.  While this and other features like it throughout the zoo provide important lessons for students, the most valuable learning tool available to students is a lesson with one of Discovery and Learning's educators.

The D&L lessons take place in what's referred to as a classroom, but on first glance could be more readily described as an indoor desert, savanna, garden, outback, or other setting.   Each room is meticulously furnished with a common theme and fully outfitted with various live as well as stuffed creatures for the school children to learn about and observe.  For example, one classroom is fully equipped to represent an arid desert.  Along the walls are various habitats with an assortment of snakes and lizards for students to observe.  Also decorating the room are real animal furs and skulls.  Gathering the children into a circle, the Discovery and Learning educator takes out some of the creatures residing within the room and teaches the children about that particular species.  Finally, the animal is brought around the room so that the students can get a closer look, and even pet the animal if they so choose (Eckinsmyth).

### 2.1.2.3 Werribee Open Range Zoo

Werribee Open Range Zoo brings the thrills of an African adventure to the greater Melbourne area in a distinctive layout design.  There are three main paths for visitors to follow in order to get the full visitor experience. Each section takes about 1 hour to complete.  This set-up makes it easy for teachers to plan the day's itinerary by scheduling

approximately one hour for walking around the trails, an hour for the safari tour, an hour for lunch, and a fourth hour for a Discovery and Learning session.

Students can start along the Volcano Trail where they can see native Australian animals including kangaroos, wallabies, emus, and brolgas.  Then they can hop on a bus and take a safari ride through the grassy African plains while a tour guide introduces the students to rhinos, giraffes, zebra, and antelope.  Next is the African walking trail where visitors can see lions, monkeys, cheetahs, and hippos.

While walking along, one can see that a considerable amount of effort was put into the creation of these paths.  Intricate cracks showing the dryness of the land are scattered among various animal footprints.  The basic idea is that these footprints tell a story that Discovery and Learning uses for one of their programs called Zoo Detectives.  In an animated adventure the students follow the footprints of a lion stalking a cow for its prey nearby an African village. In this case the prey is actually livestock of the village.  Spacing between animal tracks help to tell the story by depicting the difference between the lion stalking the prey and then finally leaping in for the kill.  Finally the school group approaches the skeletal remains of the unlucky cow. Looking closely the group identifies another set of tracks, and concludes that these must belong to a local villager inspecting the carnage.  Lastly, one can see the remnants of vomit leftover by the lion which the Discovery and Learning educator expertly explains is a result of the lion's rapid binging so that other animals can not take its hard-earned meal (Pahlow).

## 2.1.2.4 Healesville Sanctuary

While all three zoo campuses focus highly on animal conservation and awareness, Healesville Sanctuary is the only campus to host a wildlife hospital.  The Australian Wildlife Health Centre, opened in December 2005, allows visitors to come inside and see what the veterinarians are doing to help care for and protect Australia's wildlife. The most talked-about feature at Healesville is the Birds of Prey show.  In an outside stadium people gather several times a day to learn about a variety of extraordinary birds that fly so close overhead that visitors can feel wing feathers brushing against them.

The wildlife hospital and birds of prey show are not the only places where children learn.  In one of the classrooms called Grandmother's Garden children begin their journey outside where their Discovery and Learning educator tells them about the tawny frogmouth

bird and allows them to take turns petting it. Then, heading inside, students get to see and touch a snake, tree frog, and stick bug.

All in all, the three campuses of Zoos Victoria each provide a very different student experience and very different programs for students, all serving the singular goal and mission to educate students in the areas of wildlife, wildlife conservation and protection (Shadforth).

## 2.2 Importance of Informal Education

Throughout the world educators recognize the educational value of zoos, museums, and other such institutions as an important supplement to formal education. Following a study into School-Museum Learning Framework (SMLF), Janette Griffin[3] concluded that her "most significant finding was the students' recognition and declaration of their own learning in an environment in which they had choice and ownership of their learning"(1998 xi). More studies on the effectiveness of these hands-on learning techniques are conducted each year yielding positive results, thus proving that learning by doing helps to create a lesson that can last a lifetime (Griffin 1998, Harrison 1988, Morrell 2003, Ramey-Gassert 1997).

Informal education can be described in many ways. The U.S. National Science Foundation defines it as a type of "multi-faceted learning [which] is voluntary, self-directed, and often mediated within a social context; it provides an experiential base and motivation for further activity and subsequent learning" (ISE 5). In *The Elementary School Journal*, Linda Ramey-Gassert states that it can be a "variety of out-of-school science environments…and provide[s] students with unique, engaging science learning opportunities and classroom teachers with a wealth of science teaching resources" (433). In general, these informal lessons take place in group oriented projects and/or outside the classroom in environments such as museums, science centers, and zoos (Melber 3).

### 2.2.1 Studies on Informal Education

Numerous studies have been and are being conducted to examine the nature and effectiveness of informal learning. The general consensus of these studies is that interactive learning is extremely effective when used to supplement traditional classroom-based lessons (National Science Foundation, ISE, Morrell 2003, Martin 2004).

For example, with funding from the U.S. National Science Foundation the Process Oriented Guided Inquiry Learning program (POGIL) has been investigating the effectiveness

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[3] Janette Griffin is a teacher-education Professor at the University of Technology, Sydney

of hands-on, project-based learning.  The POGIL project focuses on discovering the most effective teaching methods to supplement students' learning experiences. They do this by grouping students together in teams to work on guided inquiry activities.  Thus far in their research they have been able to conclude that student-centered approaches are most effective "when: they are actively engaged and thinking in class; they construct knowledge and draw conclusions by analyzing data and discussing ideas; they learn how to work together to understand concepts and solve problems; and the instructor serves as a facilitator to assist students in the learning process" (POGIL).

An acronym rapidly becoming more common in non-traditional education is STEM, meaning science, technology, engineering, and mathematics.  The Center for Informal Learning and Schools (CILS) is one of many research projects that fall under the STEM category.  CILS is a collaboration of the Exploratorium (San Francisco), the University of California, Santa Cruz, and King's College (London).  CILS mission is to understand how museums and zoos can work together with schools to support K-12 science learning. According to Martin in her research of the framework for studying informal learning, "The task of CILS is to develop a common basis for discussion internally within the project, identify critical research issues, and prepare students and museum educators to study and design effective learning" (2004).

Another project involving STEM initiatives is the CoVis project, meaning Collaborative Vision.  The goal is to incorporate various multimedia tools into the classroom in order to strengthen learning methods in the field of science.  The Exploratorium in San Francisco worked with CoVis on one particular experiment in which the internet was used to reach inner-city school children who, under normal circumstances, would not be able to attend the museum (CoVis).  A virtual field trip was conducted by providing a remotely controlled camera which students could pan around entire exhibits from their own classroom. The students could even talk directly to curators and visitors within the museum (Fishman 25).  This is just one example of the ways in which the CoVis project is using multimedia tools to increase opportunities for informal education to students today.

The World Wildlife Fund conducted a survey on the 'Windows on the Wild' national environmental education program in 1994.  The purpose was to analyze environmental awareness among youth.  Several zoos and museums participated in the study that "revealed that the majority of formal and nonformal educators felt that environmental education should be a priority in their institutions" (Dierking 7).

In 1997 a study was conducted at the Cleveland Metroparks Zoo to investigate the prolonged effects of childhood visits to the zoo. The purpose was to understand the relationship between visits in early childhood and visitation as well as expectations later on in adulthood trips to the zoo. On average, adults who visited the zoo during childhood came to expect benefits such as education, awareness of environmental problems, gaining more knowledge about nature as well as animals. Results also showed that people who attended zoos several times as children were more inclined to emphasize the educational importance of zoos and also visit more often as adults (Dierking 11).

## 2.2.2 Differences between Formal and Informal Education

One important advantage of school-sponsored excursions is the change in learning environment achieved by taking the students out of the classroom into a more interactive educational atmosphere. Instructor-centered learning is primarily conducted through verbal lecturing as well as the written word for communication of lessons. However, in a zoo or museum students are more in involved observing the objects that surround them and in turn can learn through observation. Most importantly, these learning environments interest and involve children more than traditional learning, and therefore the children are motivated to gain more knowledge out of the experience for their own purposes, rather than simply to pass their next examination (Ramey-Gassert 434).

Some characteristic differences between formal and informal learning environments are illustrated in Figure 2-2. In Figure 2-3 Scribner illustrates the importance of out-of-classroom education by comparing the differences between thought processes associated with learning environments. He makes it apparent that the atmosphere that children encounter when on school excursions can cause them to think in different ways than they normally would in a classroom. The adjectives he used to describe the differences in thought processes [ex: creative, flexible, etc.] can be generally interpreted as beneficial in comparison.

| Informal Learning Environment Characteristics | Formal Learning Environment Characteristics |
| --- | --- |
| Voluntary - attendance<br>          - what is learned | Compulsory - attendance<br>          - what is learned |
| Unstructured | Structured |
| Unsequenced | Sequenced |
| Learner-centred | Teacher-centred |
| Contextually relevant | Relevance unclear |
| Heterogeneous groupings | Homogeneous groupings |
| Collaborative | Individual |
| Non-competitive | Competitive |
| Open-ended | Closed |
| Non-curriculum-based | Curriculum-based |
| Unintended outcomes recognised | Unintended outcomes disregarded |
| Non-assessed | Assessed |

**Figure 2-2 Comparison between Characteristics of Informal and Formal Learning Environments (Griffin, 1998).**

| School Thinking | Practical Thinking |
| --- | --- |
| Generalized | Continually creative |
| No nonsymbolic content | Strives for mastery of the concrete |
| Emphasizes mental processes | Utilizes one's knowledge |
| Verbal | Uses whatever works |
| Solitary | Involves others |
| Independent of a specific end | Sensitive to the environment |
| Uses general tools | Uses available materials |
| Built on many systematic examples | Flexible and economical |

**Figure 2-3 Terms adapted from Scribner's Characteristics of Practical Thought, 1985**

The teacher plays an important role in enhancing the effectiveness of class field trips. Rather than regarding the excursion as a hiatus from their usual routine, teachers should facilitate learning by stimulating children to think analytically about the things they observe at the museum or zoo in order to improve critical thinking skills. Regrettably, the trend in

Sydney, Australia has been to rely mainly on the museum educators to host lessons for attending school groups (Griffin 1998, 5). It is important for the teacher to prepare students for an excursion by supplying them with background knowledge about their destination and integrating appropriate material into their established curriculum. Conversely, it is important for zoos and museums to provide preparatory and follow-up materials so that teachers can appropriately incorporate the experience into their curricula.

Following a study of the School-Museum Learning Framework (SMLF) Griffin (1998) was able to conclude that the most effective museum excursions occurred when:

- "Teachers and students have a clear, shared purpose;
- the visit is linked to class work;
- students are given preparation at school for the excursion;
- worksheets are used with care to facilitate choice in learning;
- students are given choice in their learning activities;
- students' curiosity is fostered;
- students are encouraged to share their learning with peers and adults;
- students are encouraged to use the full range of learning opportunities provided by the venue;
- teachers participate in the learning process and model appropriate learning [behaviors] "(97).

In today's society the world of education is constantly changing as technology and research continue to alter conventional thoughts on a daily basis.  Traditional methods are now being reconsidered as educators begin to discover various new and different teaching techniques, which may or may not prove to be more effective.  As researchers have shown, informal education proves to be an effective reinforcement tool for traditional curricula.

## 2.3  Classroom Field Trip Trends in New England

Analyzing trends and studies of local informal education institutions will provide valuable background information that can be applied to research and analysis of similar trends associated with Zoos Victoria. Although the findings for New England institutions may not directly identify with Zoos Victoria they may identify avenues to pursue as well as research further.

Several informal education institutions in the New England area have seen a decrease in attendance by school groups. These include the Worcester EcoTarium, Springfield

Museums (specifically their art museum), and the New England Aquarium. Through discussions with Dominic Golding at the Worcester EcoTarium, it has been identified that their museum has seen a 22% decrease in school group visits over the past five years with the biggest drop in school group visitation between the years of 2002 and 2003. The primary causes they have identified include the pressures of MCAS standardized testing and budget constraints (Golding). Springfield Museums, being an interdisciplinary institution, comprises four separate museums; the Ancient Treasures Gallery, the Springfield Science Museum, Connecticut Valley Historical Museum, and the Museum of Fine Arts. Wendy Somes, the Art and History Curriculum Coordinator, states, "A once popular art appreciation program for upper elementary (4-8 grade) is now only booked a few times a year, typically by home school [groups] or an out of state group." While some of their science programs continue to draw students, their art programs have become far less popular (Somes). The New England Aquarium is yet another institution suffering from a decline in visitation by school groups. At the aquarium, there has been a steady decline in school group attendance beginning with a 9% decrease in 2004, then little change in 2005 followed by a 14.6% decrease in 2006 (Slapak).

Although there are many institutions struggling to maintain the interest of schools in informal education experiences, the Boston Museum of Science has managed to significantly increase the volume of students that they reach over the past four years. Visitation has increased from 150,000 four years ago to roughly 240,000 over the past two years. These figures do, however, include students who have participated in the traveling programs offered where the museum actually brings the exhibit/presentation to individual schools. Overall, as stated by Henry Robinson from the Boston Museum of Science, "Increases [in] marketing has supported an increase in attendance." Through the museums development of a mailing list, a monthly educator newsletter, a consistently updated website, invitations to field trip planning sessions, free teacher previews, and development of a traveling program, they have been able to effectively increase school group visitation (Robinson).

## 2.4 Internal Factors Influencing Field Trip Frequency

There are many possible explanations for the trends observed in school group visitation at Zoos Victoria. One set of factors that could be having an affect is internal occurrences within the zoo. Factors within this category include overall visitor satisfaction, teacher perspective on field trips, and the design and use of the Zoos Victoria website.

## 2.4.1  Visitor Satisfaction

Visitor satisfaction in zoos and museums is important because achieving high visitor satisfaction encourages visitors to come back again and also to encourage others (i.e., new visitors) to come based on word-of-mouth recommendations. Researchers have identified a variety of attributes that are important to visitors.  For example, the Smithsonian National Zoo found the promotion of discovery and imagination were the two top reasons as to why people like to visit the zoo (Smithsonian National Zoo). Discovery learning is a style of active learning that focuses on students' first hand experiences in the curriculum. This learning style encourages students to learn through direct involvement, not lectures, and then integrate the acquired knowledge with their existing knowledge (Bicknell-Holmes, Hoffman, 314). Providing opportunities for students to use their imagination has also been found a key attribute in many informal education programs. A case study by Carrol Butterfield, found that learning was enhanced in children where an imaginative environment was created to allow them to connect new information to past knowledge and have open discussions (Butterfield, 10). With this in mind, it is important for the museums and zoos to concentrate on this idea of providing quality education.

In another case study, Niall Caldwell surveyed visitors to 11 London Museums on topics ranging from the quality of food to the value of the exhibits. Most visitors stated that the components they valued most were the exhibits and the history associated with them. Before this study the museums had been focusing visitor satisfaction studies solely on areas of food and special openings (Caldwell 161). This study proved that visitors demonstrated a desire to gain knowledge as well as entertainment in their trips to the museums.

The level of interactivity in zoo and museum exhibits has also been found to be a key contributor to visitor satisfaction. Research has shown that interactive exhibits receive more attention from visitors than less interactive exhibits – visitors are more likely to peruse the more interactive exhibits and the 'residency time' at interactive exhibits tends to be longer. There are several styles of interactive exhibits used in museums so that different learning styles can be tailored to. These styles have been described as "hands-on," "pick-and-choose," and "multi-sensory" learning. Hands-on learning offers touchable exhibits that allow a more free-style learning.  The pick-and-choose style lets people learn what they want to learn, and multi-sensory learning involves other senses like hearing and smell. Such interactive techniques allow museums or zoos to attract and engage visitors more effectively and thus enhance learning and satisfaction (Eldridge, 5-12).

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Proper visual aids at exhibits are also important in zoos and museums because these enhance informal learning, and in turn improve upon visitor satisfaction. Having visual components is a technique used to teach concepts that may otherwise be either too complicated or uninteresting. In a study by Malkin, sixth grade students were asked to create masks out of clay. In order to make the project clearer the teacher took a systematic picture sequence for modeling the masks in order to aid students in visualizing the process. This helped them to complete the task with impressive results (Malkin). The importance of effective visual communication in museums was shown in a case study done in the Phoenix Zoo where visitors were surveyed about their learning experiences in a reptile exhibit. Although the study was not done specifically for visual effectiveness, visitors indicated that the amount learned within the exhibition was limited by ineffective visual communications, specifically by the lack of informative signs (Schnackenberg).

Attaining high visitor satisfaction is important to informal educational institutions. In order to achieve this goal these institutions must make exhibits that focus on what guests want and improve the interactive and visual aids at such exhibits. When these goals are met, people are satisfied, and this will encourage them to revisit in the future. A case study was done at the Fort Worth Zoo, showing the correlation of satisfaction and re-visitation. During their visit, visitors were first surveyed about different aspects of the zoo including the educational value, the wildlife, and zoo staff. Following that, they were asked if they would return in the future. From these data, it was shown that there was a large connection with satisfaction and likelihood to return for future visits (Tomas 239). Therefore, accurate measurement of visitor satisfaction is important so proper changes can be made to stimulate repeat visits and thus increase bookings in Discovery and Learning of Zoos Victoria and increase the number of students reached and educated.

## 2.4.2 Teacher Perspectives

In order to increase visitation by school groups, it is important to evaluate what teachers want for their students when they visit zoos and museums and to meet those goals. Doreen Finkelstein, at the Center for Informal Learning and Schools in San Francisco, California, surveyed teachers from three major urban cities in the US to determine what they most wanted from field trips to museums and zoos. She found that teachers wanted the museum or zoo visited to:

- Be a place to learn science content;

- Be a place that helps teachers improve their pedagogical skills;

- Be a place that helps teachers find and get resources for the classroom

- Be a place that provides teachers with ideas and activities that can be brought back to the classroom;

- Be a place where science experts interact with teachers and students;

- Be a place that motivates interest in science;

- Be a place where teachers and students are exposed to things and do activities that are not readily available in the classroom.

Evidently, teachers feel that trips to museums have the potential to be valuable tools for education if planned and carried out in such a way that they meet a certain set of objectives (Finkelstein 4-8).

## 2.5  External Factors Influencing Field Trip Frequency

There are many possible factors to explain trends in the frequency of field trips, many of which are not associated with the programming available.  Such factors can include but are not limited to:

- The Australian educational system and when out-of classroom experiences fit into the curriculum;

- Information technology providing easier and faster access to information;

- Liability issues associated with leaving school grounds;

- Transportation and other costs not provided for in budgets.

In a study done to investigate the decline of educational excursions in Britain, John Fisher explains the reasons that teachers give as to why they do not go on field trips. These include:

- The risk of accidents to students while away from school is too high. (Fisher, 9-18)

- Field trips are not required, passing exams is important so teachers focus on training students for that;

- Some teachers, especially newer ones, are  not conducting field trips due to complexity or lack of interest;

- Educational budgets rarely allow a lot of room for field trips;

Each of the factors mentioned will be explored to determine how it may affect visitation. Assessing these possible causes will allow Zoos Victoria to alter their practices or programs to accommodate the ever-changing academic world.

## 2.5.1 Australian Education System

The Australian educational system has undergone many changes and is different from the U.S. system in many ways. To best determine the state of informal education provided by Australian schools, valuable insight into the background of how the educational system works is necessary.

A substantial change was recently made to the Victorian Educational System when the Victorian Curriculum and Assessment Authority (VCAA) published the Victorian Essential Learning Standards (VELS) in December 2004. The purpose of the Standards was to establish a uniform framework to which the whole of Victoria would adhere. Additional components were later added to the original Standards in March 2005, then again in December 2005. For a more detailed description of the VELS see Appendix A.

Not unlike the U.S., standardized testing is a part of Victorian curriculum. In school years 3, 5, 7, and 9 children take the Achievement Improvement Monitor (AIM) tests. Introduced in 2006, the tests serve as a tool to measure students' literacy as well as their numeric skills across the entire state of Victoria. Students in years 3, 5, and 7 take their test over the course of two days at the end of August. The first day is dedicated to the Mathematics section, and the second day concentrates on English. Year 9 students follow the same structure except that their test takes place in May (VCAA).

## 2.5.1.1 Relationship between VELS and School Excursions

With the change in curriculum instituted by the VELS it is important to investigate what affect these changes may have had on the number of out of school excursions. While numerical data are extremely difficult to obtain, one can instead investigate the degree of support VCAA displays for classroom excursions.

One VELS sample unit designated for level 5 (during the students' 7th or 8th year of schooling) addresses a range of educational domains and includes an out-of-school excursion. The lesson is intended to take two to three weeks in which the pupils investigate urban living and write a research report on their findings. Part of this project includes a two-day trip into downtown Melbourne so that they can interview respondents and experience the elements

upon which they will report.  The distinct purpose of this unit is to develop effective communication skills (VELS).

In a statement about Mathematical Assessment and Reporting on the VELS website an example is included where level three students use their recent zoo experience to understand the process of collecting "simple categorical and numerical data (count of frequency) and present[ing] this data using pictographs and simple bar graphs" (VELS).

From the two examples listed above one can conclude that VCAA does not necessarily disallow classroom excursions.  In fact, it is apparent that in both situations these trips were academically beneficial for the students who participated.

## 2.5.2  Field Trip Liability

One doesn't have to dig deep in databases of recent news stories in Australia to find reports of incidents on school field trips. In fact, a search on the LexisNexis™ Academic world news database of key words "Australia" "School" and "Excursions" yields nearly all stories of death or serious injury incurred by students on school trips.  With negative stories of field trips plaguing the media, the importance of informal education is lost among the tragedies. Although these stories are of serious concern, they represent the minority of student experiences on field trips.

## 2.5.2.1 Government Standards for School Excursions

Media broadcasts of this kind of information frequently will have effects on many different groups of people including parents, teachers, and the government in charge of regulating field trips and ensuring that all safety precautions are met. Following two public accidents on school excursions in New South Wales, the Deputy Director-General of Schools, NSW Department of Education and Training Robin Shreeve has instituted new safety regulations in the past few years to be carried out for all school excursions. The new regulations under the occupation health and safety rules require teachers to provide a full risk assessment of any potential problems associated with the trip. Such assessments require heavy paperwork and frequently trips to the intended location by educators prior to visits. Although the Department has received numerous complaints from groups such as the Primary Principals' Association and the NSW Teachers' Federation, many fear that the stringent requirements cause too much hassle and may cause an end to school excursions (McDougall 2).

The Department of Education and Training in Victoria has similar stringent requirements for excursions. Each venue "should be assessed for their inherent safety and suitability as well as for the risks associated with the activities that may occur during camp or excursion," according to the student safety and risk management guidelines provided by the Victorian Department of Education and Training (Victorian Department of Education). The amount of work required to fulfill these requirements are likely affecting the frequency of field trips; however, as they are new within recent years, there is little literature to support this hypothesis.

## 2.5.2.2 Increased Cost

There are many costs associated with field trips that are currently on the rise. These include liability protection costs and transportation costs frequently not covered in the school's budget.

In response to the added risk portrayed in the media, insurance companies have raised premiums paid by schools offering "high-risk" activities such as outings and excursions. Private schools surveyed by the Association of Independent Schools of South Australia have reported increases of as much as 100 percent on yearly premiums (Chapman 12). These increases in insurance cost come without any additional assistance from the government, forcing educational institutions to divert funds from formal education or in many cases cut programs that could have valuable educational impact (Chapman 12).

In New England, the Boston Museum of Science, the New England Aquarium, and Springfield Museums, and Worcester EcoTarium have cited issues with transportation costs affecting field trips. Through research and surveys conducted by these institutions, it has been shown that the rising costs of fuel and buses are a big concern for school systems in planning field trips. Many of these institutions have begun fundraising through application for grants, outreach initiatives, and discounted admission for school groups to help counteract this problem.

# 3  Methodology

The primary goal of this project was to provide an in-depth analysis of the school group visitation data (2000-2006) provided by the Discovery and Learning department of Zoos Victoria. This project has identified and characterized the trends in the data and determined possible explanations for observed trends and anomalies in visitation data based on findings from the literature and interviews conducted with zoo staff, as well as visiting teachers. This project has made recommendations about how to track and analyze these trends in the future.

In completion of the stated goals, six main tasks have been completed. The project team has:

1. Conducted a comprehensive analysis of school group visitation data provided by Zoos Victoria identifying any discernible trends.
2. Reviewed the literature identifying visitation patterns at similar institutions and any explanations that have been proposed for these patterns.
3. Conducted interviews with educational programming staff at Zoos Victoria, to determine what trends they have observed and what factors they believe may explain such trends.
4. Conducted interviews in Australia with educators who made a visit to Zoos Victoria during the duration of the project in order to gather information on their field trip perspective.
5. Compiled a report that characterizes the trends observed in the data and summarizes the factors that appear to be most important in shaping these trends.
6. Developed a data set that can be used for Discovery and Learning reporting needs and a recommendation as to how current and future data can be interpreted.

Figure 3-1is a timeline for completion of the above tasks:

| Task | PQP | Week 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Visitation Data Analysis | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Literature Review | ■ | ■ | ■ | ■ | | | | |
| Interviews of Zoos Victoria Staff | | ■ | ■ | | | | | |
| Distribute and Collect Teacher Questionnaires | | | ■ | ■ | | | | |
| Compare Research to Data | | | | | ■ | ■ | ■ | ■ |
| Generate Data Sets and Report Findings | | | | ■ | ■ | ■ | ■ | |
| Deliver Findings | | | | | | | | ■ |

**Figure 3-1 Timeline of Completed Project Tasks**

## 3.1 Data Analysis

An important piece of this project was to complete a comprehensive analysis of the visitation database provided by Discovery and Learning that contains information across the three zoo campuses. Discovery and Learning staff at Zoos Victoria provided the team with a set of research questions to be answered with this analysis. See Appendix . By using this set of research questions, the team determined the following set of comparisons to be made for each fiscal year and each zoo campus:

- Monthly Visitation
- Independent Visitation vs. Educator-Led Visitation
- Visitation vs. Location
- Visitation vs. Student Year
- Government School Visitation vs. Private School Visitation vs. Catholic School Visitation
- School Visitation vs. Yearly Frequency

## 3.1.1 Overall Visitation

In order to understand the trends in school group visitation, overall visitation to Zoos Victoria was analyzed. Using data obtained from the Marketing Department at Zoos Victoria total visitation numbers per fiscal year across three campuses were summed. These numbers included student visitation despite the fact that the excursions were booked through Discovery and Learning. These data were compared to overall Discovery and Learning student numbers extracted from the Microsoft Access database utilizing a query of date of lesson, booking quantity, and school name. This was then exported to Microsoft Excel and lumped by fiscal year for comparison to overall visitation numbers.

In order to assess whether or not Discovery and Learning trends reflected overall visitation trends, total Discovery and Learning student numbers were normalized by overall visitation numbers. If the percentage of Discovery and Learning students remained level over the course of six fiscal years this would prove that numbers for Discovery and Learning directly correlated to overall visitation. Overall visitation numbers for Zoos Victoria and Discovery and Learning Schools were also plotted on a line graph.

Total Discovery and Learning visitation numbers were then calculated for each fiscal year and represented on a combination bar and line chart showing individual numbers for each zoo as well as total visitation for all three zoos. In order to generate a more accurate scale for the individual zoos, two separate line graphs were then created. One line graph was specifically for Melbourne Zoo and the other illustrated both Healesville and Werribee on the same graph. The purpose was to identify overall yearly trends for each of the three zoos using a linear trend line to summarize the overall slope.

The next comparison made was a summary of total visitation by month for each zoo and year. To calculate monthly numbers, the Discovery and Learning data used above was broken down by month. These monthly summaries for each year were plotted on a line graph comparing monthly visitation by year for each individual zoo. The purpose was to understand student visitation trends by month and to identify any anomalies that may have occurred in a particular month in a specific year.

After observing these graphs, possible factors affecting monthly visitation were examined. Some factors explored were the relationship in monthly visitation and school holiday schedules, major exhibit openings, and external factors such as the Commonwealth

Games. Dates of school holidays were compared to monthly visitation in order to understand why decreases in visitation occurred in a certain month every year.

In order to assess the effect of exhibit openings as well as external special events the team averaged the student visitation for each specific month in which the event occurred for years 1999-2006, excluding the year in which the event actually occurred. The standard deviation was then calculated for this average. standard deviation was then added or subtracted from the average. If the number of students attended in that month fell outside the range of one standard deviation from the mean then the effect of that particular event would be considered substantial. Detailed calculations can be found in Appendix E.

### 3.1.2 Independent Visitation vs. Educator Led Visitation

The next comparison made was the comparison of visits made independently by schools to those involving a session led by a zoo educator and the yearly trends of each type of visit at each of the three campuses. To determine this, the number of independent and educator-led students for each type of visitor each year were summed. This analysis was done for the past 4 fiscal years at the Melbourne Zoo and Healesville Sanctuary and the past 3 fiscal years at the Werribee Open Range Zoo, as these are the only years with reliable data regarding independent visitation. The team chose to use student numbers rather than booking numbers due to the fact that the sizes of independent bookings tend to be much larger than educator-led booking. For example, one school may bring 50 children and book only once for an independent visit, or instead, they may book 3 educator-led classes. This is in large part due to the size of the Discovery and Learning classrooms.

The team then compared the trends of independent visitors to educator-led visitors on the same graph, comparing year-to-year numbers of visitors. This comparison was made for each zoo. In order to accurately compare independent vs. educator-led visitation per year for all three zoos percentages needed to be calculated. This was done by dividing the number of independent visitors per year by the total student visitation per year. A line graph was then plotted showing the percentage visitation of independent visitors for the fiscal years 2002-2006.

Monthly trends were then compared for independent vs. educator-led visitation. To complete this analysis, the number of independent visitors per month was divided by the total number of student visitors in that month. Separate line graphs were then generated for each zoo illustrating the monthly distribution of independent visitation. The trends found in the

graphs were discussed and compared to factors determined in research such as school year calendar.

### 3.1.3  Visitation by Student Year

The next comparison made was the relationship of student year level to visitation. To complete this comparison, student year level distribution on a yearly basis was considered. The team began by making a query in the Microsoft Access booking databases for each available fiscal year at each zoo. The query included the booking quantity, or number of students attending in each booking, the lesson date, student year level, and lesson type, either independent or educational. The extracted data was then exported into Microsoft Excel for manipulation and analysis.

In Microsoft Excel, the data was split into independent and educational bookings so it could be analyzed both separately by lesson type and then added to obtain overall student year distribution data. Once organized by lesson type and split into different worksheets, the data was sorted by student year. Once sorted in this fashion, the number of students attended from each school year or school year grouping was summed, if the booking was made for more than one student year level. For any bookings made for more than one student year level, the number of students in the booking was equally divided between all year levels included in the booking. The students were divided and summed in this way for ease of comparison. If there were different groupings of students for each fiscal year and each zoo, it would not be possible to properly compare them. The percentage of visitation for each school year level out of the total visitation for the fiscal year being analyzed was calculated. This was done to normalize the effect of changes in total visitation between fiscal years.

Once analysis was done in this way for each fiscal year, each campus, and each lesson type, the two lesson types were lumped together to get the overall visitation by school year. For each campus, all six years were plotted on the same line graph with the y-axis representing the percentage of students visited and the x-axis representing the school year level. The observed trends were then compared to qualitative information collected through research and discussion with teachers and Zoos Victoria staff.

Following the analysis of distribution of each student year separately, analysis was also done lumping student years into the categories of kindergarten, primary, and secondary. In order to accurately determine the trend in these categories, data outside these categories was not considered in the percentage calculations. This analysis was done for each zoo across the six fiscal years. The analysis was summarized on histograms for each zoo with the y-axis

representing the percentage of students attended for each grouping and the x-axis representing fiscal year. There were three series of data, kindergarten, primary and secondary.

Differences in independent and educator-led visitation was also considered and graphed independently. To make this comparison, the lumped year levels of kindergarten, primary, and secondary were used so the differences in independent and educator-led visitation would be more apparent and therefore easier to compare. Histograms were created for each campus summarizing the percentage of students from each year level grouping that attended independently or with an educational session for each fiscal year. This allowed independent and educational visitation to be compared side by side for each year and year level grouping. Separate histograms were created for each campus to summarize the analysis with the y-axis representing the percentage of students and the x-axis representing independent and educator-led visitation for each fiscal year. There were three series of data for each kindergarten, primary, and secondary.

The final manipulation and analysis of the student school year data was done on a monthly basis to allow the team to investigate the possible effect of the new standardized testing in Victoria. AIM testing took place for the first time in the month of May 2006. In order to determine whether or not the new testing had an effect on visitation, the data was sorted and manipulated in the same way as for the yearly analysis, the percentage of students visited for each year level out of the total visitation in the month of May from 2000 to 2006 was calculated. The percentages for years 2000 to 2005 were averaged to smooth out any anomalies in the data before comparison to 2006, the year testing took place. The monthly data was organized on three histograms one for each Zoos Victoria property.

In order to statistically analyze the possible effect of the new standardized testing, the team chose to use the Wilcoxon Rank Sum. The Wilcoxon Rank Sum is a paired comparison test that can be used to determine if visitation from the year levels 3, 5, and 7 across the three zoos has been significantly negatively affected since the institution of the AIM tests with reasonable confidence. Full calculations and explanation are available in Appendix H.

### 3.1.4 Visitation by School Type

The next comparison was made between the school type categories Government, Independent, Catholic, and 'Other.' First, overall student visitation divided into school types was considered. Then the overall students were divided into school types and school levels, and the percentage of each school type out of the total schools that visited each zoo was calculated.

Percentage of students in each individual school type was considered first. To determine this, a query showing the date of lesson, booking quantity, school name, and school type was created from the main visitation database. This query extracted lessons dates from fiscal years 1999 to 2006 for Melbourne Zoo and Healesville Sanctuary, and 2000-2006 for Werribee Open Range Zoo. These data were exported into Microsoft Excel into individual sheets per zoo where the lessons were sorted into separate school types. The number of students within each school type was then summed. These totals for each school type from each individual campus were combined into one set of data. Percentages were then calculated by normalizing the number of students per school type by the total number of lessons. The results were graphed in a pie chart

Visitation by school types was further analyzed by looking at the total number of schools of each type visiting each campus. To do this a query with the date of the lesson, booking quantity, school name, and school type was created in Microsoft Access then exported to Microsoft Excel into individual sheets for each property. These lists were sorted by school type and the total number of schools of each type visiting each property was calculated. With this, the percentage of each type of school out of the total schools for each property was calculated and summarized on a histogram.

The next type of analysis in this area of comparison was determining the total number of schools that visited the three Zoos Victoria campuses. This was made from a query that had the date of the lesson, school name, and the school type in Microsoft Access. As was done before, all of the bookings from 1999 to 2006 for Healesville and Melbourne, and 2000-2006, were put into one database. This information was exported into Microsoft Excel. In Excel, the team first sorted the list into fiscal years. Following that, each fiscal year was sorted into the different school types, and a unique record search was performed in the school names. This listed all of the school names that appeared one time, so that schools that had more than one booking were counted the same as schools that had one booking. For each fiscal year, the total schools of each school type were summed, and their percentage out of their respective fiscal year total schools was taken. This calculation was performed for all three zoos. Because the percentages of school types were generally the same for all fiscal years, the average percentage of each school type was taken across the 6 years of data. These average percentages were calculated for all three zoos, and graphed together in one histogram. The determination of these trends allowed for further comparison between budgeting freedoms for the various school types, as well as other factors such as the number of schools of different school types and differences between the schools.

Visitation by school types was further analyzed by dividing the total student numbers into year level categories Kindergarten, Primary, and Secondary. To do this a query with the date of the lesson, booking quantity, school name, school type, and school level was created in Microsoft Access then exported to Microsoft Excel into individual sheets per zoo. These databases were first sorted into the year level categories, and then further sorted by school type. After this, the total number of students in each school level within each school type was summed. If a school group was logged into the database as primary/secondary the number of students in the booking was divided in half, half added to primary and half to the secondary. The total number of students per year level category for each school type was summarized on a histogram. In addition to total student numbers, the percentage of students within each school type out of the total student visitation was graphed for each zoo. The results for all three were summarized on a histogram. By simplifying the graphs it was easier to see trends for school level visitation, and the school type trends that exist within primary, secondary, and kindergarten schools.

### 3.1.5 Visitation by Location

The next comparison made was the relationship between the distance school groups travel to the amount of visitation from each range of distance. For a visual comparison, the Australian Bureau of Statistics' census SSDs (statistical sub-divisions) were used (ABS). Using the visitation data, a list of suburbs where visiting schools are located was compiled. Each suburb was then classified as being in a specific SSD using the Monash University website (Monash University). From the database, a query with lesson date, booking quantity and suburb was created in Microsoft Access. This extracted data was exported to Microsoft Excel, where the suburbs were matched with their respective SSDs. The SSDs were sorted, and using the summation formula in Excel the total number of students from each of these regions was calculated from the booking quantities. The list was also sorted into fiscal years, and this was done for all three zoos. Since SSDs are geographically based, the student numbers had to be normalized according to number of students in each region. Using the Australian Bureau of Statistics' website, the number of students in each region was determined from 2001 Census data. The average number of students from each region that visited the zoo property for all recorded fiscal years was found, and this number was divided by the total number of students in the region. Then the percentages of visitation from each region were plotted on a map color coded by percent student of visitation.

To determine the effect of travel time on visitation, suburbs of Victoria as geographical divisions were used. The fiscal years of 2000/2001, 2002/2003 and 2005/2006 were used to see if there was a change in visitation patterns in the past 6 years. These are subdivisions of the SSDs and therefore could provide a more accurate traveling time calculation. An approximate travel distance to each zoo was then determined for each suburb that had visited it using WhereIs (Whereis), an online company that generates travel times. Since the calculation was based only on location of the suburb, not the exact street address of the school, these approximate travel times included some error due to geographical distribution, traffic, or accuracy of the WhereIs program.

Travel times and corresponding student visitation numbers were then grouped into intervals of 30 minutes. Student numbers from each interval were counted in a similar manner as with the SSDs, except the suburbs were assigned the traveling times to the respective zoo in the given fiscal year. The percentage of students from each time range out of the total visitation was then calculated. A line graph of travel time versus percent of students from each calculated distance was created for each zoo using this data.

In determining the relationship of travel distance to visitation, the possible effect of travel cost on visitation was investigated. One factor explored and correlated to this trend was the changes in fuel costs for fiscal years 2002-2007 obtained from the Royal Automobile Club of Victoria (RACV), and how this changed visitation by more distant schools (RACV). For comparative purposes travel time vs. visitation data was generated for fiscal years 2000-01, 2002-03 and 2006-07.

### 3.1.6 Repeat Visitation Analysis

Many schools repeat visitation to one or more of Zoos Victoria's three campuses either within the same school year or across several years. To determine the frequency of repeat visitation by schools, several different visitation patterns were investigated. The types of repeat visitation to be considered were visitation to more than one campus or to the same campus, both considered for each individual school year as well as across all six school years of data given. The difference in repeat visitation of educator-led visitors as compared to independent visitors across the six years of data for each zoo was considered. For each of these comparisons school calendar year was chosen as the basis as many schools will plan excursions around the school year schedule and not fiscal years.

### 3.1.6.1 Multiple Campus Visitation

The first type of repeat visitation considered was visitation to more than one campus. To complete this analysis, a query was made into the Microsoft Access bookings database for school name and date of lesson for each zoo. Looking across all six years initially, the date column was not used. The data was exported to Microsoft Excel where each of the three individual lists of schools was filtered for unique records in separate worksheets. Filtering in such a way allows only multiple campus visitation to be addressed as any school that had more than one booking at the same zoo would be reduced to one row on each zoo's respective list. Once filtered, the lists for each zoo were added in a single column. The cumulative list was then filtered for unique records and all unique records were cleared leaving only schools that had made a visit to more than one zoo. This list was filtered for unique records once more, leaving a list of schools that had visited more than one Zoos Victoria campus in the previous six school years.

The process previously outlined was completed in the same way for each school year separately to determine how many schools visited more than one Zoos Victoria campus within the same school year. The percentages of schools that had repeated across six years as well as within a single year were calculated and the results for the overall and yearly analysis were summarized.

### 3.1.6.2 Same Campus Repeat Visitation

Another pattern of visitation to consider is schools that visit the same Zoos Victoria campus within the same year or across six years. In order to determine this, analysis was done in a similar way as outlined above for multiple campus visitation. A list of schools for each of the zoos for all six years was filtered in the same fashion for each school year and across the six years of data. Once the lists of total schools and repeat schools for each year were obtained, the percentages of repeat visitation for each school year for each zoo were calculated and summarized. The percentage of repeat visitation across the six years were also calculated and summarized.

### 3.1.6.3 Independent and Educator Led Visitation

In considering the differences in frequency of educator-led and independent visitation, the six school years of data were used collectively for each zoo. The data was split into

separate worksheets for independent and educator-led schools. Once in separate worksheets, the data was filtered as described above for multiple campus visitations to determine the number of independent and educator-led schools that repeated visitation of the same type within the six years of data. If a school made a single visit independently and a single visit with an educator-led session, that school would not be counted as a repeat visitor. Alternatively, if a school repeated visitation as both an independent and as an educator-led visitor, they would be counted as a repeat visitor twice, in each separate category. The percentages of repeat visitation for each type of visit at each zoo were calculated.

## 3.2 Literature Review

One key method for understanding Zoos Victoria's trends in visitation is the literature review. The main purpose of the literature research was to investigate internal and external factors that could be responsible for the trends observed in the data. Literary materials regarding informal education, field trip trends, information technology, and visitor satisfaction measurement, among other topics have been thoroughly investigated.

In order to develop a comprehensive list of reasons for the trends in visitation, research must be conducted to locate similar trends in zoos and museums throughout the globe. However, this particular type of data tends to be internal. As a result, various zoos and museums in the U.S. were contacted in order to find visitation declines as well as any ascending trends along with explanations and factors determined to have affected or caused such trends.

## 3.3 Teacher Questionnaires

The teachers traveling to the zoo with the student groups have valuable information in the way of qualitative explanations of the trends found and analyzed in the data analysis portion of the project. In order to gather the maximum information available, it was concluded that the most feasible way to do this was to create a pre-visit questionnaire and then follow up by speaking with teachers on the day of their excursion. Teachers making both independent and educator-led visits were contacted. Some of the questions included were; why teachers chose Zoos Victoria, what online resources they used to prepare for the excursion, what their zoo itinerary included, and what factors effect their decision to schedule an excursion. For independent visitors there was also a question regarding why they chose

not to schedule a Discovery and Learning session. An inquiry was also made to establish how well the excursion fits into the Key Learning Areas and the Victorian Essential Learning Standards (VELS) established by the Victorian Curriculum and Assessment Authority (VCAA). It was essential to get this information from the educators' perspective as they have extremely valuable insight.

As many educators as possible were interviewed; however, there was a time constraint caused by a scheduled school holiday that took place while information was being collected. Individuals were identified through the contact information provided by Zoo Victoria and spoke with 12 educators at both Melbourne Zoo and the Werribee Open Range Zoo. Unfortunately due to scheduling issues, no questionnaires were returned by educators at the Healesville Sanctuary. Full copies of the questionnaires distributed as well as a summary of the responses are attached in Appendix C and Appendix D.

## 3.4  Development of Deliverables

Discovery and Learning requested two main deliverables as the outcome of this project. First, a comprehensive set of past and recently collected data was presented in a way that will make interpretation of trends easy for the Discovery and Learning schools in the future.  This has been done by providing a large set of figures illustrating different trends and variables and how they have changed during the years of data provided. These figures are also available for further research and reporting needs of Discovery and Learning. The other outcome is a set of recommendations on how to effectively collect and interpret visitation data of this type in the future. In fulfillment of this request, the team has provided a set of recommendations on how to alter the database in a way that visitation data can be much more easily manipulated for interpretation in the future as well as questions and recommendations for future research and development.

# 4 Findings and Analysis

The following is a summary of the findings for the data comparisons outlined in the methodology. The raw data from the Microsoft Access database for each campus has been organized and analyzed. Along with the graphical and statistical analysis, possible explanations and factors responsible for the observed trends and patterns have been discussed.

## 4.1 Overall Visitation

To begin the data analysis, overall yearly and monthly visitation for each of the three zoos was analyzed. The purpose was to identify different overall trends in visitation that Discovery and Learning at each of the three zoos may have followed as well as to recognize any irregularities that may require further investigation.

### 4.1.1 Zoos Victoria Visitation

In order to fully grasp the magnitude of changes in visitation for Discovery and Learning schools the team analyzed overall visitation numbers for all of Zoos Victoria. Specifically, it was important to understand whether deviations in student visitation reflected deviations in overall visitation at Zoos Victoria. In order to do this a percentage was calculated for number of Discovery and Learning students out of total number of Zoos Victoria visitors per year (see Figure 4-2). Total visitation numbers for Zoos Victoria are available in Table 1 and plotted in Figure 4-1.

|                                  | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|----------------------------------|---------|---------|---------|---------|---------|---------|
| **Zoos Victoria**                | 735,600 | 748,249 | 779,680 | 877,940 | 833,539 | 720,752 |
| **Discovery & Learning**         | 93,139  | 130,525 | 191,519 | 157,124 | 178,746 | 171,554 |
| **% D&L out of total ZV visitation** | 15%  | 18%     | 16%     | 17%     | 17%     | 19%     |

**Table 1 Total visitation numbers for Zoos Victoria and Discovery and Learning Schools**
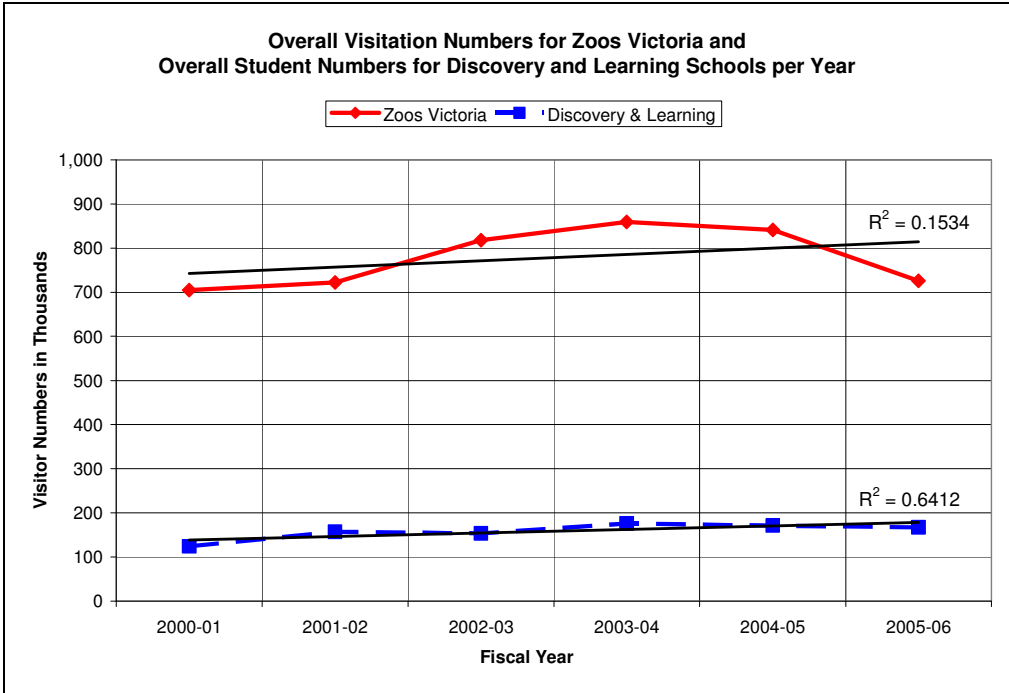
**Figure 4-1 Number of Total Visitors for Zoos Victoria and Student Visitors for Discovery and Learning Schools vs. Year**
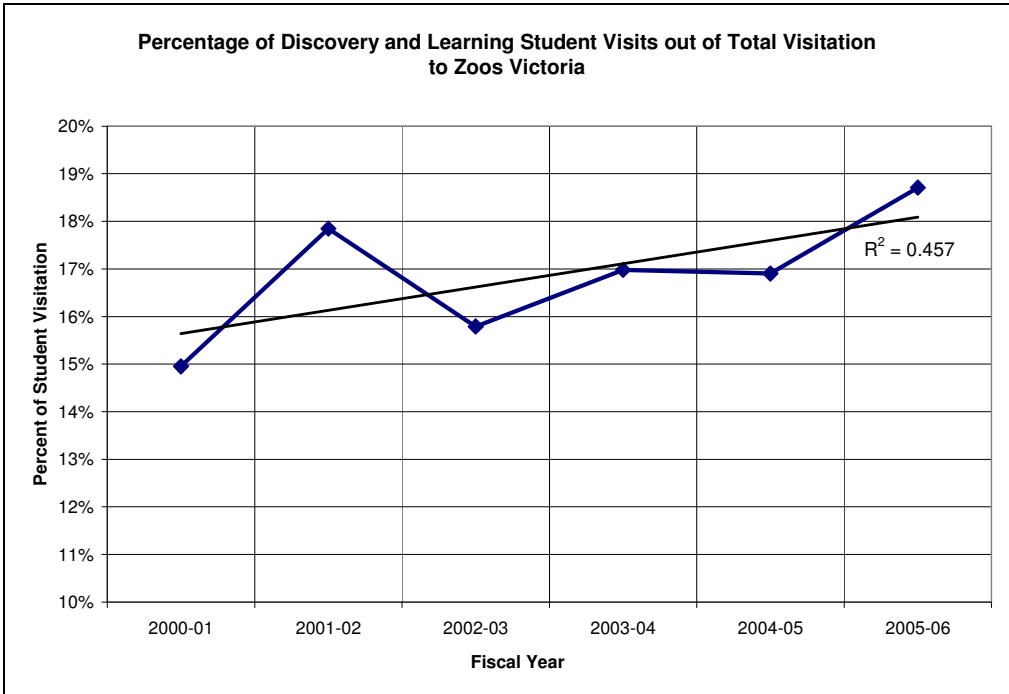


**Figure 4-2 Percentage of Discovery and Learning Student Visits out of Total Visitation to Zoos Victoria**

Figure 4-2 shows a variation in percentage of student visitation over the course of 6 fiscal years.  This variation shows that changes in school group visitation do not perfectly

reflect changes in overall visitation for Zoos Victoria. Instead, one can see an overall increase in Discovery and Learning Schools' percentile with a noticeable peak in the 2001-02 fiscal year. Also, the percentage of D&L student visitation is high in 2005-06 which is most likely due to the fact that overall visitation is low in that year.

### 4.1.2  Yearly

Looking at the Discovery and Learning visitations, the team observed yearly trends to compare visitation for Melbourne Zoo, Healesville Sanctuary, and Werribee Open Range Zoo.  It was quickly discovered that Melbourne displayed a significantly greater number of student visitors than the other two campuses.  This is clearly displayed in Figure 4-3.  For this reason, the total visitation (also shown in Figure 4-3) follows a very similar pattern to that of Melbourne Zoo. Observing this graph one may find it difficult to identify an apparent trend in visitation, whether it is positive or negative.  One can see, however, that total visitation peaks in the fiscal year 2003-04 and decreases slightly during fiscal years 2004-05 and 2005-06.
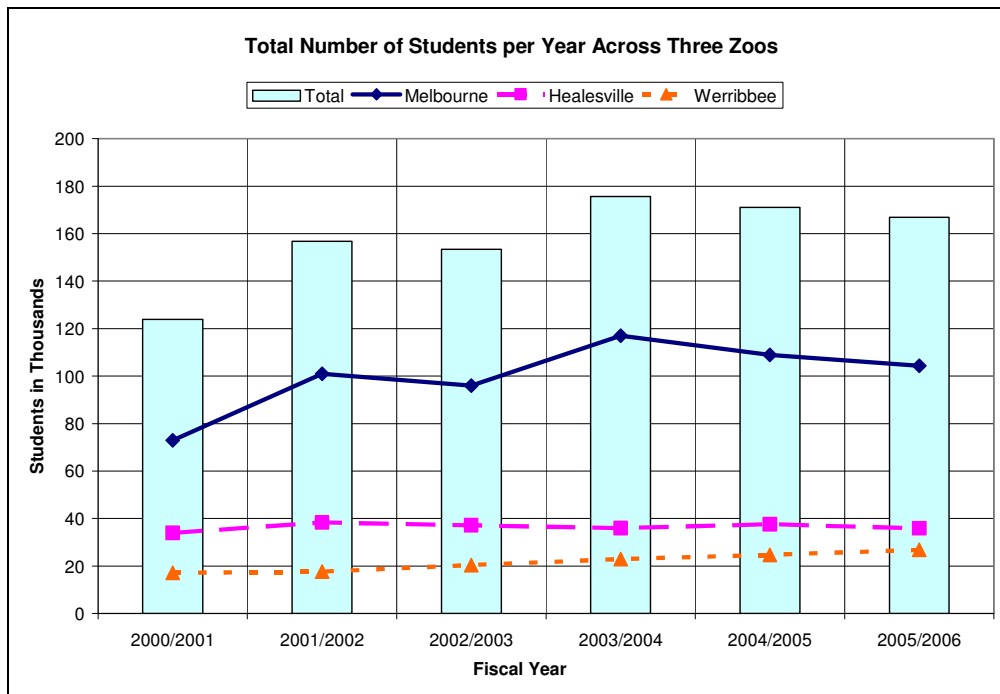


**Figure 4-3 Total Number of Students per Year Across Three Zoos**

In order to more accurately observe the change in student numbers over six years Melbourne data was put into a separate graph (Figure 4-4) so that the scale would be more appropriate for the Healesville and Werribee graph (Figure 4-5).
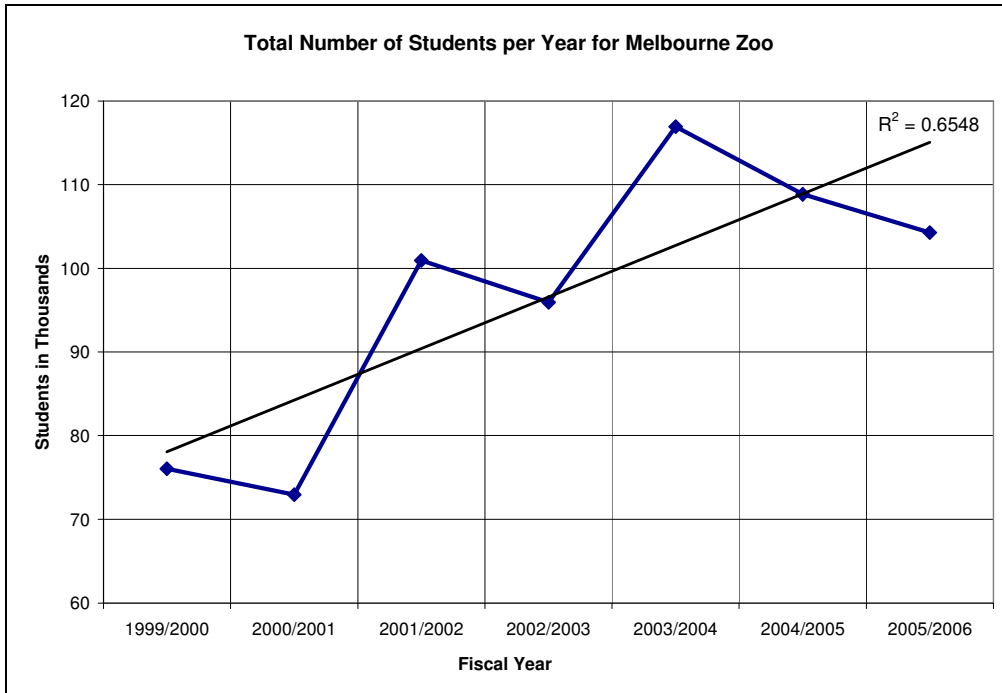
**Figure 4-4 Total Number of Students per Year for Melbourne Zoo**
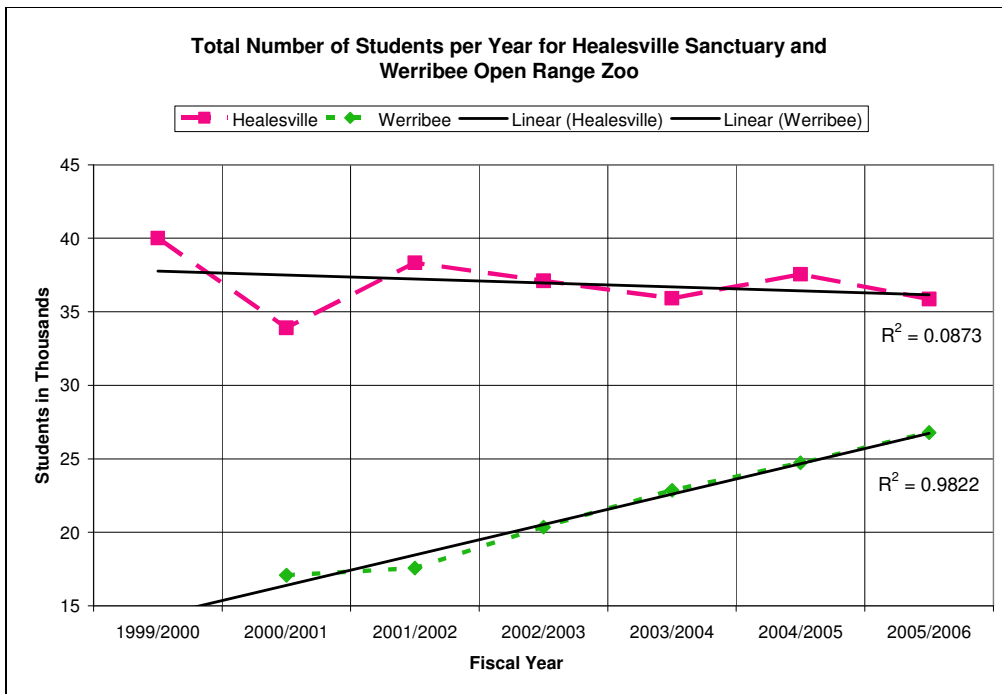


**Figure 4-5 Total Number of Students per Year for Healesville Sanctuary and Werribee Open Range Zoo**

The Melbourne graph (Figure 4-4) shows a series of alternating increases and decreases from fiscal year 1999-00 to 2003-04, with an over all increase of approximately

50,000 students. Healesville also shows a series of fluctuations between approximately 35 and 40 thousand students and a nearly constant overall trend line. Werribee, however, shows a steady increase from 2000-01 to 2005-6 for an overall increase of almost 50%.

### 4.1.3 Monthly

Total numbers of students as well as booking numbers were broken down on a monthly basis in order to assess trends within each year. The purpose was to understand what times during the school year students are likely to take excursions to the zoos as well as identify any anomalies in the data for further investigation. The line charts in Figure 4-6, Figure 4-7, and Figure 4-8 show the monthly percentage of students visiting the zoo each year for Melbourne, Healesville and Werribee, respectively.
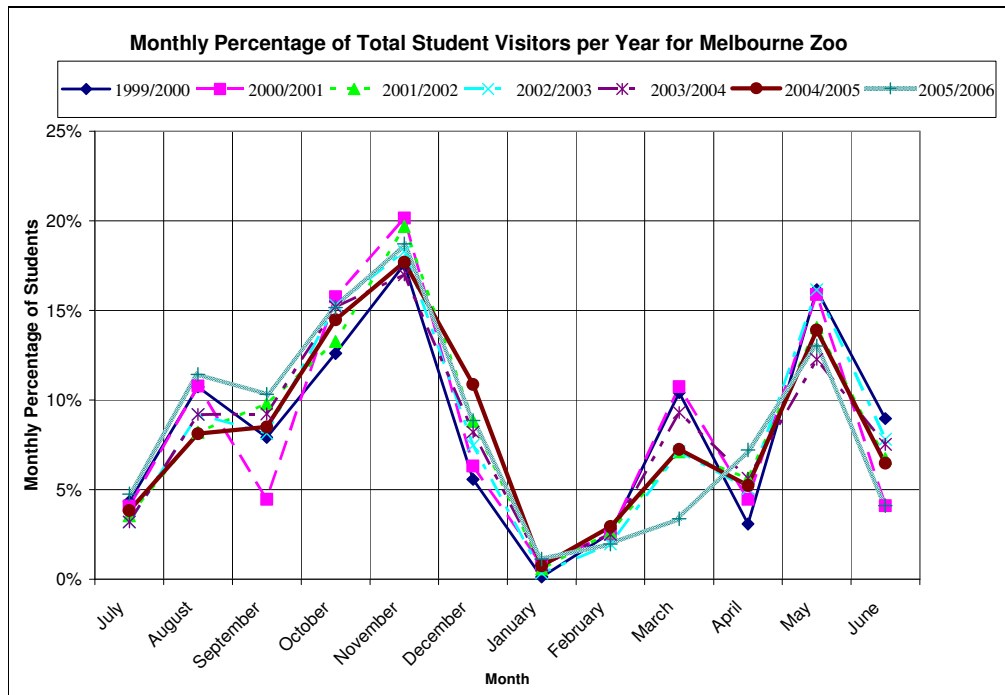


**Figure 4-6 Monthly Percentage of Total Student Visitors per Year for Melbourne Zoo**
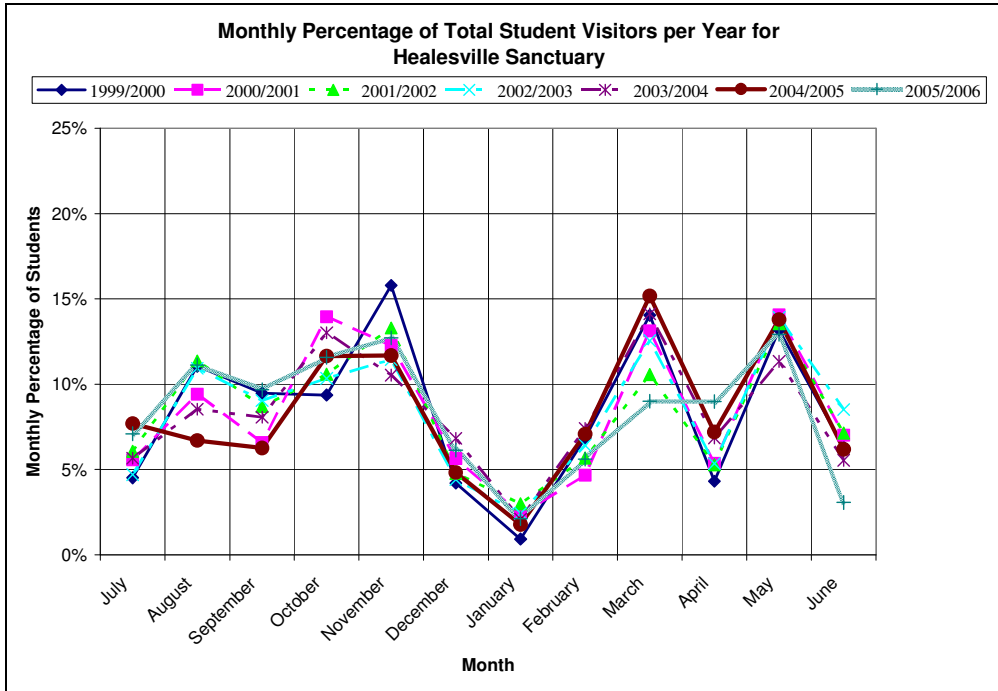
**Figure 4-7 Monthly Percentage of Total Student Visitors per Year for Healesville Sanctuary**
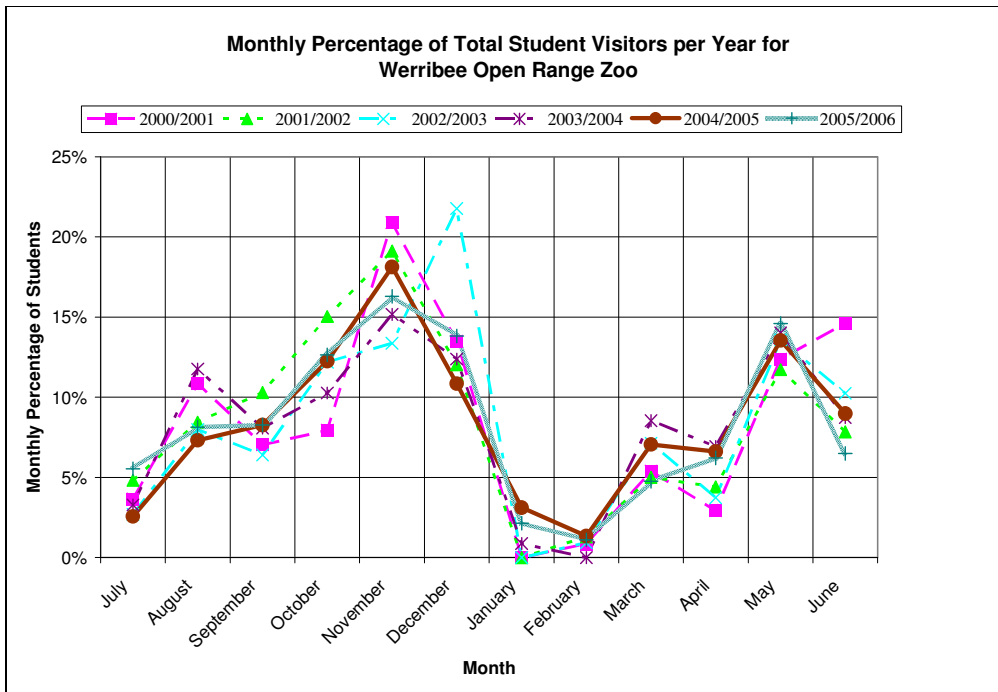


**Figure 4-8 Monthly Percentage of Total Student Visitors per Year for Werribee Open Range Zoo**

Comparing the three graphs one can see that peaks in visitation occur at both Melbourne and Werribee Zoos during the months of May and November. For Healesville

however, the highest average percentage of visitation appears to occur in March; high levels of visitation also occur in May, October and November.

As expected, some of the lower points on the graph can be attributed to school holiday breaks, listed in Table 2. Although this table shows a particular calendar year, the time of month in which the holiday breaks occur will vary minimally from year to year.  The lowest months for visitation are July (14 days off), September (7 days off), January (typically no school), February and April (14 days off).  Most noticeable is the drastic decrease in visitation during the month of January. Four of the five lowest months of visitation coincide with the school holiday schedule.  The low numbers in February could be explained by the fact that students have just returned from their summer vacation and are at the start of a new school year.

| Term 1    31 January - 30 March |
| --- |
| 14 days off in April |
| Term 2    16 April - 29 June |
| 14 days off in July |
| Term 3    16 July - 21 September |
| 7 days off in September 7 days off in October |
| Term 4    8 October - 21 December |
| 7 days off in December 30 days off in January |

**Table 2 Summary of Victoria school holiday schedule**

One feature that is apparent upon close comparison is the drop in visitation for both Melbourne and Healesville in March 2006, which coincides with the occurrence of the Commonwealth Games which took place in Melbourne during March 2006. According to Gary Shadforth, Discovery and Learning Team Leader at Healesville Sanctuary, this had a major effect on school visitation when he worked at the Royal Botanical Gardens. In order to analyze the effect of the Commonwealth Games on student visitation in March 2006, averages and standard deviations were calculated for March visitation for years 1999 to 2005. For a normally distributed sample, values are 68% likely to fall within one standard deviation and 95% likely to fall within two standard deviations (Witte).

Visitation at both Melbourne Zoo and Healesville Sanctuary in March 2006 fell more than one standard deviation below the averages for the previous 5 years. Werribee showed no significant change, with student numbers within the first standard deviation. Appendix E shows detailed calculations of averages and standard deviations for March.

Similar calculations were done for major exhibit openings for years 1999-2006 to test whether these events had any major impacts on student visitation. Appendix E shows the detailed calculations. Table 3 shows the dates for specific exhibit openings. With the exception of the opening of the Australian Wildlife Health Centre in Healesville (December 2005) there was no significant increase in student visitation for any of the exhibit openings. This does not mean, however, that overall visitation was not affected.  The lack of change is most likely due to the interval between booking date and actual lesson date which can vary from 3 months to 1 year. Therefore, the effects of these openings could have been spread out over the course of many months.

| Exhibit | Campus | Opening Date |
|---|---|---|
| World of Bugs & Butterflies | Melbourne | Oct-02 |
| Tree Kangaroos & Cassowaries | Melbourne | Nov-02 |
| Trail of the Elephants | Melbourne | Mar-03 |
| Lions on the Edge | Werribee | Jan-04 |
| BHP Billiton Platypusary | Healesville | May-05 |
| Australian Wildlife Health Centre | Healesville | Dec-05 |

**Table 3 Major Exhibit Openings in Zoos Victoria for 1999-2006**

## 4.1.4  Independent vs. Educator-Led

Staff at Discovery and Learning Schools has expressed an interest in understanding the different visitation trends between independent visitors and educator-led visitors.  For this purpose the total number of students for all three zoos were used to understand what portion of school visitors are independent or educator-led visitors. These data were also broken down into monthly numbers for each zoo. The purpose was to discover which times of the year are popular for the two types of visitors.

Figure 4-9 compares the percentage of independent students (out of total student visitors) visiting each zoo in the fiscal years 2002-2006. Only four fiscal years are shown for this comparison because independent visits have only been recorded in the Discovery and Learning database for the past four fiscal years. Werribee is shown for only 3 fiscal years due to insufficient data.

In Figure 4-9 one can see that in 2002-03 for the Melbourne Zoo almost one third of the student visitors came as independent visitors. However, in more recent years the independent visits have increased to almost 45%. At Healesville Sanctuary independent visitation has remained approximately one quarter out of total student visitation over the last four years. The percentage of independent visitors at Werribee, on the other hand, dropped approximately 16% in 2005-06.  According to Katie Pahlow, Discovery and Learning Senior

Team Leader, the structure of Werribee lends itself to an educator-led visit. This is because the general format of educator-led excursions at Werribee includes a one-hour safari, a 45-minute discovery session with a zoo educator, a one-hour independent walking tour around the African Trail, and one hour for lunch. Werribee zoo staff members speculate that the convenient scheduling for educator-led excursions makes independent visitation less appealing due to the fact that teachers will have almost a full hour of extra time to fill without the Discovery and Learning session.
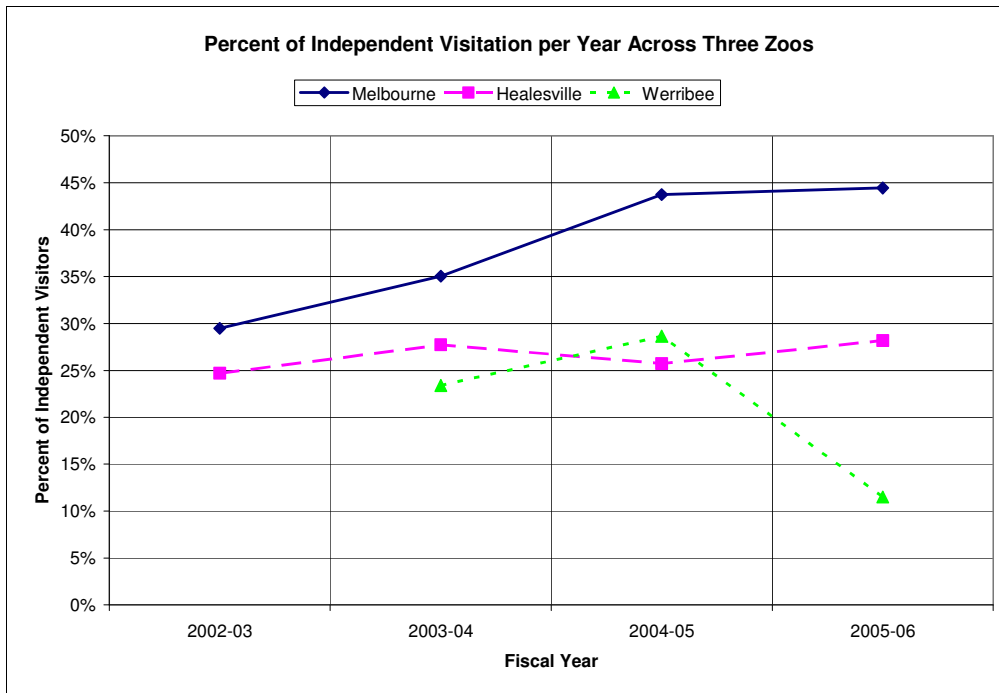


**Figure 4-9 Percent of Independent Visitation vs. Year across Three Zoos**
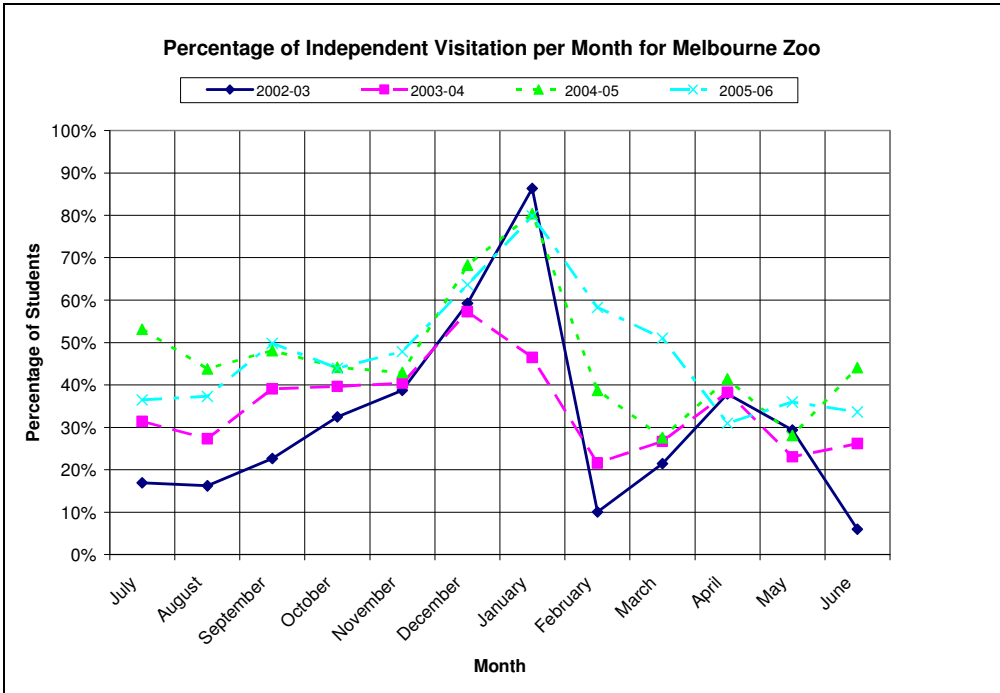
**Figure 4-10 Percentage of Independent Visitation vs. Month for Melbourne Zoo**
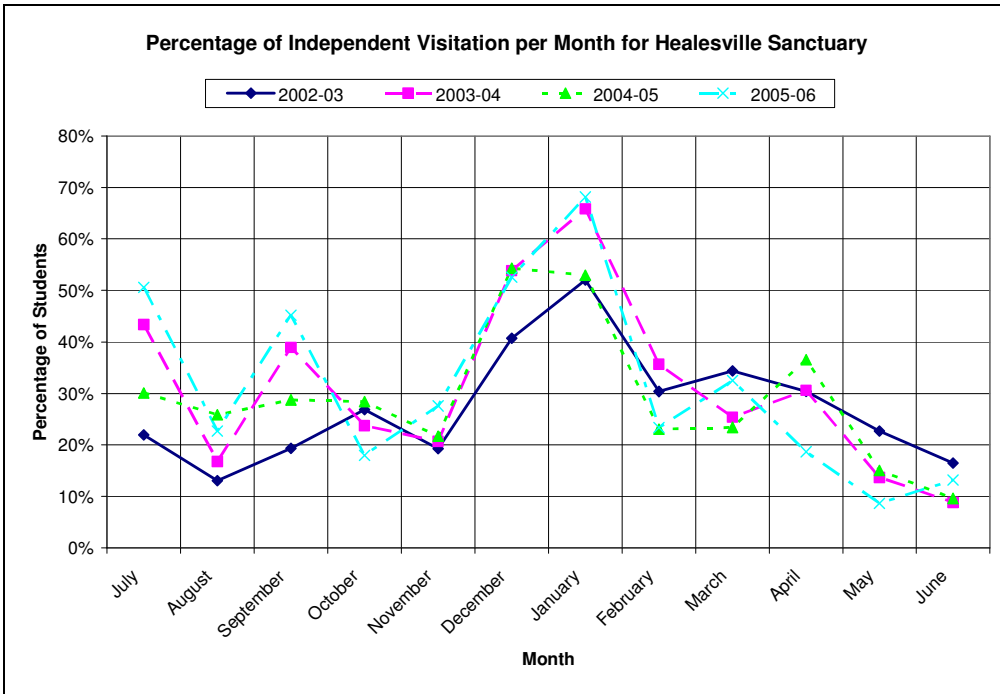


**Figure 4-11 Percentage of Independent Visitation vs. Month for Healesville Sanctuary**
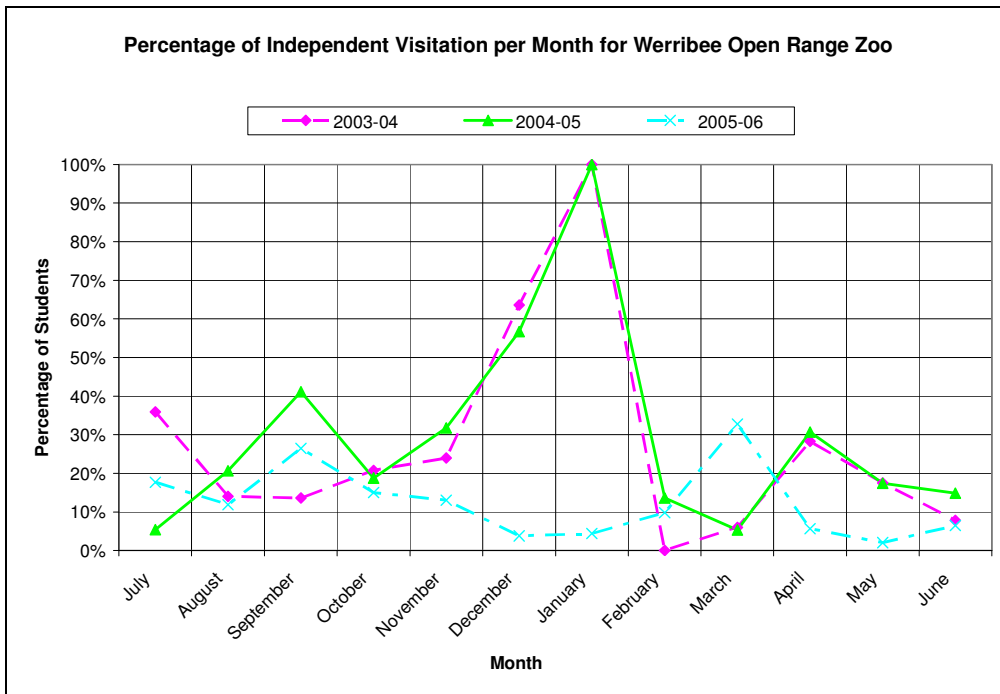
**Figure 4-12 Percentage of Independent Visitation vs. Month for Werribee Open Range Zoo**

Figure 4-10, Figure 4-11, and Figure 4-12 display a calculation of independent visitors out of the total number of visitors in each month. This method was used to discover whether certain months appeal to independent visitors. For all three zoos there is a substantial peak in visitation during January. Reviewing monthly student visitation (Figure 4-6, Figure 4-7, and Figure 4-8) the observer must keep in mind that January visitation is also the lowest month for overall student visitation. The reason for this may be that these independent visitors are organizations such as YMCA's rather than actual school groups. These types of organizations are also logged into the database as they are considered educational organizations. This explains why they may be visiting during the January school holiday.

Additional graphs in Appendix F and Appendix G show the percentage of independent and educator-led visitors per month in each of the three zoos. The percentage was calculated as the number of independent visitors per month out of the total number of independent visitors in each year. Of the three graphs, independent visits at Melbourne Zoo appear to follow the most uniform trend. This may be simply due to the fact that Melbourne has the largest numbers of visitors per year, causing variations to somewhat smooth out.

## *4.2  Visitation by Student Year*

Another comparison made by the team was to look at the relationship of student year level and visitation both yearly, monthly, and by comparing educator-led and independent visitation. Yearly analysis was done to show the general distribution of student visitation across all student year levels independently and by lumping data into the categories of Kindergarten, Primary and Secondary for ease of comparison. Monthly analysis was done to specifically address the possible effect on visitation of the new AIM standardized tests implemented for the first time in May 2006 for students in years 3, 5 and 7.

### 4.2.1  Yearly

Yearly student visitation was studied to determine overall distribution by student year and how it has changed over the past 6 years at each property. Figure 4-13, Figure 4-14, and Figure 4-15 show the percentage of students in each year level out of the total student visitation for fiscal years 2000-2006 for Melbourne Zoo, Healesville Sanctuary and Werribee Open Range Zoo, respectively. The percentage scale was chosen such that the overall change in visitation year to year does not affect the comparison of student year levels. The special category listed after tertiary includes students visiting with schools specialized for students with disabilities; the adult category includes any adult groups that have booked visits through Discovery and Learning.
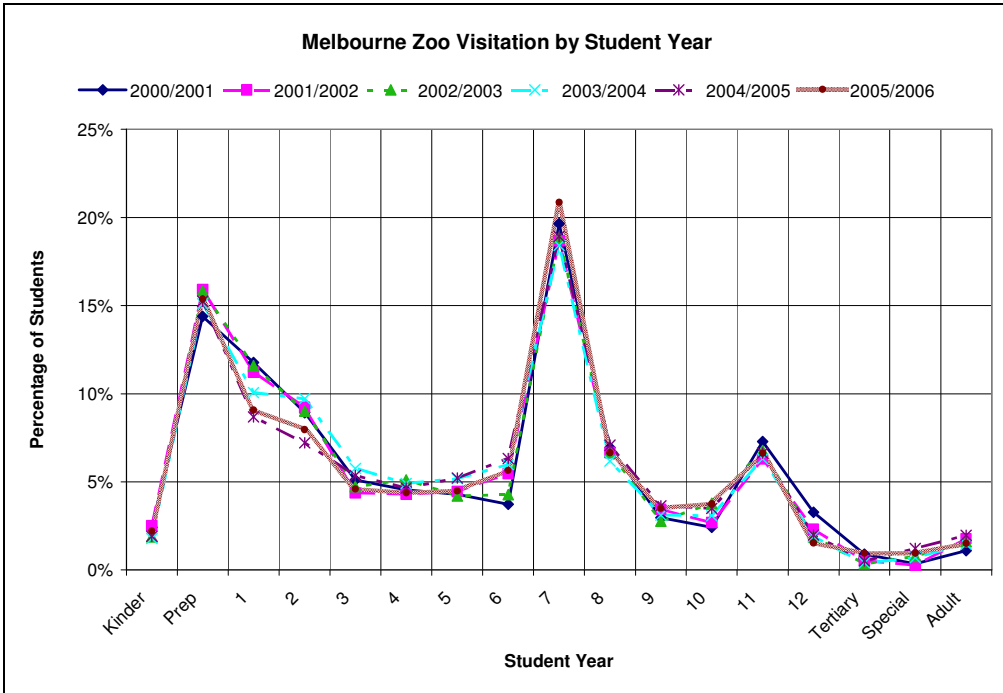
**Figure 4-13 Melbourne Zoo Visitation by Student Year**
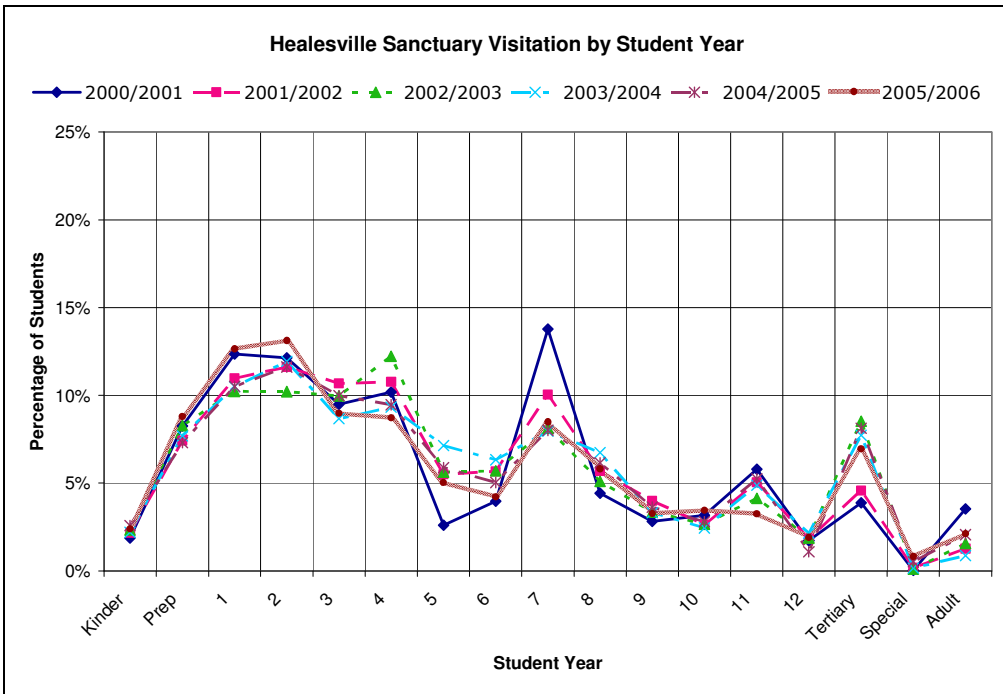


**Figure 4-14 Healesville Sanctuary Visitation by Student Year**
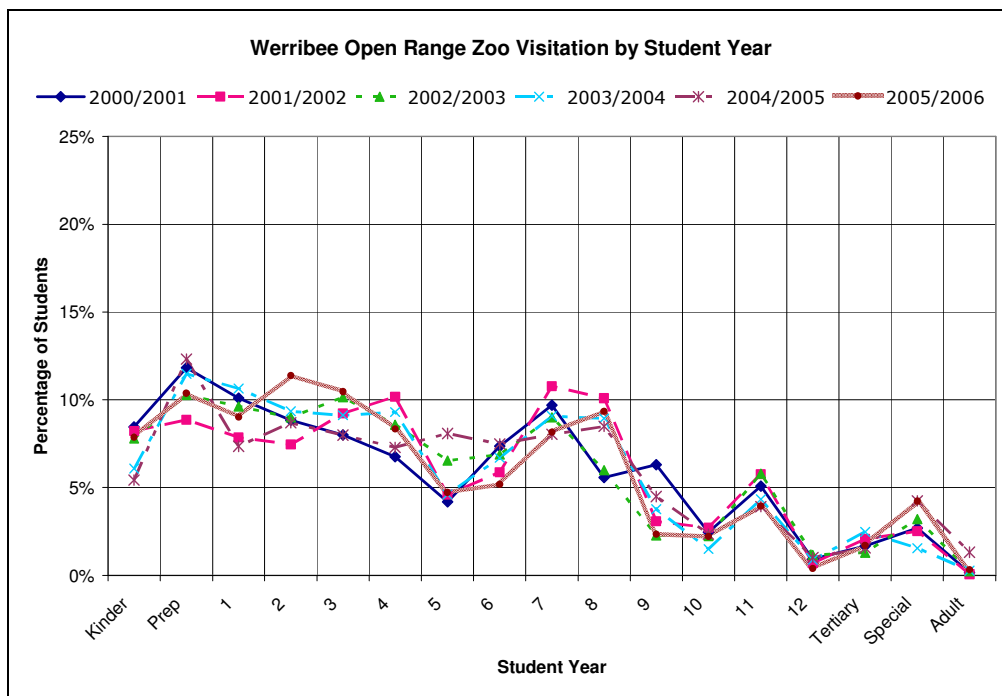
**Figure 4-15 Werribee Open Range Zoo Visitation by Student Year**

Initial visual analysis of the Melbourne Zoo graphs shows that there appears to be a very consistent and steady market in terms of student year levels over the past six fiscal years. The Healesville Sanctuary and Werribee Open Range Zoo appear to follow a less consistent trend than Melbourne but it still appears to be relatively consistent.

In addition to consistency, the other clear trend in the data above is the student year levels with the highest visitation. In all three zoos, but most noticeably in Melbourne Zoo, year 7 students have a high percentage of visitation. One possible explanation for this trend is the applicability of zoo excursions in the year 7 curriculum used prior to the institution of the VELS.  Within the curriculum followed, there was a unit on classification that lends itself easily to include an excursion to the zoo. The peak in year 11 visitation also has to do with programming and curriculum applicability. Zoos Victoria offers several VCE programs that have been attractive for year 11 students, as year 12 students are generally busy with exams. For the prep year students, there are not as many curriculum issues at their young age allowing more time in the schedule for excursions (Pritchard).

## 4.2.2 Student Year Lumped Analysis

In simplification of the student year analysis above, several student years were lumped into different categories for ease of comparison. Students were lumped into the year level classifications of kindergarten, primary (years P-6), and secondary (years 7-12) and compared on a year-to-year basis. Figure 4-16, Figure 4-17, and Figure 4-18 display this division for each campus. These numbers were also split into educator-led vs. independent visitation and can be found in Appendix A.
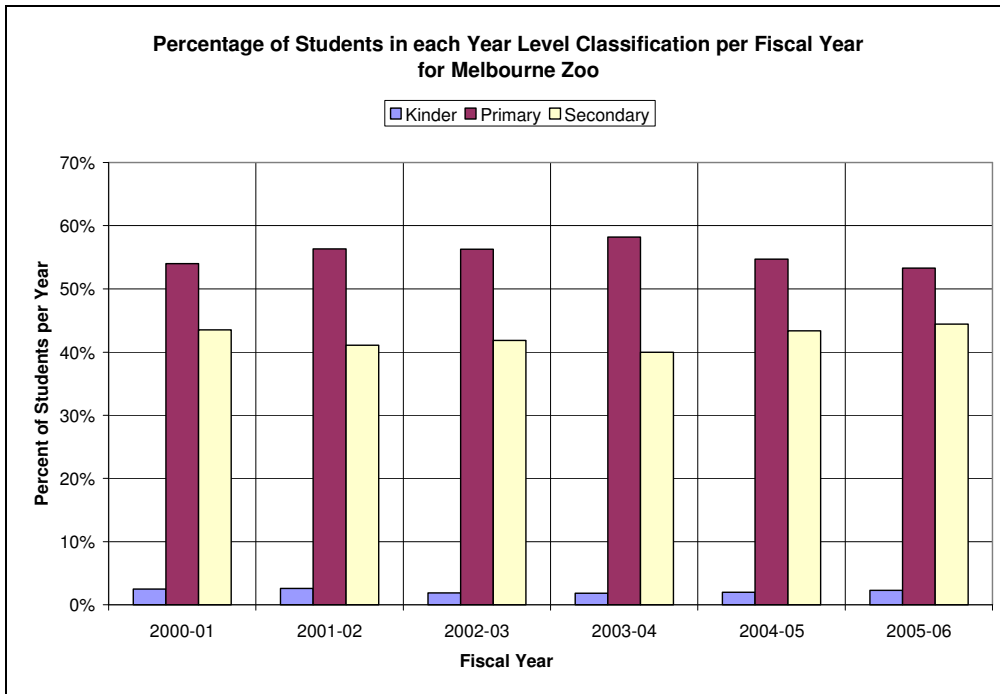


**Figure 4-16 Percentage of Students in Each Year Level Classification vs. Fiscal Year for Melbourne Zoo**
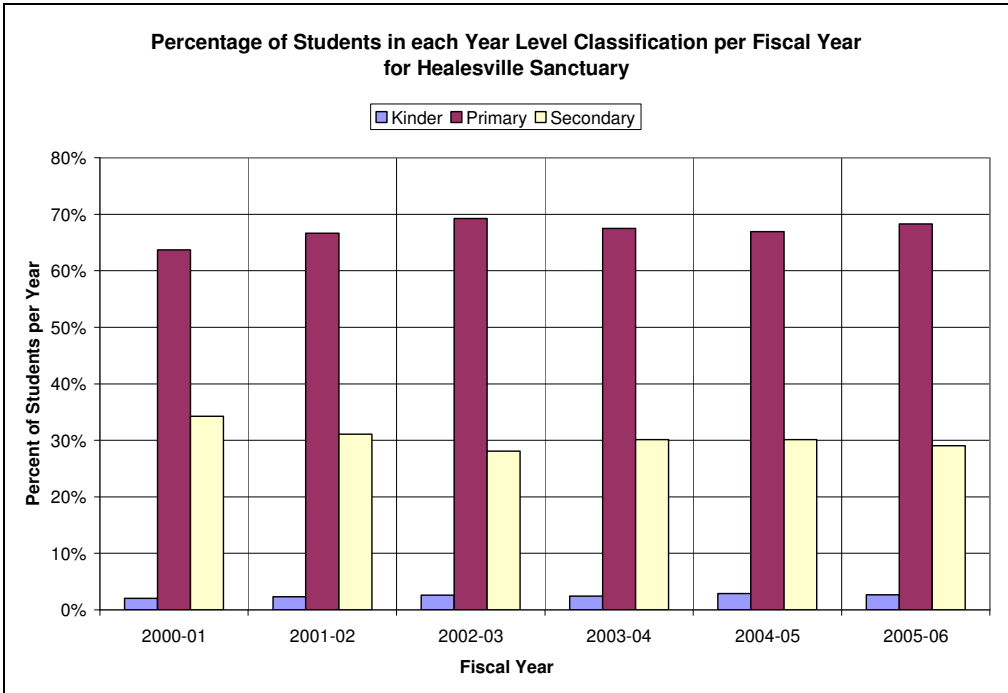
**Figure 4-17 Percentage of Students in Each Year Level Classification vs. Fiscal Year for Healesville Sanctuary**
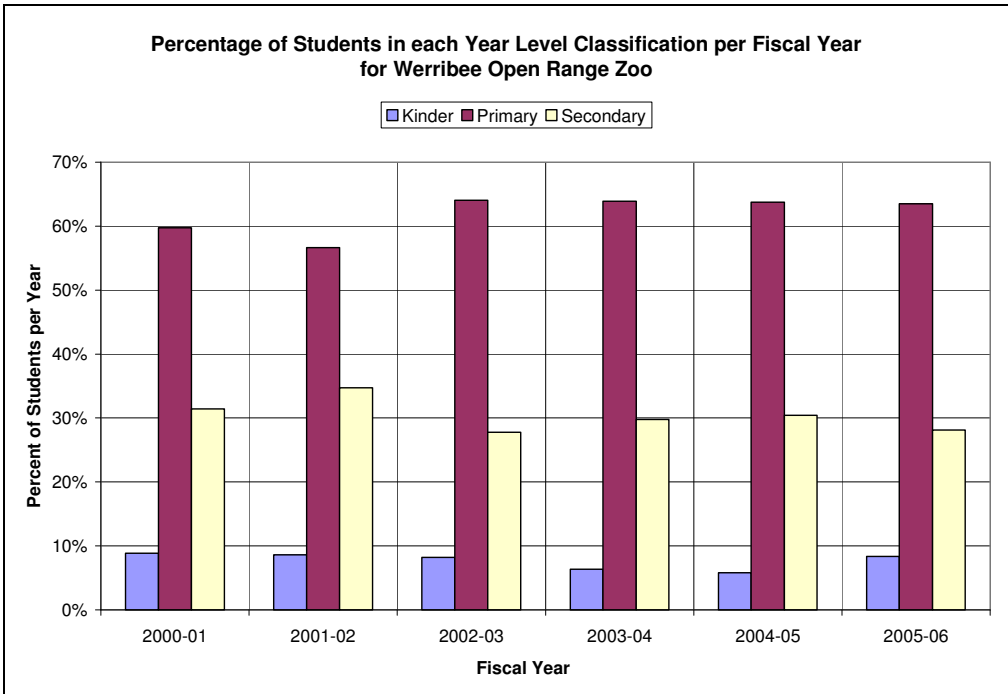


**Figure 4-18 Percentage of Students in Each Year Level Classification vs. Fiscal Year for Werribee Open Range Zoo**

Comparing these graphs one can see which zoos are more popular for particular school year categories. For both Healesville and Werribee a substantial percentage of student

visitors are primary schools, with approximately twice as many primary students visiting than secondary students. Melbourne on the other hand has higher percentages of secondary school visitation and Werribee has the highest percentage of kindergarten visitation. Reasons for this may be that certain school groups are more attracted to specific programs or attractions at individual zoos.

### 4.2.3 Monthly

Following the yearly analysis, the team analyzed the data in the month of May for years 3, 5, and 7 across the six years to explore the effect of the new AIM testing on visitation. AIM testing does also occur in year 9 as these tests are held in August and the month of August has generally low visitation, it would be too difficult to determine if there was a significant decrease. The following histograms Figure 4-19, Figure 4-20, and Figure 4-21 compare visitation by student percentage for each year level for the months of May 2000 - 2005 averaged against May 2006 for the Melbourne Zoo, Healesville Sanctuary, and the Werribee Open Range Zoo respectively. The bars on the averaged data series represent one standard deviation outside of the calculated average.
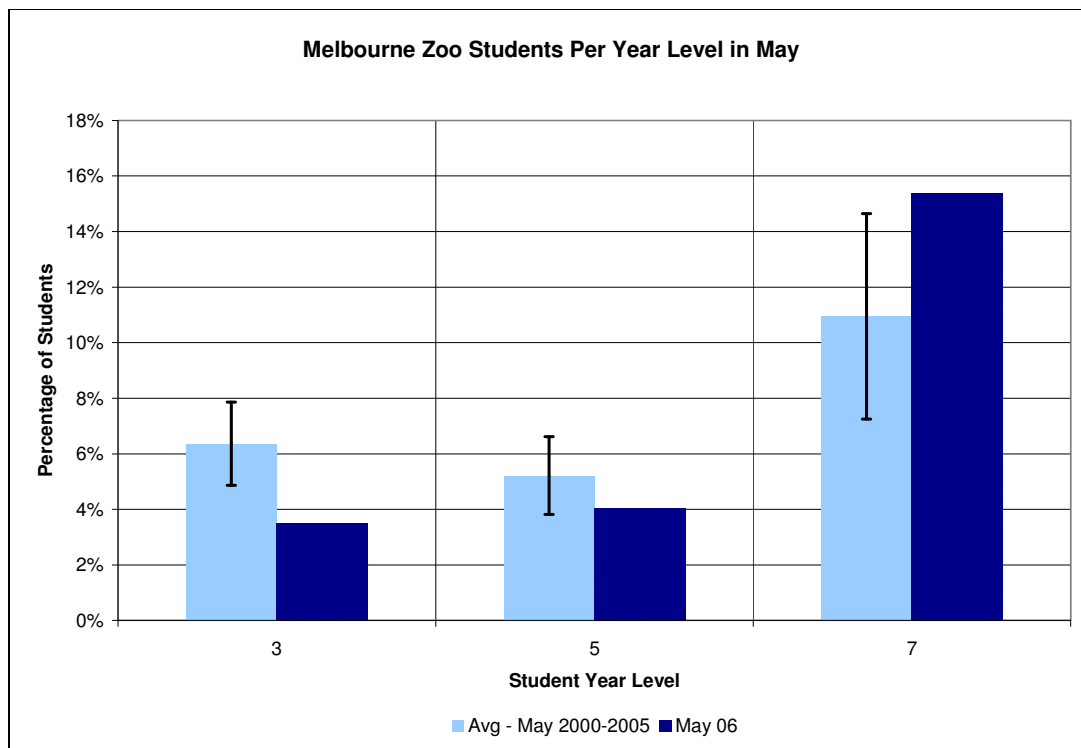


**Figure 4-19 Melbourne Zoo May 00-06 Visitation by Student Year**
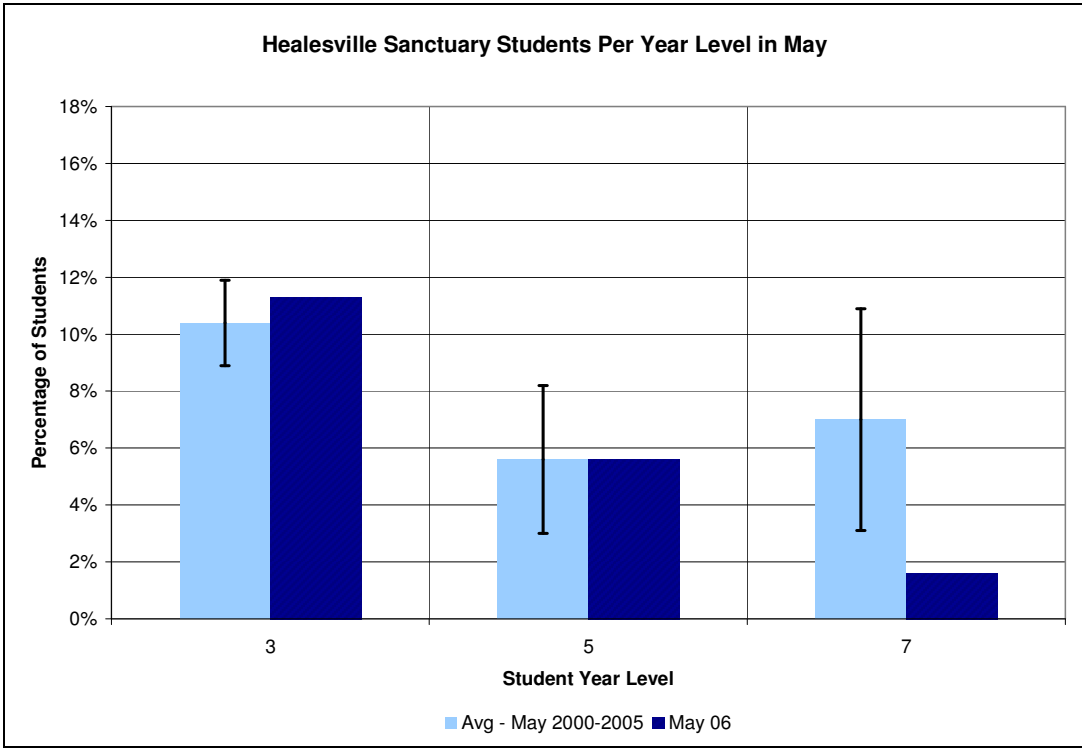
**Figure 4-20 Healesville Sanctuary May 00-06 Visitation by Student Year**
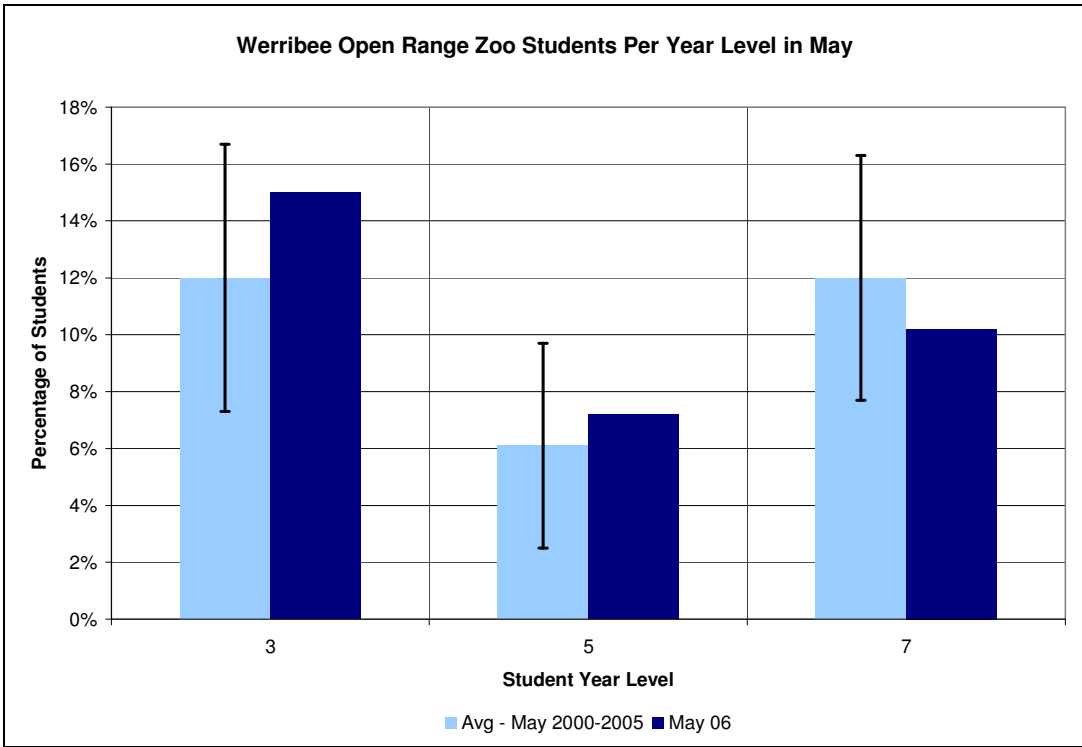


**Figure 4-21 Werribee Open Range Zoo May 00-06 Visitation by Student Year**

In Figure 4-19 for the Melbourne Zoo, comparisons between May 2006 and average visitation for the previous years shows a decrease in visitation by year 3 and 5 students and an increase in visitation by year 7 students. In Healesville, Figure 4-20, the only significant change was the drop in year 7 visitation. For Werribee, Figure 4-21, the largest change is the increase in visitation by year 3 student visitors. Although one can see that year level 7 has decreased in visitation numbers, years 3 and 5 have increased. Due to the amount of change in both directions, statistical analysis comparing the changes in testing was applied.

Assuming that the AIM tests would affect visitation at all three zoos similarly, a Wilcoxon Rank Sum paired test was used to determine if there was a statistically significant change in visitation by students in years 3, 5, and 7 in the month of May 2006. The Wilcoxon test does not show a significant change in visitation, at a 95% confidence level. Details of the analysis are provided in Appendix H. The team concluded that standardized testing did not appear to be a deterrent in excursions in 2006. However, there is the possibility that it could affect visitation in the future and is worth considering in any analysis done in later years.

## 4.3  Visitation by School Type

The next factor considered was the type of schools visiting the three Zoos Victoria campuses. There are three major school types in Australia: Government, Catholic, and Independent schools. There are also schools that do not fit into any of these categories and these are referred to as 'other'. Examples of these schools include tertiary education and adult classes.  The goal of this comparison was to determine if schools of a specific type went on more excursions. Comparisons were made in terms of bookings, total schools, and school year levels.

### 4.3.1  Overall

School type visitation was first looked at on an overall basis by student visitation across all three Zoos Victoria properties. Figure 4-22 shows the total student visitation from all three zoos organized by the type of school.
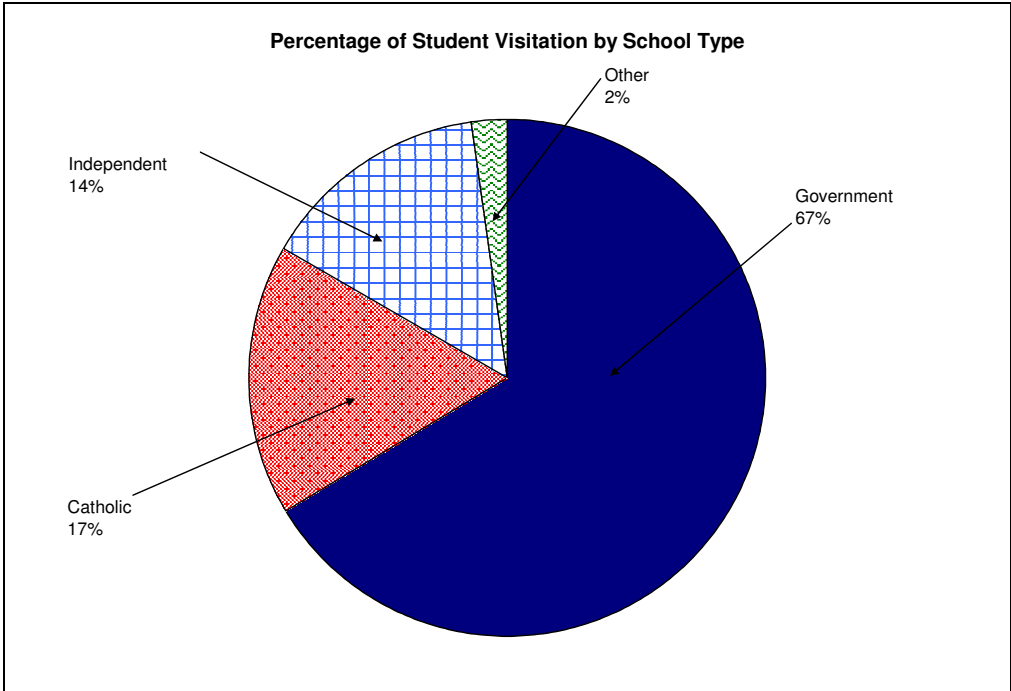
**Figure 4-22 School Type Visitation for Zoos Victoria from 1999-2006**

Visitation was next organized by school type for each Zoos Victoria campus. Across all years, the number of students was determined for each school type and the percentage of students from each school type was determined for each fiscal year. The percentages for all recorded years were then averaged. Data are included from 1999-2006 for the Melbourne Zoo and Healesville Sanctuary and 2000-2006 for the Werribee Open Range Zoo. Figure 4-23 shows visitation by each school type to the three Zoos Victoria campuses in terms of their percentage of the total schools that have visited since 1999.
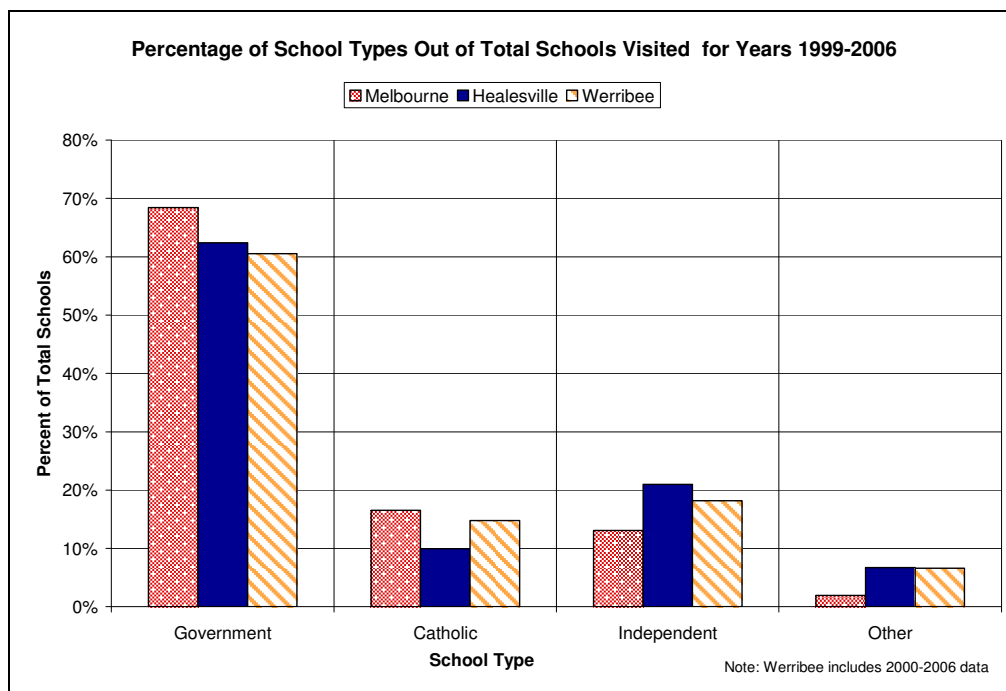
**Figure 4-23 Percentage of School Types out of Total Schools Visited**

It can be seen that overall and individually throughout the three campuses that government schools made up the highest percentage of visiting schools. The independent and Catholic schools were a much smaller percentage of the total schools. A discussion of possible factors influencing this trend will follow the school year level breakdown.

## 4.3.2 Year Level

Next, school type visitation was investigated for each campus including a comparison of school level. Within the individual campus analysis, the total number of students visited is also organized by year level, divided into kindergarten, primary, and secondary schools. Primary schools include grades Prep-6, and secondary schools include grades 7-12. The kindergarten, primary, and secondary schools are further divided into school types. In this way, patterns of school type visits can be seen within these three school levels along with the school type distribution. In Figure 4-24 the total number of students from the three school levels, within each school type, from all three zoos is aggregated because the results are similar for all three. The distribution of school type for the student visitation within all kindergarten, primary, and secondary schools, calculated for each zoo, is represented in Figure 4-25. Graphs with combined school type and school levels, done for each zoo, can be found in Appendix F.
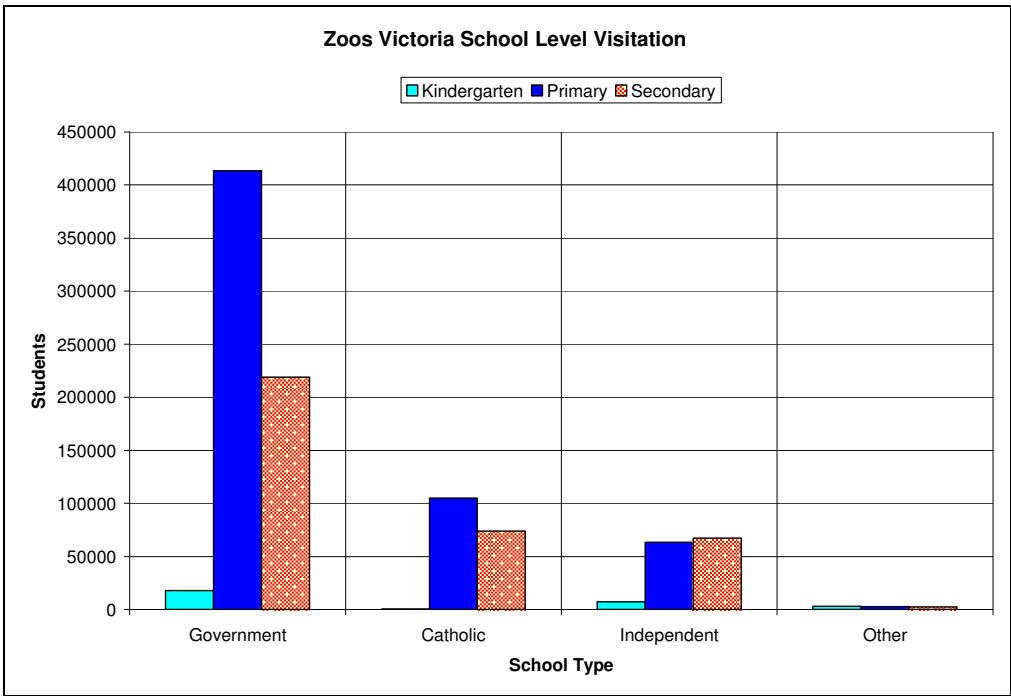
**Figure 4-24 Zoos Victoria Student Visitation by School Level**
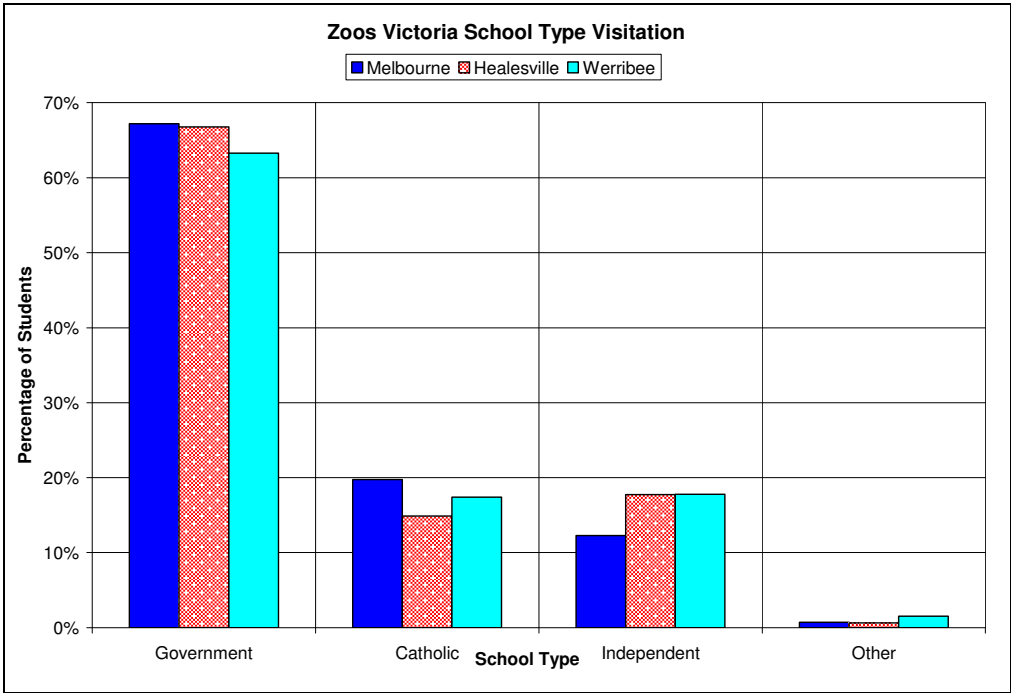


**Figure 4-25 Zoos Victoria Student Visitation by School Type**

Across all three Zoos Victoria properties and all year levels, it is once again clear that the majority of student visits are from Government schools. In addition, one can observe that

the majority of Government school students are from primary schools. For the other types of schools, the visitation between different year levels is a much closer distribution between primary and secondary schools.

One factor considered in the frequency of visitation by different school types is government funding provided to the different types of schools. The team hypothesized that the schools with greater funds would have more opportunities to go on excursions. The following table illustrates the difference in funding for Government and non-Government schools.
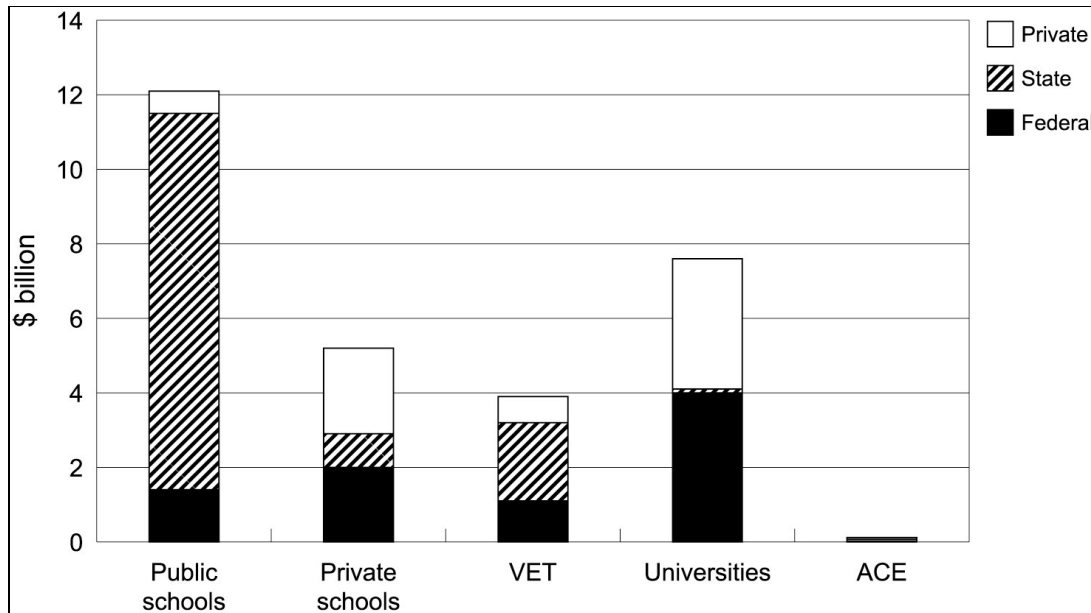


**Figure 4-26 Sources of Education Funding by Sector, Australia (Watson 21)**

As Figure 4-26 shows Public or Government schools receive much higher overall funding from both State and Federal Governments. The amount they receive from government sources exceeds the total funding received by the private schools. In terms of funding per student, as of 2003-04, the government was funding about $10,000 per student in government schools and just over $5,000 per student in non-government schools (Byrne 7). In addition to having less funding, students in non-Government schools pay more for classes, between 20 and 70 percent of the cost of their education (Watson 29). Students in Government schools only have to pay an average of 5 percent of the total cost of their education. In addition to the factor of outside funding, when it comes to excursions, many schools require students to pay a fee out of pocket for these trips. Therefore, it is also important to consider the socio-economic level of the majority of students. According to 2002

Census data (ABS), 34 percent of students in Catholic schools are in high income families, as opposed to other non-Government schools, such as Independent schools, where 47 percent are from high income families. Alternatively, 21% of government school students come from high income families (Byrne 7). This difference may explain why more Independent schools visit Zoos Victoria over Catholic schools.

Another possible reason for the high percentage of Government school visitation is the total number of each school type within Victoria. Table 8 shows the percentage of students attending each school type within Victoria since 2002.

| | Government | | Catholic | | Independent | |
|---|---|---|---|---|---|---|
| Year | Primary | Secondary | Primary | Secondary | Primary | Secondary |
| 2002 | 38.9% | 26.6% | 12.5% | 9.7% | 4.7% | 7.6% |
| 2003 | 38.6% | 26.7% | 12.2% | 9.8% | 4.8% | 7.6% |
| 2004 | 38.4% | 26.8% | 12.0% | 9.8% | 4.9% | 8.0% |
| 2005 | 38.1% | 26.9% | 11.9% | 10.0% | 5.0% | 8.1% |

**Table 4 Percentage of Students in Victoria by School Type and Level (ABS)**

As shown in Table 4 there are a much more Government school students in Victoria. In addition, within government schools there are about one third more primary students than there are secondary students. This corresponds to the large difference seen in the visitation data between primary and secondary school students. Among Catholic students, there are more primary students than secondary students, and in independent schools there are more secondary school students. These ratios also correspond to the numbers from the visitation data.

The high percentage of students visiting from government schools reflects the total number of students attending government schools; both are approximately 65%. This table also shows that there are fewer independent schooled students as opposed to Catholic schooled students. This suggests that a high percentage of students from independent schools must visit compared to students from Catholic schools. This also relates to the investigation of socio-economic level, as there are a higher percentage of higher-income students in Independent schools.

## 4.4 Visitation by Location

In an interview with Andrew Ekinsmyth, Learning Technologies Coordinator, and Guy Pritchard in Learning Programs at the Melbourne Zoo, it was determined that educators at the zoo believe there has recently been a decrease in visitation by school groups. Some of the

concerns and explanations expressed included the effect of rising transportation costs. In this comparison, the team compared the location of schools to the percentage visitation by students in the same region. This comparison was made by creating a geographic visitation distribution map for each of the parks to illustrate the percentage of students that come from different regions of Victoria out of the number of students enrolled in these regions. The map is divided into 45 divisions, called statistical subdivisions, set by the Australian Bureau of Statistics for census purposes, with 18 of these divisions in the greater Melbourne area. These statistical subdivisions are non-overlapping regions assigned by ABS to collect census data. The reported values represent the average number of students visited from that region over the past 6 fiscal years divided by the number of students enrolled in the region during the 2001 census (ABS). This calculation resulted in the percentage of students of a given region that visited a given campus, normalizing the effect of large student numbers for regions of higher population.

To illustrate the student percentages throughout Victoria, a color-coded map of the state was used. For each campus, ranges of percentages are assigned a color. Each campus has two maps, one of the whole state of Victoria and one of the greater Melbourne area, where 18 of the subdivisions are situated. Figures 1-30, 1-31, 1-32, 1-33, 1-34, and 1-35 are the resulting geographical visitation distribution maps.
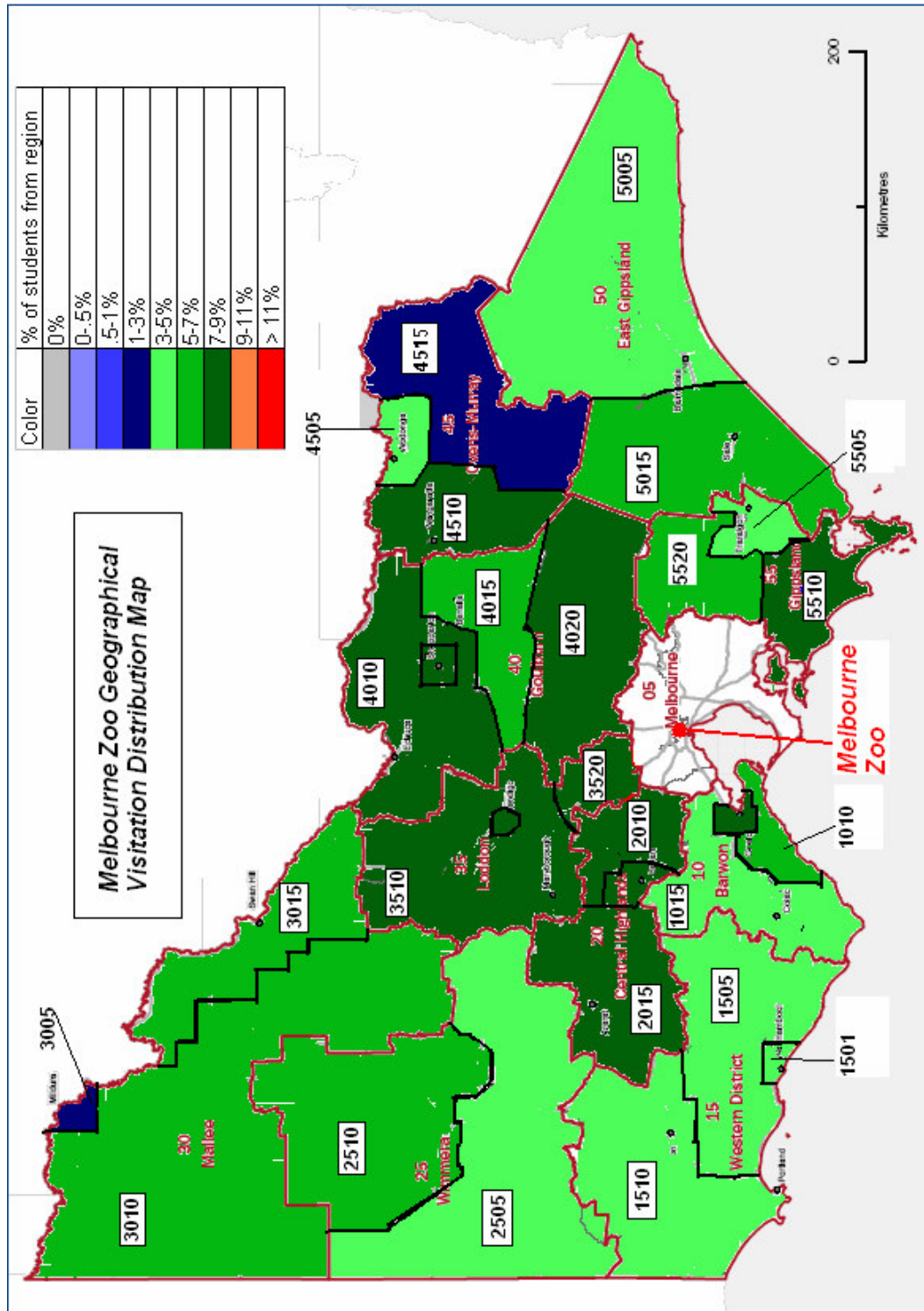
**Figure 4-27 Melbourne Zoo Geographical Visitation Distribution Map**
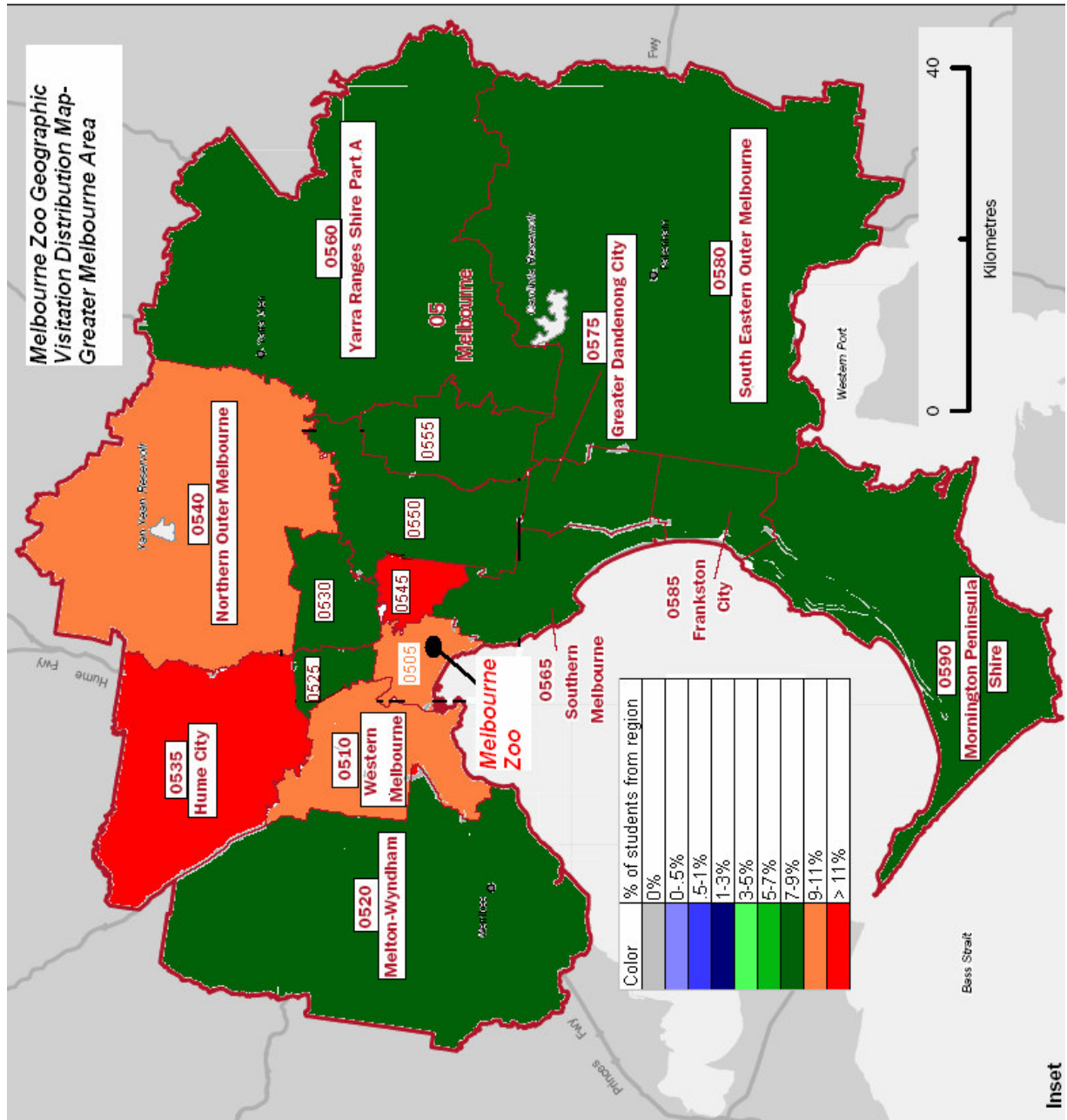
**Figure 4-28 Melbourne Zoo Geographical Visitation Distribution Map – Greater Melbourne Area**
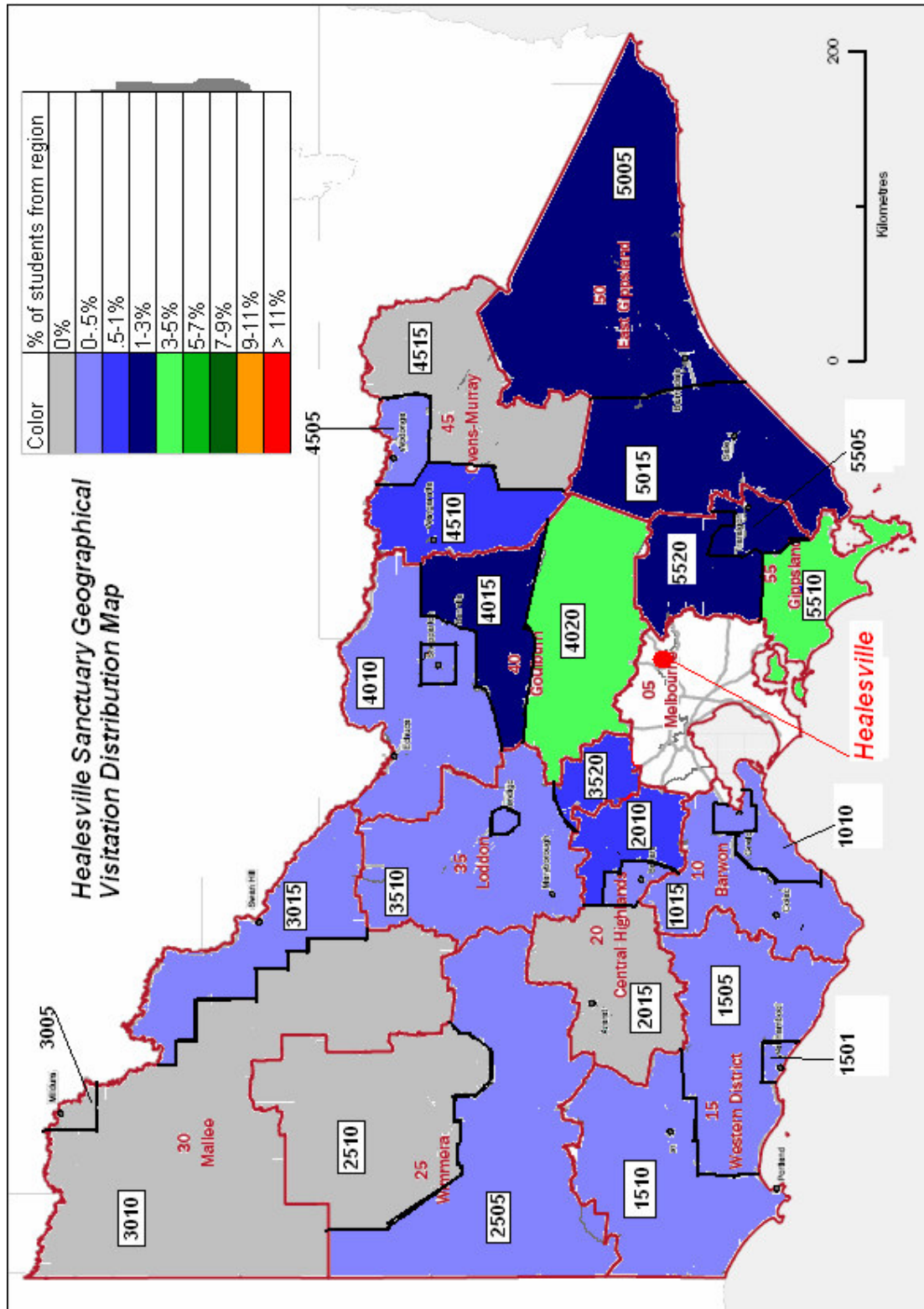
**Figure 4-29 Healesville Sanctuary Geographical Visitation Distribution Map**
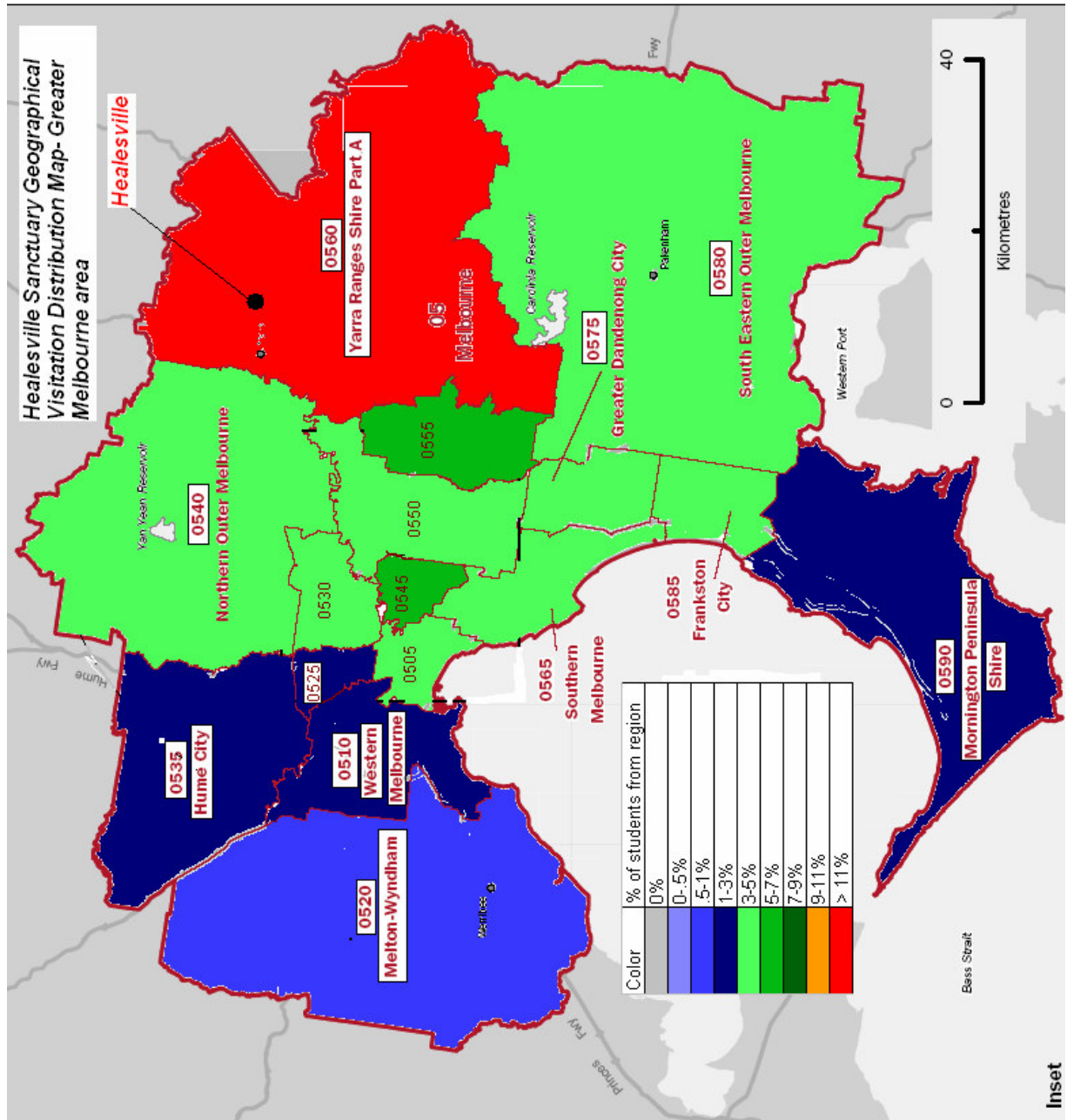
**Figure 4-30 Healesville Sanctuary Geographic Visitation Distribution Map – Greater Melbourne Area**
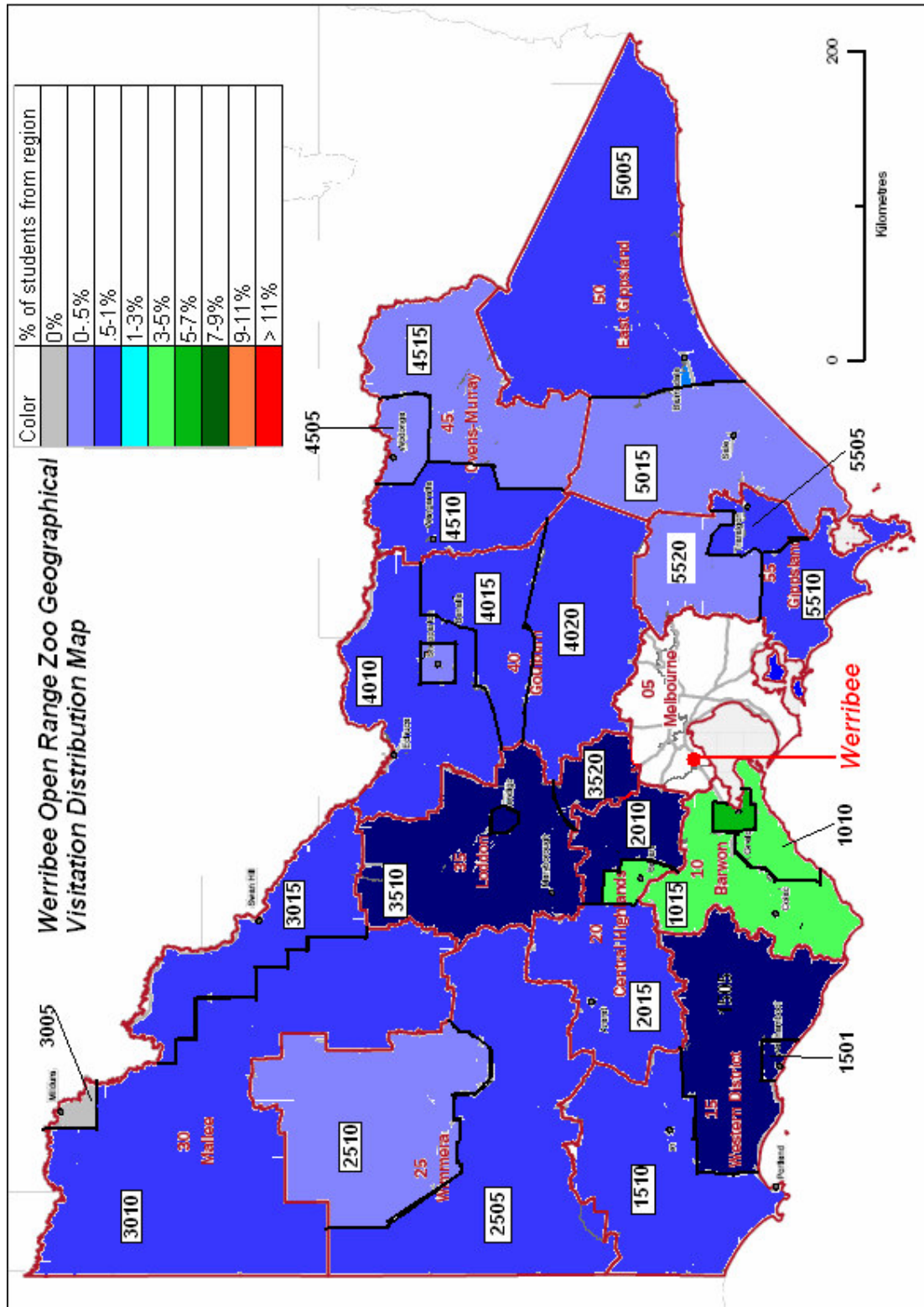
**Figure 4-31 Werribee Open Range Zoo Geographical Visitation Distribution Map**
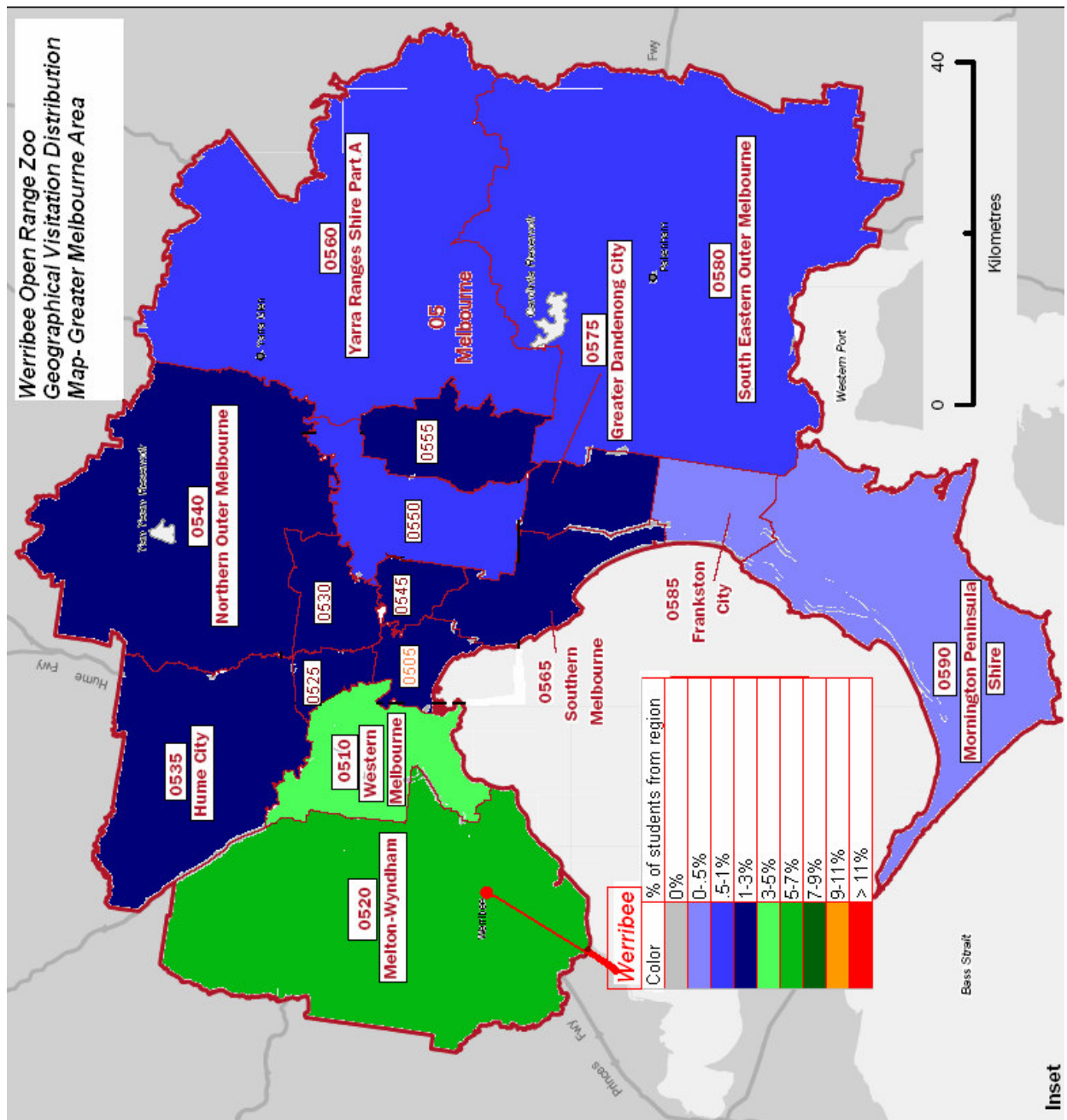
**Figure 4-32 Werribee Open Range Zoo Geographic Visitation Distribution Map – Greater Melbourne Area**

For the Melbourne Zoo, regions closer to Melbourne generally have a higher percentage of students that have visited, with a few exceptions. In the greater Melbourne area map, all the regions have high student visitation percentage.

Healesville Sanctuary is located in the eastern side of the Melbourne area. This is evident from the layout of the map, with regions to the west having lower student visitation

percentages and the regions in eastern Victoria having higher student visitation percentages. The greater Melbourne area map reveals regions of high percentage concentrated in the eastern side, which correlates to Healesville Sanctuary's location.

Werribee Open Range Zoo is located in the west side of the greater Melbourne area. From this, it can be seen that the regions of high percentage are on the western border of the Melbourne area, near Werribee. The greater Melbourne area map shows a high percentage of student visits from the region in which Werribee is located. The percentage of student visits gets lower towards the east.

## 4.4.1 Travel Time

Following the analysis of visitation by region, the team considered the effect of travel time on visitation to the three Zoos Victoria properties. The team considered how long it takes visiting schools to get to the respective campuses. The numbers of students from all traveling times were lumped into 30-minute increments of travel time to minimize the error in time calculation, traffic and location generalization, and to smooth out any anomalies in the data. Percentages of students from each time increment were taken out of the total number of students visited in the year considered. Percentage was used so that the comparisons between 2000-01, 2002-03, and 2005-06 were not affected by changes in total overall visitation. Figure 4-33, Figure 4-35, and Figure 4-37 illustrate the overall travel time distribution by student percentages for the Melbourne Zoo, Healesville Sanctuary, and the Werribee Open Range Zoo respectively. In addition, Figure 4-34, Figure 4-36, and Figure 4-38 were produced with a smaller scale to look at travel time distributions for smaller student percentages that appear in the increments of longer traveling times.
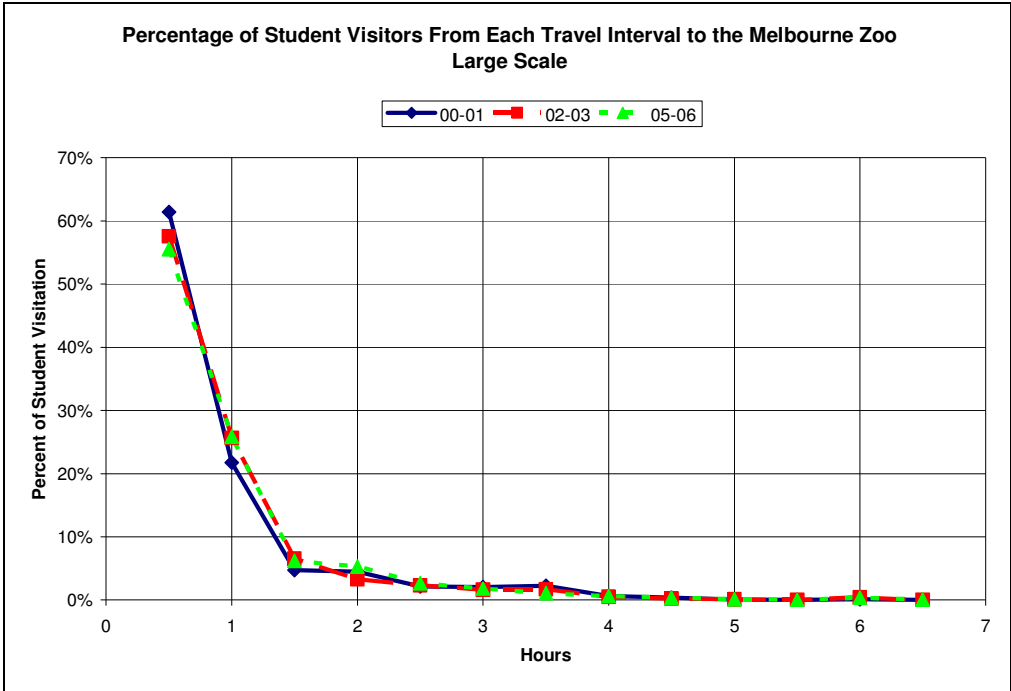
**Figure 4-33 Melbourne Zoo Traveling Distance Percentage**
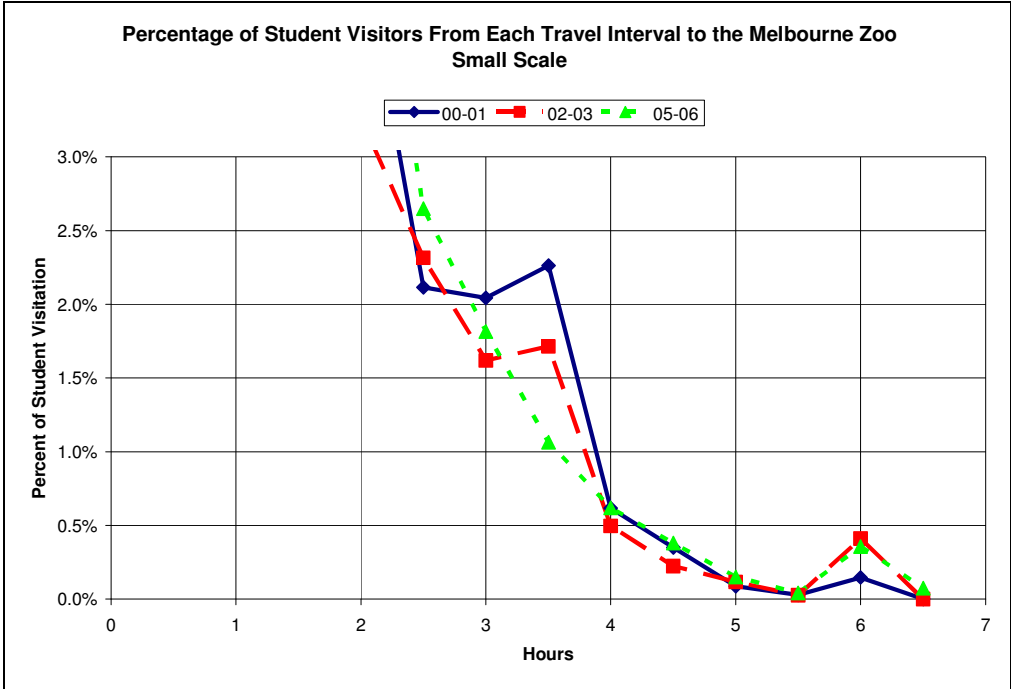


**Figure 4-34 Melbourne Zoo Traveling Distance Percentage- Small Scale**
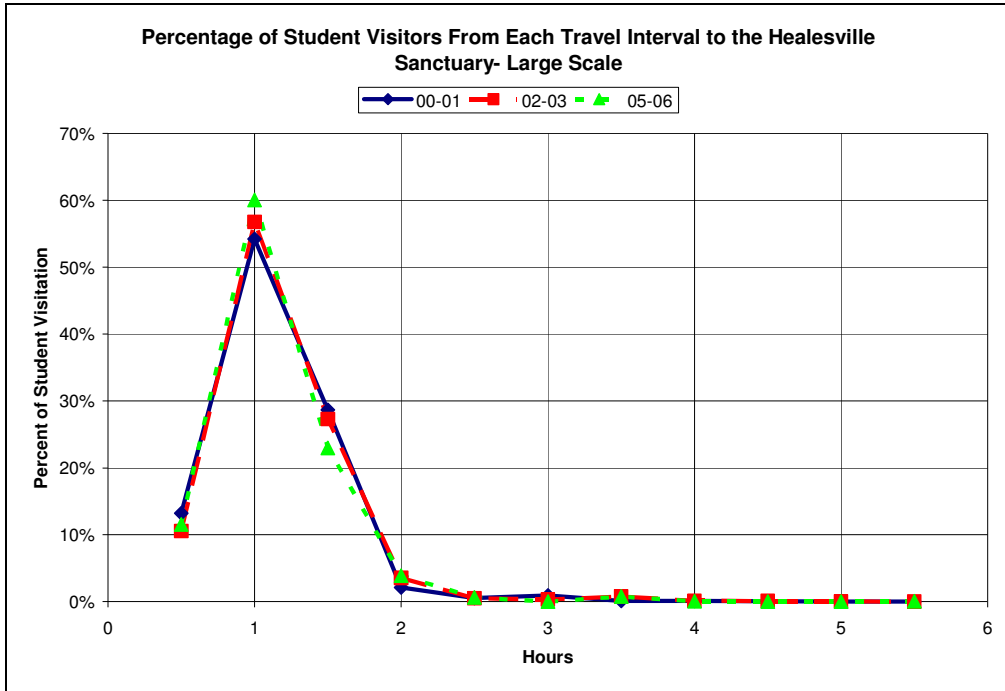
**Figure 4-35 Healesville Sanctuary Travel Distance Percentage**
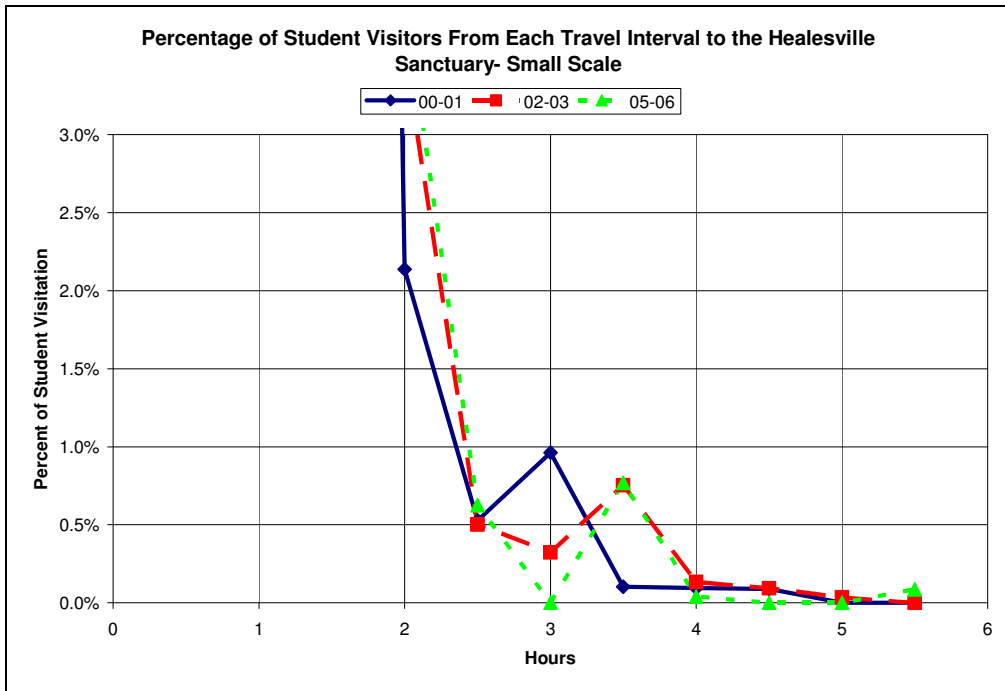


**Figure 4-36 Healesville Sanctuary Traveling Distance Percentage- Small Scale**

**Percentage of Student Visitors From Each Travel Interval to the Werribee Open Range Zoo- Large Scale**
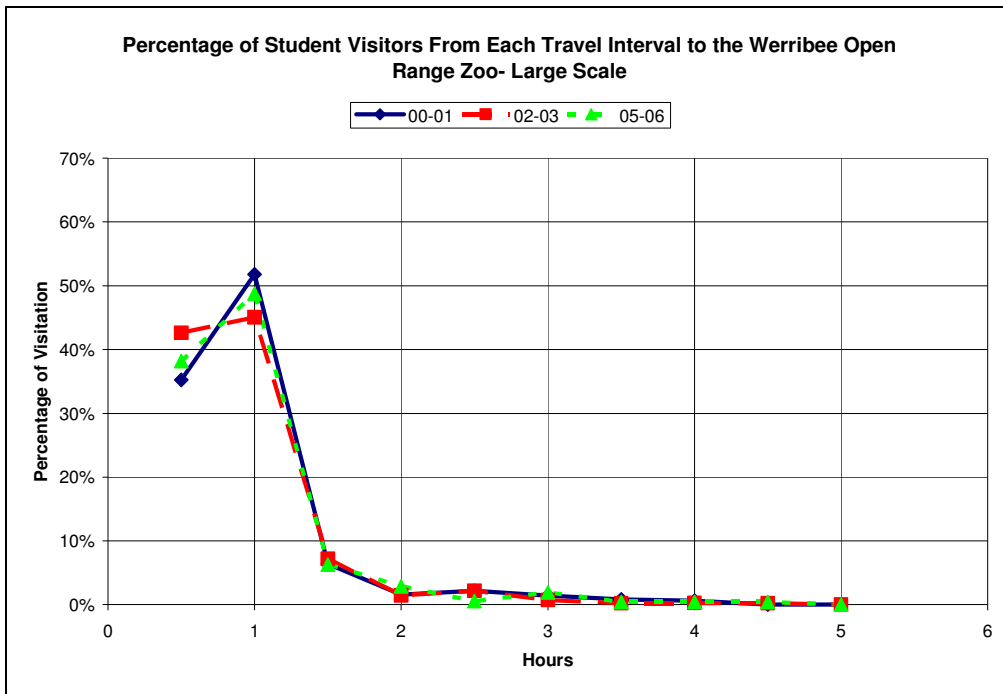


**Figure 4-37 Werribee Open Range Zoo Traveling Distance Percentage**

**Percentage of Student Visitors From Each Travel Interval to the Werribee Open Range Zoo- Small Scale**
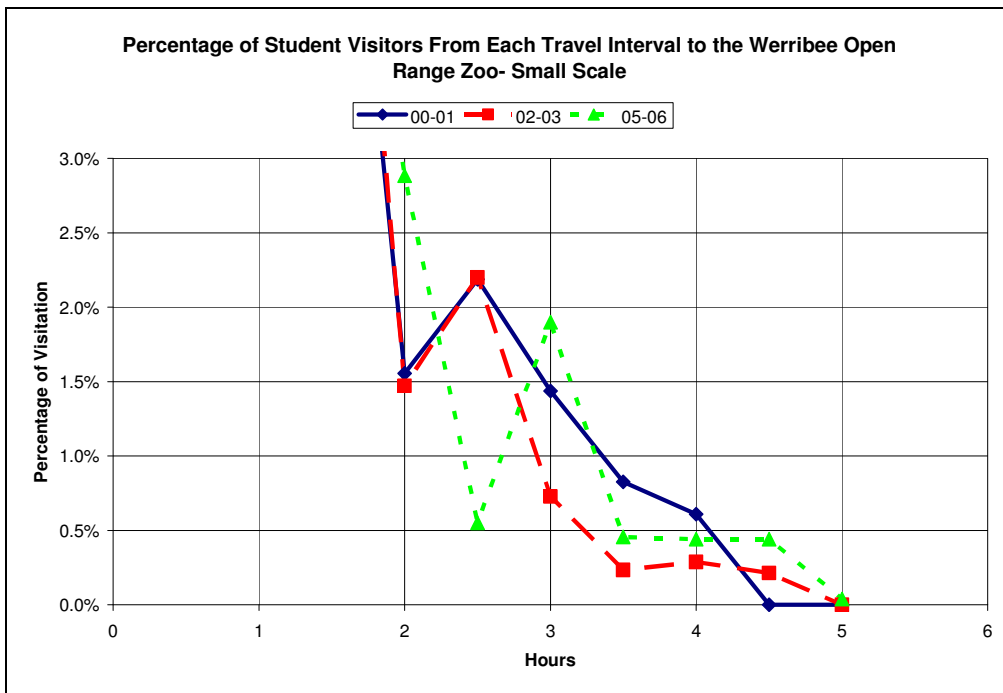


**Figure 4-38 Werribee Open Range Zoo Traveling Distance Percentage- Small Scale**

For the Melbourne Zoo the results for all three years were very similar. The first time increment, or the 0 to 30 minute traveling time increment, had the highest visitation percentage. As the travel times increased, the visitation percents gradually got lower. In the

later increments, the percentages varied year to year, this indicates that the visitation pattern is following no trend in these years.

For Healesville Sanctuary all three years were very similar, as in the Melbourne Zoo. In Healesville, the visitation percentage consistently peaked in the second time increment, 30 to 60 minutes traveled. After this peak, the percentages gradually approached zero. Like in Melbourne, there was a variation in later increments between the three years with no regular pattern. This is partly because there were not many visiting schools from longer distances. For example, in 2002-2003, only six schools visited Healesville from more than 3 hours away.

Werribee Open Range Zoo, like both Healesville and Melbourne, showed a consistent visitation pattern between the three years. It had a high visitation percentage in the first time increment, but peaked in the second increment. It went on to decrease more quickly in the third time increment before approaching zero sooner than Healesville or Melbourne. Once, again, there was a large variation seen in the later increments between the three years with no regular pattern. Like in Healesville, few schools visited from more than 3 hours away. In 2002-2003, for example, only nine schools traveled more than 3 hours to Werribee.

This comparison was made to explore whether or not the increases in fuel price in recent years has changed the visitation patterns to the three zoos. It was hypothesized that the percentage of visits from longer travel times in the later years would decrease when the fuel prices rose. According to the majority of the teachers who returned questionnaires, increased transportation cost was the most influential factor in planning a school excursion. From 2002 to 2005, the average price of gas rose 30 cents per liter; a full table of fuel price changes can be found in Appendix B. From Figure 4-33 through Figure 4-38, however, it appears that there has been a similar visitation pattern across the three years compared. In addition, it can be observed on the small scale graphs that there is variance in the amount of visitation from longer travel times; however, the differences in visitation across the three years of comparison follow no apparent pattern, nor do they decrease with any significance as fuel price increases. From these observations, it can be concluded that fuel prices have not made a significant impact on visitation across the past six fiscal years.

A possible explanation for this is that since a majority of visiting students are within one hour of travel time, the distance traveled is not long enough for schools to be significantly affected by changes in fuel costs. Schools that will probably be more concerned about fuel prices are the ones traveling from longer times, or greater than 2 hours. The visitation patterns for the longer distances show large variations year by year, where different

years have higher percentages for different time increments so there is no discernable pattern in this region of the graph. Note also that there are very few visitors from locations more than 2 hours from any zoo.

## *4.5 Repeat Visitation Analysis*

Zoos Victoria is currently investigating instituting a multiple visitation discount for school groups. It is important to note that there are many groups that book through Discovery and Learning that are not typical schools. There are kindergartens, special schools, adult groups, and other groups such as summer camps and other youth organizations that are accounted for; therefore, the total number of schools visited refers to all groups and will exceed the number of schools in the state of Victoria. As an initial step towards determining the feasibility of a multiple visitation discount it was determined how many schools repeat visitation between multiple campuses and at the same campus both within the same school year and across the six school years of data provided. The differences in repeat visitation by schools that have had a session with a zoo educator and those that have visited independently were also considered. The team chose to use school years instead of fiscal years for this analysis, as many schools are likely to plan excursions around their school schedule.

### 4.5.1 Multiple Campus Visitation

Each of the three Zoos Victoria campuses offer different programs and exhibits and as such many schools choose to rotate visitation between the campuses depending on their needs at the time. Therefore, it was determined how many schools have visited more than one Zoos Victoria campus in each school year as well as across all six school years together. Table 5 is a summary of the total number of schools visited in a year, the number of those schools that repeated visitation to at least one other campus in the same year and the percentage of the total schools that repeated visitation to at least one other campus.

| School Year | # Schools Visited | # Schools Visited Multiple Campuses | % Repeated |
|---|---|---|---|
| 2000 | 1386 | 292 | 21% |
| 2001 | 1576 | 312 | 20% |
| 2002 | 1934 | 318 | 16% |
| 2003 | 1738 | 321 | 18% |
| 2004 | 1863 | 343 | 18% |
| 2005 | 1926 | 588 | 31% |
| Across 6 Fiscal Years | 4086 | 1458 | 36% |

**Table 5 Multiple Campus Visitation by School Year**

From Table 5, one can observe that the percentage of schools that have visited more than one campus has stayed relatively consistent over the past six years, with an increase in the school year 2005.

## 4.5.2 Repeat Visitation to One Campus

Another facet of this comparison is to look at repeat visitation to the same Zoos Victoria property within the same school year and across all six school years. Table 6, Table 7, and Table 8 summarize the number of schools that have visited a property in a given school calendar year, how many of those schools returned to that same campus in the same school calendar year, followed by the percentage of the total schools that repeated visitation for the Melbourne Zoo, Healesville Sanctuary, and Werribee Open Range Zoo respectively.

Table 9 summarizes the number of schools that have visited a property across the past six school calendar years, how many of those schools repeated visitation to the same campus within the same six years, and the percentage of the total that has repeated.

| School Year | # Schools Visited | # Schools Repeated in Same School Year | % Repeated |
|---|---|---|---|
| 2000 | 893 | 277 | 31% |
| 2001 | 1078 | 325 | 30% |
| 2002 | 1093 | 341 | 31% |
| 2003 | 1228 | 387 | 32% |
| 2004 | 1359 | 470 | 35% |
| 2005 | 1344 | 471 | 35% |

**Table 6 Melbourne Zoo Repeat Visitation in the Same School Year**

| School Year | # Schools Visited | # Schools Repeated in Same School Year | % Repeated |
|---|---|---|---|
| 2000 | 529 | 129 | 24% |
| 2001 | 532 | 142 | 27% |
| 2002 | 549 | 132 | 24% |
| 2003 | 550 | 137 | 25% |
| 2004 | 514 | 140 | 27% |
| 2005 | 572 | 147 | 26% |

**Table 7 Healesville Sanctuary Repeat Visitation in the Same School Year**

| School Year | # Schools Visited | # Schools Repeated in Same School Year | % Repeated |
|---|---|---|---|
| 2000 | 288 | 59 | 20% |
| 2001 | 298 | 52 | 17% |
| 2002 | 282 | 13 | 5% |
| 2003 | 306 | 58 | 19% |
| 2004 | 371 | 69 | 19% |
| 2005 | 429 | 80 | 19% |

**Table 8 Werribee Open Range Zoo Repeat Visitation in the Same School Year**

| Campus | # Schools Visited | # Schools Repeated in 6 School Years | % Repeated |
|---|---|---|---|
| Melbourne | 2832 | 1728 | 61% |
| Healesville | 1653 | 792 | 48% |
| Werribee | 1159 | 447 | 39% |

**Table 9 One Campus Repeat Visitation Across 6 School Years**

In comparing Table 6, Table 7, and Table 8, one can observe that the percentage of repeat visitation within the same school year is highest at the Melbourne Zoo and lowest at Werribee with Healesville in the middle. This could be due to the fact that schools tend to be more likely to make repeat visits to Melbourne and Healesville. This is a similar pattern to the repeat visitation percentages across all six years for each campus as observed in Table 9. Possible reasons for such a pattern could be that the Melbourne Zoo has the highest visitation overall, leading one to conclude that more schools are repeating visitation in order to account for the volume of visits. In addition, as with multiple campus visitation, the percentage of repeat visitation is higher across the 6 years together rather than within the same year. This is expected, as the period of time to repeat is much longer and many schools have a curriculum pattern that repeats year to year and as such may include the same excursions each school calendar year.

### 4.5.3  Educator-Led and Independent Visitor Repeat Visitation

One concern of Zoos Victoria is the differences in the trend of educator-led and independent visitation. One possible factor influencing the changes in these types of visitation is the number of schools who repeat trips to the zoo independently and with educator-led sessions at each campus. Table 10 summarizes the total number of schools that have visited each campus both independently and with an educator-led session in the last six school years, the number of those schools that have repeated with the same type of visitation

to the same campus in the same time period and the percentage of the schools that repeated visitation of the same type. In this analysis, schools making an independent visit or an educator-led visit are considered separately. This means that a school that made one independent visit and one educator-led visit but didn't repeat in either category would not be included in the number of schools that repeated. Likewise, if a school repeats both types they would be included in the number of schools repeated for both categories.

| | Total # of Schools | # of Schools Repeated | % Repeated |
|---|---|---|---|
| **Melbourne** | | | |
| Educator Led | 2627 | 1581 | 60% |
| Independent | 1638 | 719 | 44% |
| **Healesville** | | | |
| Educator Led | 1519 | 745 | 49% |
| Independent | 874 | 276 | 32% |
| **Werribee** | | | |
| Educator Led | 1309 | 532 | 41% |
| Independent | 277 | 34 | 12% |

**Table 10 Educator-led and Independent Visitor Repeat Visitation (over 6 years)**

Table 10 clearly shows that schools partaking in an educator led session as a part of their Zoos Victoria excursion are more likely to repeat visitation in a subsequent school year. Possible reasons for this include classes that choose to take part in a Discovery Session with a Zoo educator have the added educational value of expert interaction, the close-up animal encounters, creating a more emotional connection to the animals for the students, and the school teachers have the added interaction with the zoo educators giving them a more personal connection.

# 5 Recommendations and Conclusions

Based on the data analysis and research completed, the team has concluded there are two main areas in which to provide Zoos Victoria with recommendations for future improvement. The first area to consider is which topics of research to investigate further based on the current analysis. The preliminary analysis and research has revealed which variables are and are not currently affecting visitation; with this information Discovery and Learning can expand research and develop strategies to improve their programs and offerings. The second area to consider is the booking database design and what restrictions it places when attempting to extract valuable information. If designed and used in the most effective manner, the database can quickly and easily provide the information Zoos Victoria needs at any given time.

## 5.1 Future Research and Development

In completion of this report, the team has answered a set of research questions and expanded upon the answers as more questions arose. However, the analysis has undoubtedly raised new and important questions within certain topics that can still be expanded upon.

Visitation by student year has shown that year level visitation distribution is constant with peaks in years Prep, 7, and 11. Although this has been analyzed and explained, Discovery and Learning is now aware of the opportunity to develop and market programs to other year levels in order to improve their reach within the Victorian school systems. As the curriculum continues to grow and change with the institution of the VELS, Discovery and Learning can use these changes to their advantage to improve the breadth and applicability of their programs. Traditionally excursions to the zoo have primarily been part of a science unit; however, as evidenced by new programs like "Mere Monkeys?" a program in psychology and "Animal Rites/Animal Rights" a program in philosophy, there are many other subjects and areas in the curriculum Zoos Victoria can cater towards. Widening the applicability of the offered programs will allow other year levels to fit Zoos Victoria excursions into their curriculum.

Another area where continued research could be useful is in the area of repeat visitation. The analysis done shows how many schools are coming back across two different time periods, in a single year and across six years; however, it does not show how many times schools are repeating in these time periods and what year levels they are bringing. This

analysis will be complicated and it may be necessary to wait for the previously recommended database changes to be made in order for these questions to be answered. Although difficult, further analysis in this area will be important to continue as according to Zoos Victoria staff, many schools have requested multiple visit discounts and this option is currently being investigated.

High travel cost was the most common cited issue by both informal education institutions in New England as well as by the Zoos Victoria teachers who returned questionnaires. Although the analysis done on travel time does not reveal a significant change in visitation by the schools located further away, there is the possibility of this problem growing in the future if fuel costs continue to rise. As advertised on their websites, a solution to this problem being implemented by many other informal education institutions in both New England and across Australia is the creation of outreach programs that travel to schools. This eliminates the cost of expensive buses for schools, could potentially increase the number of students reached and keep Zoos Victoria offerings on par with other zoos in Australia.

## *5.2 Bookings Database Changes*

Through extensive work with the bookings database, the team has developed a set of changes and updates that can be made to make this a more valuable and workable resource for Zoos Victoria in the future. The two general categories of changes that need to be made are changes in how data are recorded and what data are recorded. Changes in these areas would allow more research questions to be answered and in a more timely, effective, and complete fashion.

### 5.2.1 Method of Data Collection

The most detrimental problem encountered by the team was the lack of uniformity in the way data were recorded. One such example was in the analysis of student year. When student years of visitors were recorded, it was done in one of many forms. For some bookings student age was recorded rather than student year. For bookings covering more than one student year it was frequently recorded in different forms. When data are recorded inconsistently, it requires manual sorting which is time consuming and unnecessary. A simple solution to solve the problem with the lack of uniformity is to create drop down menus in the database. This limits the choices and guarantees that all data are recorded in the same form allowing for quick and easy comparison, organization and analysis. In order to expand the

accuracy of this category, it also would be helpful to record for groups that include more than one year level how many students are from each level. If the data are recorded to include these numbers, student year analysis would be streamlined even further and would also be more accurate.

The addition of drop-down menus can be instituted in other areas as well. Other uses include in the case of suburb. Many times suburbs were misspelled once again requiring time consuming, manual sorting. For this application it may be helpful to include an out-of state and an international category for schools outside of Victoria.

Another problem encountered in the data manipulation and analysis was when bookings information was incomplete. Although there was not a large number of bookings with missing information, if all bookings were complete analysis would be more accurate. A possible solution to this problem would be to restrict movement between forms in the database until all categories were completed.

## 5.2.2 Content of Data Collection

Zoos Victoria provided the team with a set of research questions that included the information they would like to be able to extract from the database. By spending a great deal of time in the database, the team has established which of these research questions can indeed be answered with the current data and which require the collection of different or more types of information.

One area of information that can be expanded upon is visit cancellations; the team found bookings that included booking dates with no attached lesson date. This suggests that the school cancelled or did not follow through with their booking for whatever reason. An important change that can be made to the database to address this problem would be to allow a field to record cancellations and to include a field for the reason for cancellation or record it as a no-show. Although there is a field currently for schools that made changes to their bookings, the record of cancellations could be more consistent and complete.

Finally, another area of data collection the team began to pursue and should be continued is more information associated with independent visitors. This begins with recording the teacher name that will be accompanying the students thus allowing for the distribution of questionnaires either pre-or post-visit. Zoos Victoria has posed many questions relating to independent visitation and answering such questions requires the collection of more data from independent visitors in the future.

## 5.3 Conclusions

Upon extensive data analysis, research, and comparisons, several conclusions about Discovery and Learning visitation patterns have been formed. These conclusions have been drawn from several research topics. The first being general visitation trends for all of Zoos Victoria's visitation numbers, as well as yearly and monthly school group visitation. Also analyzed were the differences in educator-led vs. independent visitation. Next investigated were the visitation patterns for specific student year levels. Several external factors were also researched including the effects of travel time and rising fuel costs, the introduction of standardized testing in the state of Victoria, and funding for various school types. Finally, an analysis was conducted to find the frequency of repeat visitation by school.

Foremost, it has been concluded that contrary to the concerns of Zoos Victoria staff, there is not a significant decrease in overall visitation to Discovery and Learning. In comparison to general admission data, school group visitation is increasing representing around 17-18% of total visitation to Zoos Victoria. In terms of the differences in independent and educator-led visitation, independent visitation has increased from approximately 30 to 45% of total school group visitation at the Melbourne Zoo, decreased from approximately 24 to 10% at the Werribee Open Range Zoo, and remained consistent around 27% at the Healesville Sanctuary.

Prior to the start of the data analysis, several possible visitation factors were determined for investigation. In completion of the above analysis and research, it has been determined that the external factor of travel time as related to fuel price changes has not affected visitation. This has been proven, as visitation from longer distances has not changed significantly across the past six fiscal years. Another external factor considered was the effect of the newly instituted standardized testing. According to the statistical analysis completed, it has been proven that thus far, standardized testing has not been a significant barrier in school group visitation in testing year levels.

Another factor analyzed was the frequency of repeat visitation across multiple campuses and individual zoos. The repeat visitation analysis showed that schools repeat most frequently to the Melbourne Zoo followed by the Healesville Sanctuary and finally the Werribee Open Range Zoo. In addition, schools repeated more frequently as educator-led visitors than as independent visitors. For the Melbourne Zoo and Healesville Sanctuary, approximately 15% more schools repeated educator-led visitation than independent whereas

in Werribee approximately 30% more schools repeated educator-led visits as opposed to independent.

Finally, visitation demographics of several types have been determined. The categories explored include student year level, geographic distribution and school types. Through student year analysis, it was found that student year level distribution has been very consistent across the past six fiscal years and year levels prep, 7 and 11 have the highest visitation at the Melbourne Zoo whereas early primary students, years 7 and 11 have the highest visitation at the Healesville Sanctuary and the Werribee Open Range Zoo. In addition, at the Melbourne Zoo, visitation of primary and secondary schools is nearly equal whereas in Healesville and Werribee have nearly twice as many primary schools visiting than secondary schools. For school type, it has been determined that approximately two thirds of school group visitors across the three properties are coming from Government schools leaving Independent and Catholic schools making up most of the remaining third with a very small percentage of groups listed as other. The exact ratios varied slightly across the three properties. The last demographic explored was visitation by location, regional maps representing the percentage of enrolled students visiting from each region were generated.

In providing the above findings, Discovery and Learning has a set of analysis that can be used in several ways in the future. The completed analyses answer a set of research questions and in doing so has raised many more. The following research and analysis will act as a stepping-stone to continued research in the future. Furthermore, the variables and trends identified will allow Zoos Victoria to alter and improve their offerings in such a way as to broaden their reach in Victorian schools providing more students with informal education experiences.

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# Appendix A

## *Percentage of Educator-Led vs. Independent Visitation by Year Level Classification per Fiscal Year*
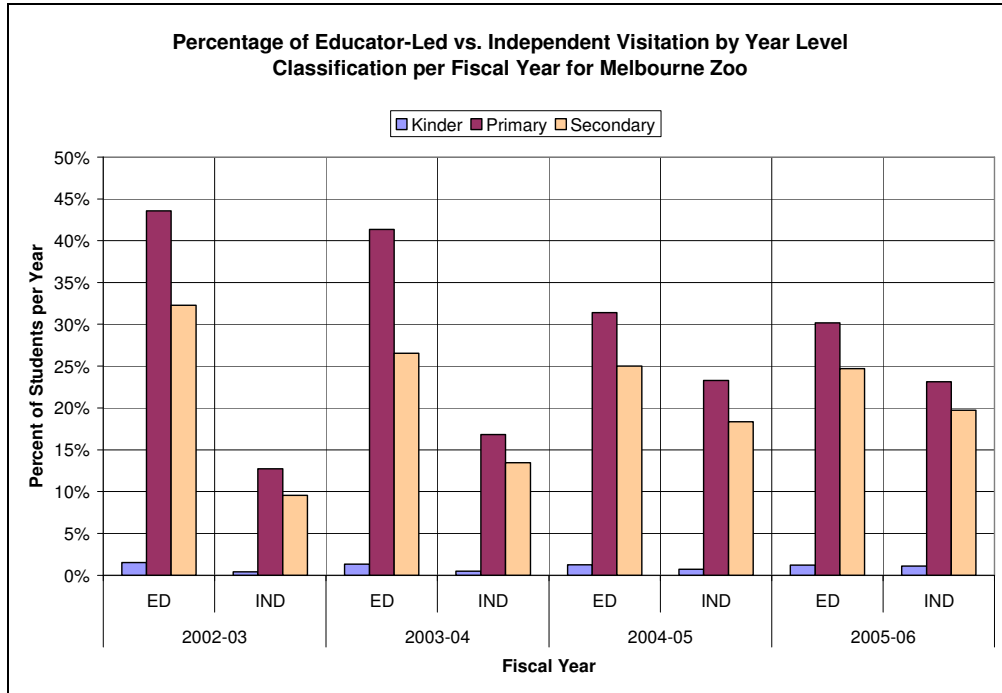


**Figure A- 1 Percentage of Educator-Led vs. Independent Visitation by Year Level Classification per Fiscal Year for Melbourne Zoo**

The graph for Melbourne Zoo shows a progressive change in division between independent and educator-led visitation. From 2000-01 to 2005-06 the split has gone from almost entirely educator-led visitation to nearly half and half. Healesville, however, shows very little change over the course of 6 fiscal years. For Werribee only fiscal years 2003-04 to 2005-06 have recorded data on independent visitation. However, in the 2005-06 fiscal year primary and secondary independent visitation decreased by about 8% from the previous year.
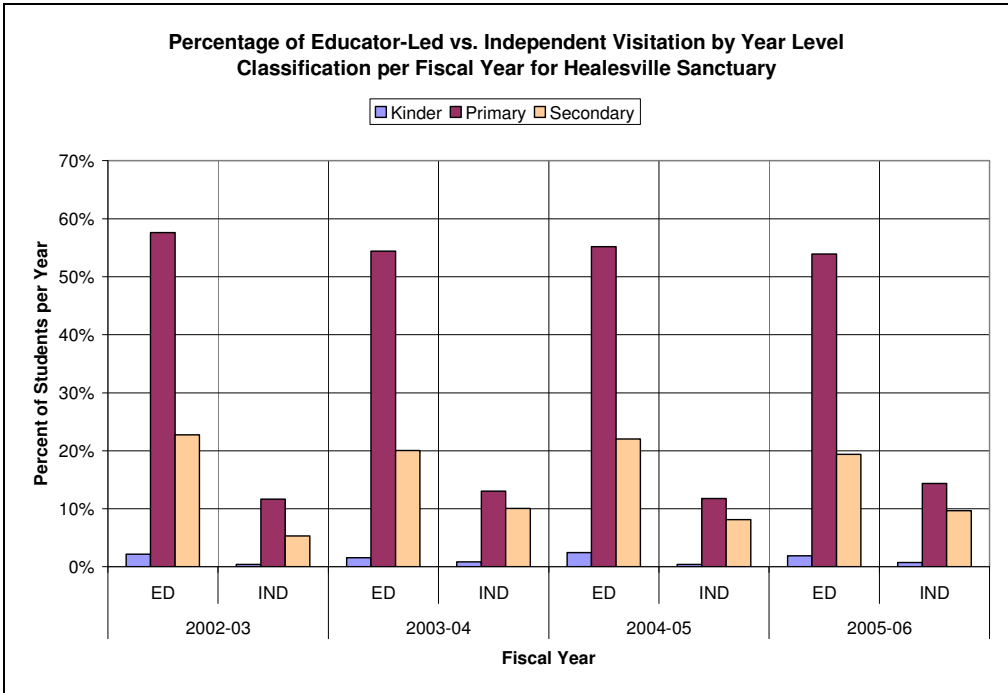
**Figure A- 2 Percentage of Educator-Led vs. Independent Visitation by Year Level Classification per Fiscal Year for Healesville Sanctuary**
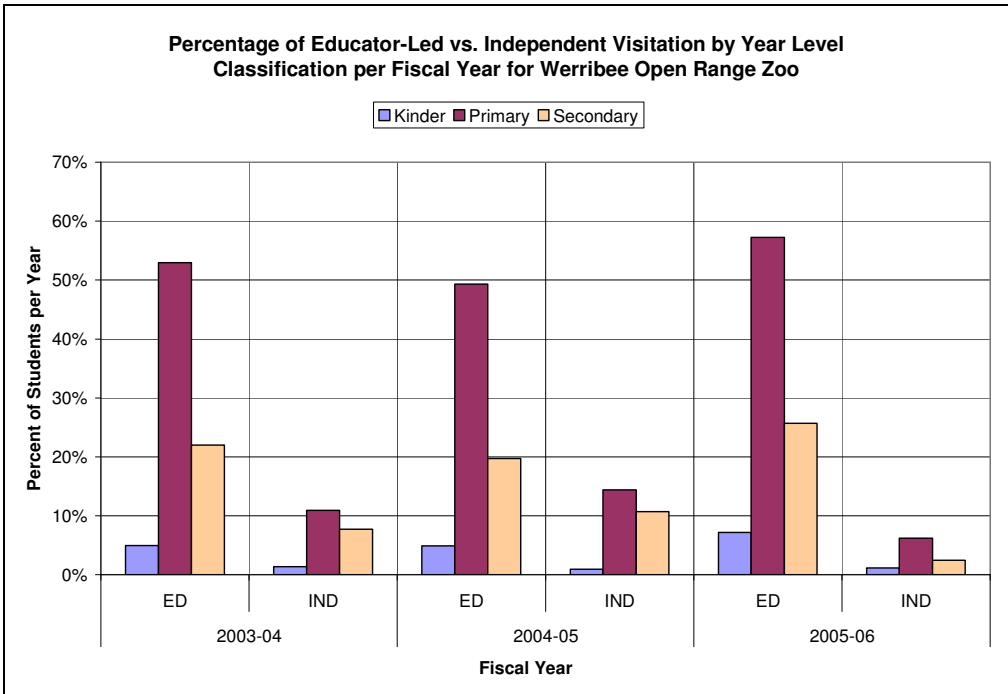


**Figure A- 3 Percentage of Educator-Led vs. Independent Visitation by Year Level Classification per Fiscal Year for Werribee Open Range Zoo**

# Appendix B

## *Victoria Average Fuel Prices for 2002-2006[4]*

| 02/03 | cents/liter | O3/O4 | cents/liter | O4/O5 | cents/liter | O5/O6 | cents/liter |
|---|---|---|---|---|---|---|---|
| Jul-02 | 86.0 | Jul-03 | 84.5 | Jul-04 | 95.9 | Jul-05 | 111.2 |
| Aug-02 | 86.7 | Aug-03 | 89.3 | Aug-04 | 101.1 | Aug-05 | 120.2 |
| Sep-02 | 88.0 | Sep-03 | 89.8 | Sep-04 | 98.9 | Sep-05 | 127.9 |
| Oct-02 | 89.9 | Oct-03 | 85.4 | Oct-04 | 104.6 | Oct-05 | 123.4 |
| Nov-02 | 87.6 | Nov-03 | 87.4 | Nov-04 | 102.0 | Nov-05 | 112.9 |
| Dec-02 | 87.8 | Dec-03 | 85.2 | Dec-04 | 94.8 | Dec-05 | 113.4 |
| Jan-03 | 91.8 | Jan-04 | 91.9 | Jan-05 | 93.0 | Jan-06 | 120.0 |
| Feb-03 | 96.9 | Feb-04 | 89.0 | Feb-05 | 97.7 | Feb-06 | 116.4 |
| Mar-03 | 98.4 | Mar-04 | 92.5 | Mar-05 | 104.7 | Mar-06 | 119.4 |
| Apr-03 | 89.4 | Apr-04 | 92.8 | Apr-05 | 107.9 | Apr-06 | 129.2 |
| May-03 | 85.2 | May-04 | 97.9 | May-05 | 102.2 | May-06 | 132.8 |
| Jun-03 | 85.4 | Jun-04 | 99.9 | Jun-05 | 105.9 | Jun-06 | 137.0 |
| **2002-03 Ave** | **89.4** | **2003-04 Ave** | **90.5** | **2004-05 Ave** | **100.7** | **2005-06 Ave** | **122.0** |

**Table 11 Victoria Average Fuel Prices for 2002-2006**

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[4] Data provided by the Royal Automobile Club of Victoria. <www.racv.com.au>

# Appendix C

## *Questionnaire Summary*

**Melbourne Zoo: Independent School Group Visitors**

3 Questionnaires Completed

Student Year Level –  Kinder – 1
                 P-2 – 1
                 Special – 1

Questions and Responses:

1. How did you hear about the school excursion opportunities at Zoos Victoria?

Been Before – 3

2. Why did you choose to visit Melbourne Zoo as opposed to Healesville Sanctuary or Werribee Open Range Zoo?

Exhibits – 3
Location – 2
Most appropriate for students with disabilities – 1

3. Were you aware of the Discovery & Learning Sessions available with a Zoo Educator?

Yes – 3

        a.   If yes:  Why did you choose not to utilize Discovery & Learning Schools?

        Wanted to be involved in educating the students, knew what they wanted the focus to be

        Children to young and limited time

        Not suited for children's level of disability

4. Did you use the Zoos Victoria Website?

Yes – 2
No – 1

        b.   If yes:  What tools on the website did you use?

     Teacher Notes – 1
     FAQ's – 1

5. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?

Part of unit of work – 3
Social outing – 1

6. Do you have a specific itinerary prepared for your visit?
> i.e. Will the class be splitting into groups or traveling as a whole?  Are there specific exhibits you intend to see and why?

No – 2
Traveling as a whole – 1

7. Has the number of student excursions in your school decreased over recent years?

No – 2
Yes – 1

8. What factors do you believe contribute to the frequency of excursions in your school?

Cost – 2
Applicability within curriculum – 1

**Melbourne Zoo: Educator Led School Group Visitors**

6 Questionnaires Completed

Student Year Level – Prep – 1
> 1 – 1
> 7 – 1
> 10 – 1
> 11 – 2

Questions and Responses:

1. Why did you choose to visit Melbourne Zoo as opposed to Healesville Sanctuary or Werribee Open Range Zoo?

Exhibits – 4
Location – 3
Diet and Dentition Program – 1

2. Why did you choose to book a Discovery & Learning session?

Previous Visit – 5
Info on Website – 1
3. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity

Part of unit of work – 6

4. Has the number of student excursions in your school decreased over recent years?

Yes – 3
No – 3

5. What factors do you believe contribute to the frequency of excursions in your school?

Cost – 6
Proximity to School – 2
Applicability within Curriculum – 3
Liability Concerns – 2

6. Is there anything that Zoos Victoria can do in order to make preparation for your excursion easier?

- Easier, friendlier booking
- Good things – website, online resources, pre visit call
- Good booking process, liked being able to book all three groups in sessions at the same time
- Transportation cost is a large deterrent; VCE students come by train to lessen cost
- Time needed for trip organization makes planning difficult for teachers, teacher needed to make an additional trip to the zoo prior to visit to prepare
- Legal and liability concerns are an issue
- The zoo is great!

**Werribee Open Range Zoo: Independent School Group Visitors**

2 Questionnaires Completed

Student Year Level – 10 – 1
                                11 – 1

Questions and Responses:

1. How did you hear about the school excursion opportunities at Zoos Victoria?

Been Before – 2

2. Why did you choose to visit Werribee Open Range Zoo as opposed to Melbourne Zoo or Healesville Sanctuary?

Exhibits – 1
Most students had already been to the Melbourne Zoo – 1

3. Were you aware of the Discovery & Learning Sessions available with a Zoo Educator?

Yes – 2

a.  If yes:  Why did you choose not to utilize Discovery & Learning Schools?

Studying open range visits, wanted bus tour
Didn't know enough about it and Cost

4. Did you use the Zoos Victoria Website?

Yes – 2

a. If yes:  What tools on the website did you use?

General Info – 1
Student trails – 1

5. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?

Part of curriculum – 2

6. Do you have a specific itinerary prepared for your visit?
          i.e. Will the class be splitting into groups or traveling as a whole?  Are there specific exhibits you intend to see and why?

Bus tour and free time in groups – 2

7. Has the number of student excursions in your school decreased over recent years?

Yes – 1 (due to drought)
No – 1

8. What factors do you believe contribute to the frequency of excursions in your school?

Cost – 2
Scheduling Issues – 2
Proximity to School – 1


**Werribee Open Range Zoo: Educator Led School Group Visitors**

1 Questionnaire Completed

Student Year Level – 8

Questions and Responses:

1. How did you hear about the school excursion opportunities at Zoos Victoria?

Website and Conference

2. Why did you choose to visit Werribee Open Range Zoo as opposed to Melbourne Zoo or Healesville Sanctuary?

Studying Grasslands

3. Why did you choose to book a Discovery & Learning session?

Wanted students to see animals and walk along habitat corridor

4. Did you use the Zoos Victoria Website?

Yes

     a. If yes: What tools on the website did you use?

     Teacher Notes and VELS Tables

5. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?

Unit of work on grasslands and habitat corridors

6. Do you have a specific itinerary prepared for your visit?

Yes

7. Has the number of student excursions in your school decreased over recent years?

No

8. What factors do you believe contribute to the frequency of excursions in your school?

Applicability within Curriculum

# Appendix D

*Questionnaires*

## Discovery & Learning Pre-Visit Questionnaire

School: _____      Visit Date:_____

Teacher Name: _____      Student Year Level: _____ Number of Students: _____

2.  Why did you choose to visit Melbourne Zoo as opposed to Healesville Sanctuary or Werribee Open Range Zoo? (circle all that apply)

      Location      Exhibits      Advertisements      Colleague Recommendation

      Other_____ (please specify)

3.  Why did you choose to book a Discovery & Learning session? (circle all that apply)

    Colleague Recommendation      Reasonable Pricing    Previous Visit      Information on Website

    Other _____ (please specify)

4.  How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?_____

_____
_____

5.  Has the number of student excursions in your school decreased over recent years?     yes        no

6.  What factors do you believe contribute to the frequency of excursions in your school? (circle all that apply)

    Cost      Proximity to School    Necessary Paperwork      Scheduling Issues

    Applicability within Curriculum      Liability Concerns    Other

Please Elaborate:

_____
___
_____
_____
_____
_____

7.  Is there anything that Zoos Victoria can do in order to make preparation for your excursion easier?

_____
_____
_____

**Independent Visitor Pre-Visit Questionnaire**

School: _____          Visit Date:_____

Teacher Name: _____          Student Year Level: _____  Number of Students: __

8. How did you hear about the school excursion opportunities at Zoos Victoria?

      Been Before     Website       Phone Query       Colleague     Zoo Educator

      Teacher Preview      Conference    Poster      PD Onsite     PD Offsite

      D&L Brochure       Other_____ (please specify)

9. Why did you choose to visit Melbourne Zoo as opposed to Healesville Sanctuary or Werribee Open Range Zoo? (circle one)

      Location      Exhibits      Advertisements      Colleague Recommendation

      Other_____ (please specify)

10. Were you aware of the Discovery & Learning Sessions available with a Zoo Educator? yes  no

    a. If yes:  Why did you choose not to utilize Discovery & Learning Schools?

      Cost    Didn't know enough about it      Negative reviews from previous visitors

      Other_____ (please specify)

11. Did you use the Zoos Victoria Website?     yes     no

    a. If yes:  What tools on the website did you use?

      Teacher Notes      Student Trail      FAQ's Section      VELS Tables

12. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?_____

13. Do you have a specific itinerary prepared for your visit?
        i.e. Will the class be splitting into groups or traveling as a whole?  Are there specific exhibits you intend to see and why?
_____

14. Has the number of student excursions in your school decreased over recent years? (circle one) yes  no

15. What factors do you believe contribute to the frequency of excursions in your school?

      Cost      Proximity to School    Necessary Paperwork      Scheduling Issues

      Applicability within Curriculum      Liability Concerns    Other

Please Elaborate: _____

## Discovery & Learning Pre-Visit Questionnaire

School: _____          Visit Date:_____

Teacher Name: _____     Student Year Level: _____  Number of Students: __

16. Why did you choose to visit Healesville Sanctuary as opposed to Melbourne Zoo or Werribee Open Range Zoo? (circle all that apply)

      Location      Exhibits      Advertisements      Colleague Recommendation

      Other_____ (please specify)

17. Why did you choose to book a Discovery & Learning session? (circle all that apply)

Colleague Recommendation      Reasonable Pricing    Previous Visit        Information on Website

      Other _____ (please specify)

18. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?
_____
_____
_____

19. Has the number of student excursions in your school decreased over recent years?    yes        no

20. What factors do you believe contribute to the frequency of excursions in your school? (circle all that apply)

Cost      Proximity to School    Necessary Paperwork      Scheduling Issues

Applicability within Curriculum        Liability Concerns    Other

Please Elaborate:
_____
___
_____
_____
_____
_____

21. Is there anything that Zoos Victoria can do in order to make preparation for your excursion easier?
_____
_____
_____
_____
_____

**<u>Independent Visitor Pre-Visit Questionnaire</u>**

School: _____ Visit Date:_____
Teacher Name: _____ Student Year Level: _____Number of Students: ___

22. How did you hear about the school excursion opportunities at Zoos Victoria?

    Been Before     Website          Phone Query          Colleague      Zoo Educator

    Teacher Preview        Conference     Poster          PD Onsite       PD Offsite

    D&L Brochure          Other_____ (please specify)

23. Why did you choose to visit Healesville Sanctuary as opposed to Melbourne Zoo or Werribee
    Open Range Zoo? (circle one)

    Location          Exhibits          Advertisements          Colleague Recommendation

    Other_____ (please specify)

24. Were you aware of the Discovery & Learning Sessions available with a Zoo Educator? yes no

    a.   If yes:  Why did you choose not to utilize Discovery & Learning Schools?

    Cost     Didn't know enough about it          Negative reviews from previous visitors

    Other_____ (please specify)

25. Did you use the Zoos Victoria Website?       yes       no

    a.   If yes:  What tools on the website did you use?

    Teacher Notes          Student Trail          FAQ's Section          VELS Tables

1    How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a
     social outing, or end of term
     activity?_____

26. Do you have a specific itinerary prepared for your visit?
            i.e. Will the class be splitting into groups or traveling as a whole?  Are there specific
            exhibits you intend to see and why?
     _____

27. Has the number of student excursions in your school decreased over recent years? (circle one)
    yes no

28. What factors do you believe contribute to the frequency of excursions in your school?

    Cost          Proximity to School     Necessary Paperwork          Scheduling Issues

    Applicability within Curriculum          Liability Concerns     Other
    Please Elaborate:

## Discovery & Learning Pre-Visit Questionnaire

School: _____       Visit Date:_____

Teacher Name: _____       Student Year Level: _____Number of Students: _____

29. Why did you choose to visit Werribee Open Range Zoo as opposed to Healesville Sanctuary or Melbourne Zoo? (circle all that apply)

     Location     Exhibits     Advertisements     Colleague Recommendation

     Other_____ (please specify)

30. Why did you choose to book a Discovery & Learning session? (circle all that apply)

     Colleague Recommendation     Reasonable Pricing     Previous Visit     Information on Website

     Other _____ (please specify)

31. How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?
_____
_____
_____

32. Has the number of student excursions in your school decreased over recent years?    yes       no

33. What factors do you believe contribute to the frequency of excursions in your school? (circle all that apply)

     Cost     Proximity to School     Necessary Paperwork     Scheduling Issues

     Applicability within Curriculum     Liability Concerns     Other

Please Elaborate:
_____
_____
_____

34. Is there anything that Zoos Victoria can do in order to make preparation for your excursion easier?
_____
_____
_____
_____
_____

School: _____ Visit Date:_____

Teacher Name: _____ Student Year Level: _____Number of Students: _____

35. How did you hear about the school excursion opportunities at Zoos Victoria?

    Been Before     Website        Phone Query          Colleague       Zoo Educator

    Teacher Preview        Conference      Poster       PD Onsite       PD Offsite

    D&L Brochure          Other_____ (please specify)

36. Why did you choose to visit Werribee Open Range Zoo as opposed to Melbourne Zoo or Healesville Sanctuary? (circle one)

    Location        Exhibits         Advertisements        Colleague Recommendation

    Other_____ (please specify)

37. Were you aware of the Discovery & Learning Sessions available with a Zoo Educator? yes no

    a.  If yes:  Why did you choose not to utilize Discovery & Learning Schools?

    Cost     Didn't know enough about it         Negative reviews from previous visitors

    Other_____ (please specify)

38. Did you use the Zoos Victoria Website?      yes       no

    a.  If yes:  What tools on the website did you use?

    Teacher Notes         Student Trail          FAQ's Section          VELS Tables

How does this excursion fit into your curriculum schedule? i.e. part of a broader unit of work, a social outing, or end of term activity?_____

39. Do you have a specific itinerary prepared for your visit?
        i.e. Will the class be splitting into groups or traveling as a whole?  Are there specific exhibits you intend to see and why?
_____

40. Has the number of student excursions in your school decreased over recent years? (circle one)
    yes no

41. What factors do you believe contribute to the frequency of excursions in your school?

    Cost        Proximity to School     Necessary Paperwork          Scheduling Issues

    Applicability within Curriculum            Liability Concerns      Other

Please Elaborate: _____

# Appendix E

## *Effects of Major Events and Exhibit Openings*

**Commonwealth Games (March 2006)**

|  | **March Ave** | **St. Dev.** | **March 2006** | **ave-(StDev)** | **ave-2\*(StDev)** |
|---|---|---|---|---|---|
| **Melbourne** | 8082 | 1437 | 3526 | 6646 | 3773 |
| **Healesville** | 4924 | 657 | 3226 | 4267 | 2952 |
| **Werribee** | 1389 | 481 | 1274 | 908 | -55 |

**Table 12 Effects of the Commonwealth Games**

**Exhibit Openings**

| **Exhibit** | Zoo | Ave. for opening month | St. Dev. | Student #'s for opening date | Ave+St. Dev |
|---|---|---|---|---|---|
| World of Bugs & Butterflies | MEL | 13965 | 3057 | 14679 | 17022 |
| Tree Kangaroos & Cassowaries | MEL | 17760 | 2932 | 17543 | 20692 |
| Trail of the Elephants | MEL | 7532 | 2354 | 6831 | 9885 |
| Lions on the Edge | WORZ | 223 | 351 | 199 | 574 |
| BHP Billiton Platypusary | HS | 4851 | 458 | 5180 | 5309 |
| Australian Wildlife Health Centre | HS | 1887 | 311 | 2198 | 2198 |

**Table 13 Effects of Major Exhibit Openings**

# Appendix F

## *Monthly Percentages of Educator-Led Visitors per Year*
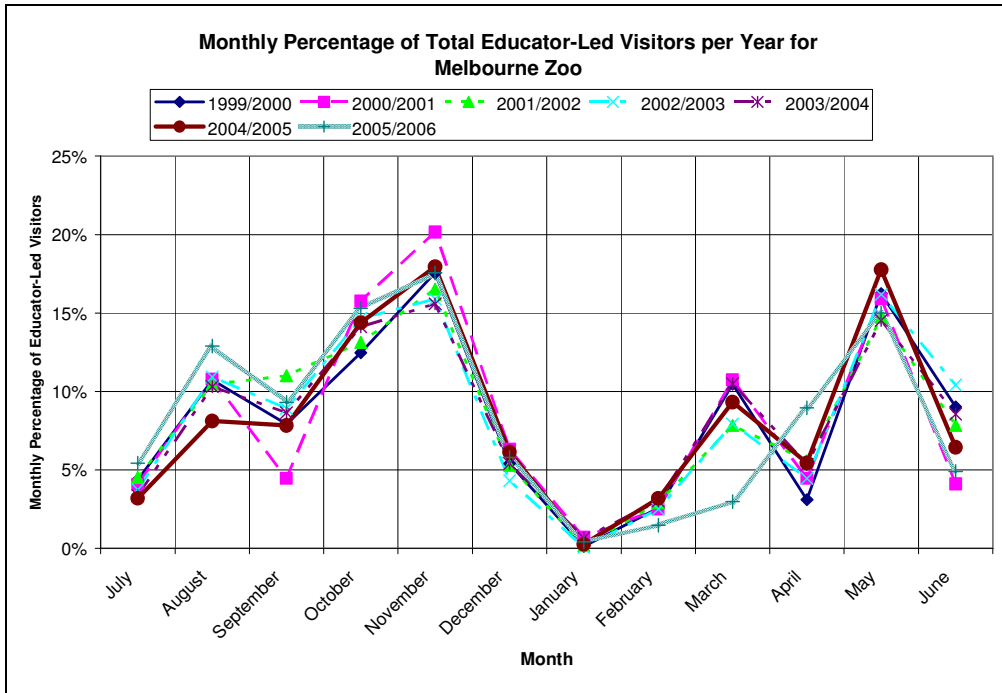


**Figure G- 1 Monthly Percentage of Total Educator-Led Visitors per Year for Melbourne Zoo**
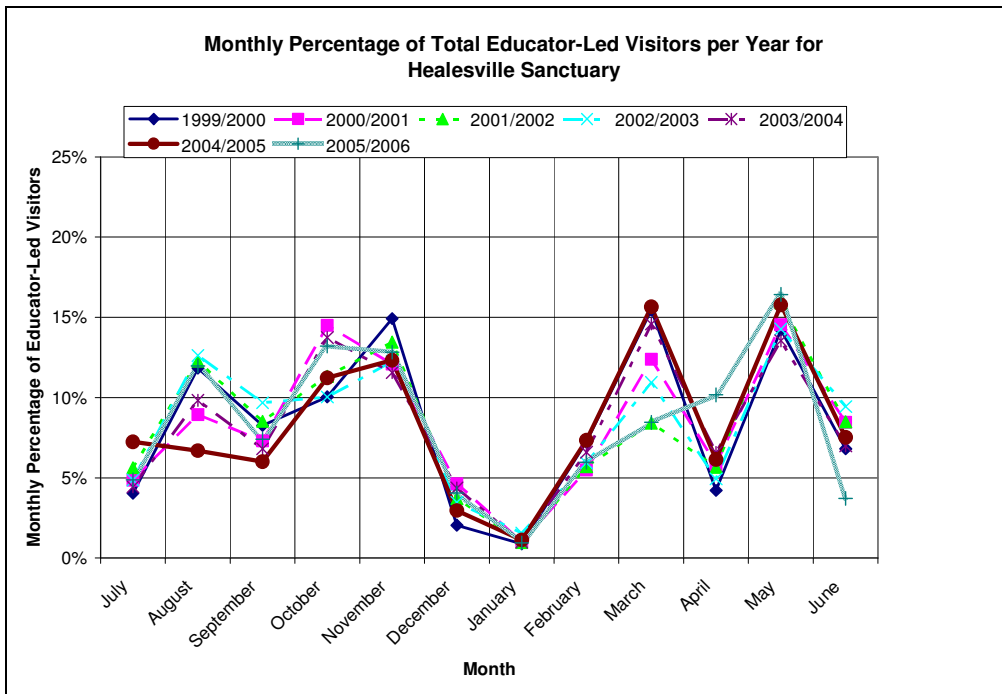


**Figure G- 2 Monthly Percentage of Total Educator-Led Visitors per Year for Healesville Sanctuary**
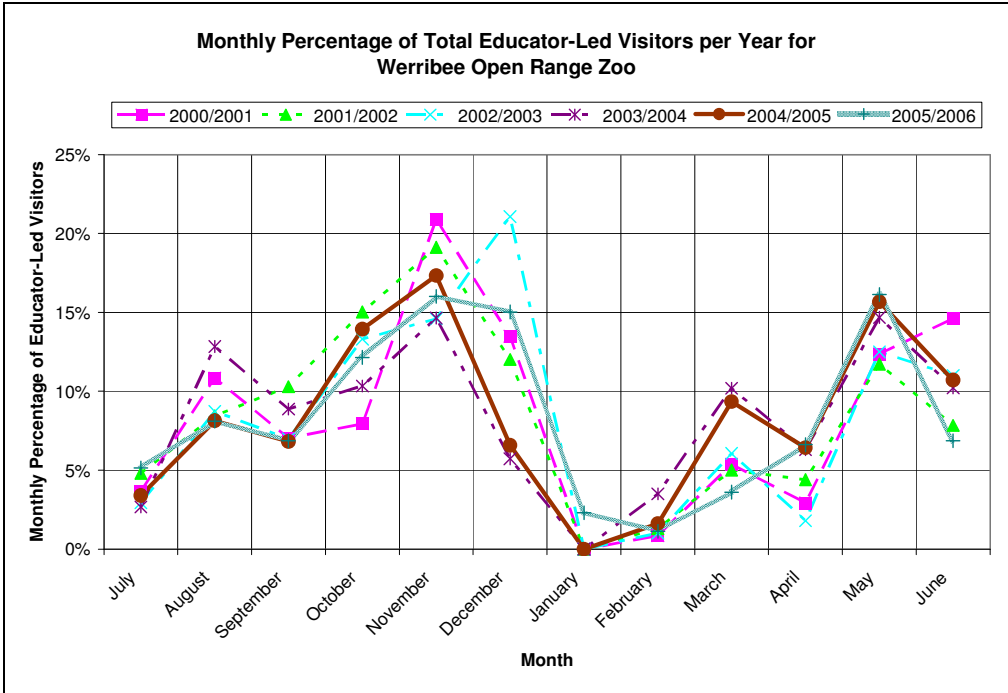
**Figure G- 3 Monthly Percentage of Total Educator-Led Visitors per Year for Werribee Open Range Zoo**

# Appendix G

## *Monthly Percentages of Independent Visitors per Year*

**Monthly Percentage of Total Independent Visitors per Year for Melbourne Zoo**
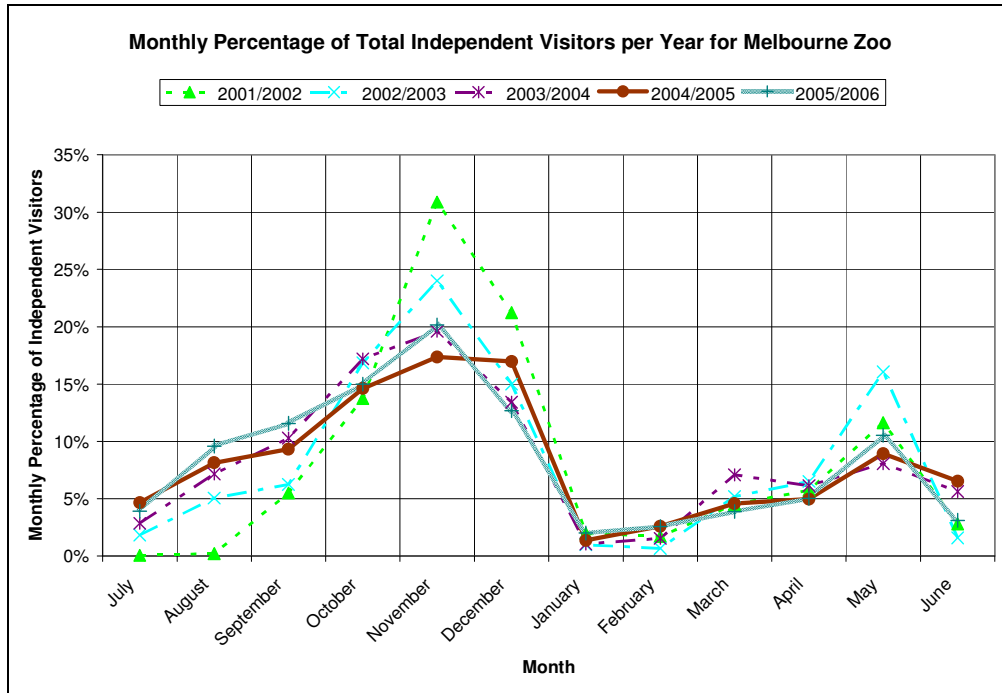


**Figure H- 1 Monthly Percentage of Total Independent Visitors per Year for Melbourne Zoo**
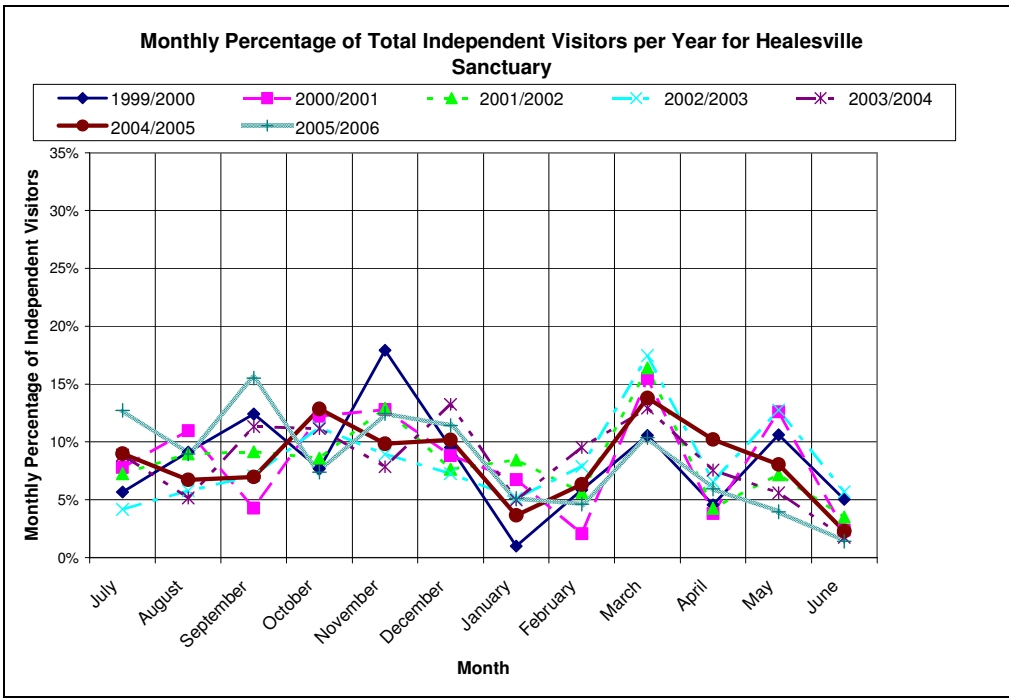
**Figure H- 2 Monthly Percentage of Total Independent Visitors per Year for Healesville Sanctuary**
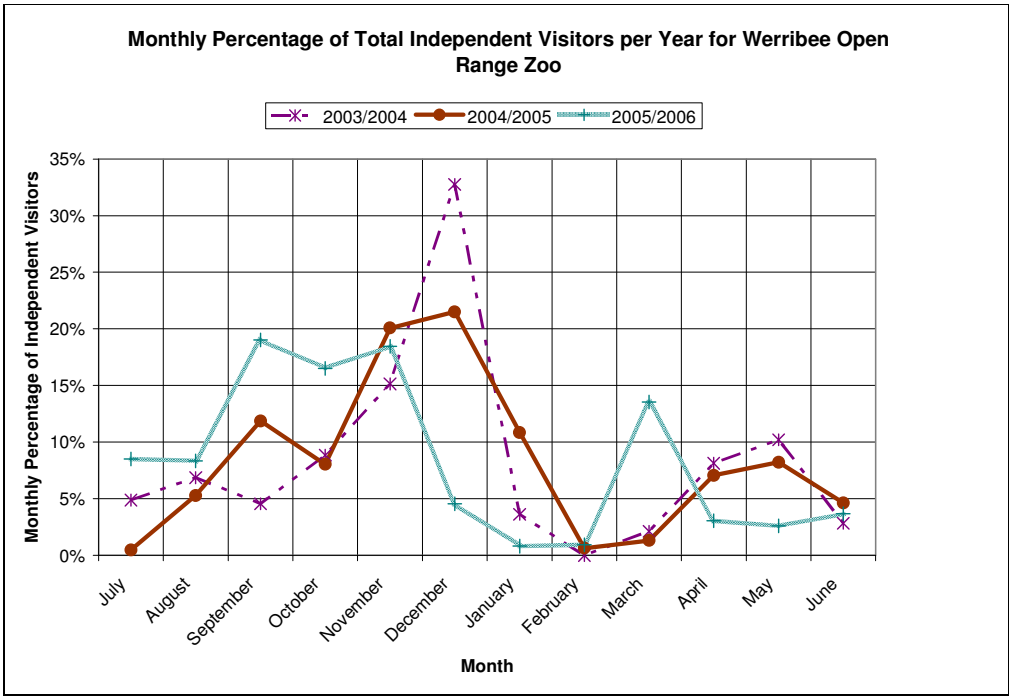


**Figure H- 3 Monthly Percentage of Total Independent Visitors per Year for Werribee Open Range Zoo**

# Appendix H

## *Wilcoxon Rank Sum T-test*

In order to accurately assess the affect of the newly introduced standardized testing in Victoria, the team used a Wilcoxon Rank Sum T-test.  This particular calculation is used to test whether or not two samples are in fact independent of each other.  While a student t-test could have been alternatively used, the data better lends itself to the Wilcoxon test due to the variability among student numbers.  In this way the team was able to ensure that the results could not become skewed by the range of sample sizes.

The AIM tests take place in May 2006 for year levels 3, 5, and 7 so the team took the average percentage of total visitation in May 2000-2005 for these year levels and compared them with the same data for May 2006 (Table 14).  The percent visitation for the month of May 2006 was then subtracted from the average May visitation from years 2000 to 2005.  The differences between these sums were then sorted in ascending order using absolute values. Each value was then assigned a corresponding rank.  These ranks were then separated into two columns, one for ranks representing positive values, and the other for ranks representing negative values.  These two columns of ranks were then summed.

The smallest value was then used to test the relationship between the two populations. For n = 9 ('n' meaning the number of samples in a population) the Wilcoxon T-table requires that in order to be 95% confident that a relationship exists the T value must be less than or equal to 8.  For this particular test a T-value of 21 was found.  Therefore, it cannot be confidently stated that there is a significant relationship between AIM testing and non AIM testing years.

|  | Year Level | Avg - May 2000-2005 | May 06 |
|---|---|---|---|
| **Melbourne** |  |  |  |
|  | 3 | 0.06 | 0.03 |
|  | 5 | 0.05 | 0.04 |
|  | 7 | 0.11 | 0.15 |
| **Healesville** |  |  |  |
|  | 3 | 0.10 | 0.11 |
|  | 5 | 0.06 | 0.06 |
|  | 7 | 0.07 | 0.02 |
| **Werribee** |  |  |  |
|  | 3 | 0.12 | 0.15 |
|  | 5 | 0.06 | 0.07 |
|  | 7 | 0.12 | 0.10 |

**Table 14 Average Percentage of Total Visitation for Testing Year Levels**

| 2006 - 2005 | Absolute Value | Ranked Differences | Ranks | | Pos Rank | Neg Rank |
|---|---|---|---|---|---|---|
| 3.0 | 3 | 0.1 | 1 | | **Pos Rank** | **Neg Rank** |
| 1.3 | 1.3 | 0.9 | 2 | | 2 | 1 |
| -1.8 | 1.8 | 1.2 | 3 | | 4 | 3 |
| 0.9 | 0.9 | 1.3 | 4 | | 7 | 5 |
| -0.1 | 0.1 | 1.8 | 5 | | 8 | 6 |
| -5.4 | 5.4 | 2.9 | 6 | | | 9 |
| -2.9 | 2.9 | 3 | 7 | | 21 | 24 |
| -1.2 | 1.2 | 4.4 | 8 | | **T=21** | **T=48** |

**Table 15 Wilcoxon Rank Sum Calculations for AIM Testing Correlation**

# Appendix I

## *Student Visitation by School Type and School Year Level Classification*
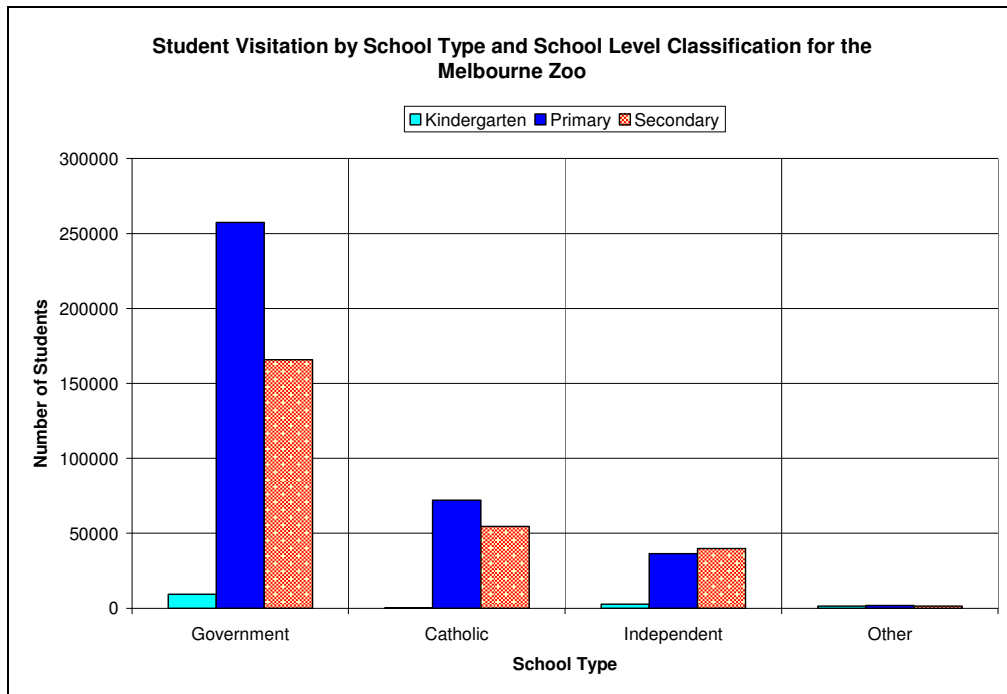


**Figure L- 1 Student Visitation by School Type and School Year Level Classification for the Melbourne Zoo**
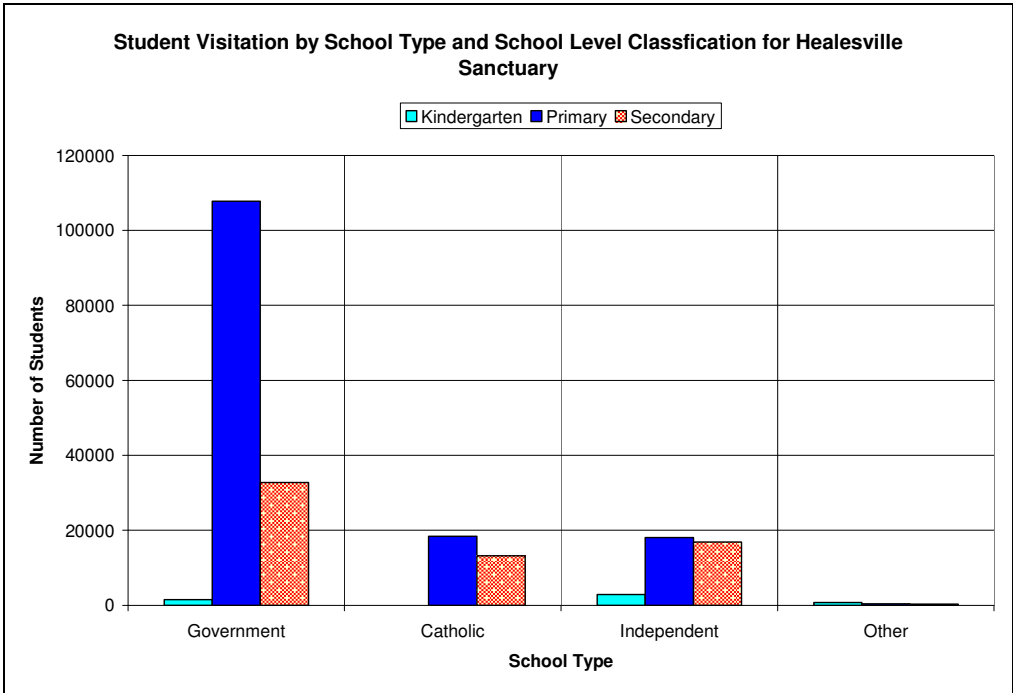
**Figure L- 2 Student Visitation by School Type and School Level Classification for Healesville Sanctuary**
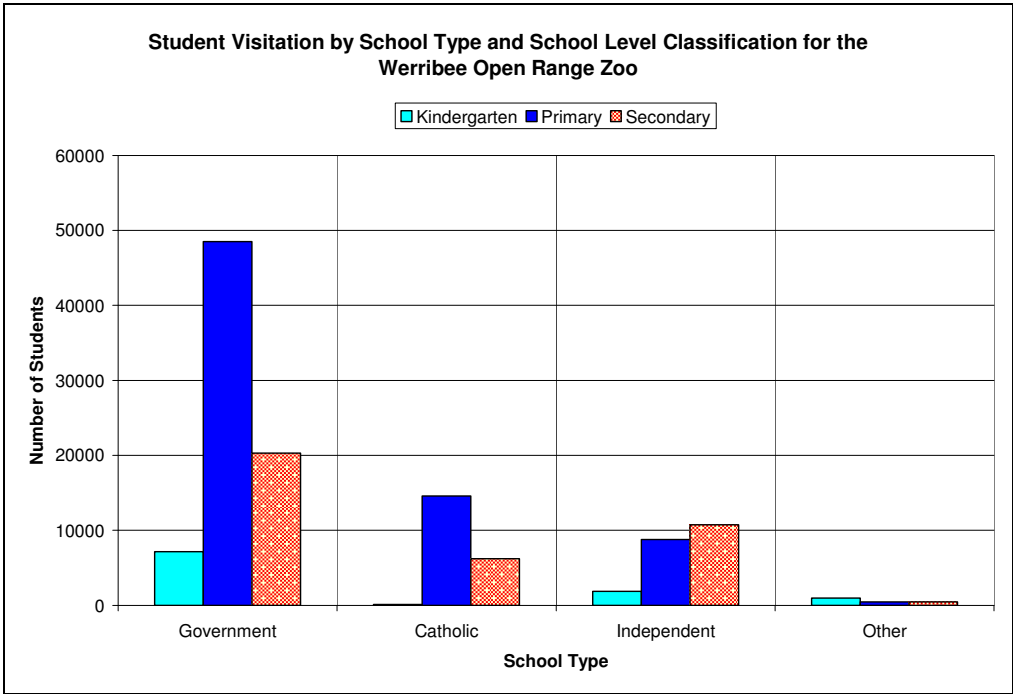


**Figure L- 3 Student Visitation by School Type and School Level Classification for the Werribee Open Range Zoo**

# Appendix J

## *Zoos Staff Research Questions*

1) <u>Overall</u>

    a)  What are the trends for independent visitors over the last 6 years?

        i)   What are the trends for educator led sessions over the last 6 years?

    b)  What is the total and percentage of visitors for each year level?

        i)   Independent/Educator led?

            (1) Does the same school visit regularly (once a year) or is it biennial or triennial?

    c) Is there a different trend for primary and secondary schools?

    d) What percentage of schools brings more than one year level per year?

    e) What time of year is the greatest for independent visitation?

    f) What percentage of independent visitors utilizes the web based resources?


2) <u>Werribee</u>

    a) Are schools switching from independent visits to educator led sessions?

3) <u>Healesville</u>

    a) Are schools that used to visit Healesville switching to one of the other Zoos Victoria campuses?

4) <u>Melbourne</u>

    a) Only the overall questions listed above


5) <u>External Factors</u>

    a) Are these trends similar to other zoos in Australia?

    b) Are these trends reflected across the extension education sector in Victoria?

# Appendix K

## *Statistical Subdivision and Suburb Details*[5]

| SSD | Name | Number of Students |
|---|---|---|
| 25520 | South Gippsland | 10647 |
| 25510 | West Gippsland | 8276 |
| 25505 | La Trobe Valley | 18656 |
| 25015 | Wellington Shire | 9595 |
| 25005 | East Gippsland Shire | 8604 |
| 24515 | East Ovens-Murray | 5213 |
| 24510 | West Ovens-Murray | 7059 |
| 24505 | Wodonga | 12964 |
| 24020 | South West Goulburn | 10598 |
| 24015 | South Goulbourn | 7473 |
| 24010 | North Goulbourn | 16980 |
| 24005 | Greater Shepparton City Part A | 10276 |
| 23520 | South Loddon | 9925 |
| 23510 | North Loddon | 10704 |
| 23505 | Greater Bendigo City Part A | 20250 |
| 23015 | East Mallee | 7256 |
| 23010 | West Mallee | 2384 |
| 23005 | Mildura Rural City Part A | 10433 |
| 22510 | North Wimmera | 3092 |
| 22505 | South Wimmera | 8161 |
| 22015 | West Central Highlands | 3818 |
| 22010 | East Central Highlands | 10016 |
| 22005 | Ballarat City | 21824 |
| 21510 | Glenelg | 8665 |
| 21505 | Hopkins | 7617 |
| 21501 | Warrnambool City | 7462 |
| 21015 | West Barwon | 9037 |
| 21010 | East Barwon | 13112 |
| 21005 | Greater Geelong City Part A | 38132 |
| 20590 | Mornington Peninsula Shire | 28648 |
| 20585 | Frankston City | 27007 |
| 20580 | South Eastern Outer Melbourne | 60176 |
| 20575 | Greater Dandenong City | 28952 |
| 20565 | South Melbourne | 90947 |
| 20560 | Yarra Ranges Shire Part A | 37795 |
| 20555 | Eastern Outer Melbourne | 62529 |
| 20550 | Eastern Middle Melbourne | 104104 |
| 20545 | Boroondara City | 44056 |
| 20540 | Northern Outer Melbourne | 47289 |
| 20535 | Hume City | 35577 |
| 20530 | Northern Middle Melbourne | 56984 |
| 20525 | Moreland City | 29274 |
| 20520 | Melton-Wyndham | 37240 |
| 20510 | Western Melbourne | 96110 |
| 20505 | Inner Melbourne | 57347 |

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[5] Australian Bureau of Statistics 2001 Census Data

# Travel Time in Minutes from Victoria Suburbs to Zoos Victoria

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Abbotsford | 28 | 58 | 8 |
| Airport West | 27 | | 12 |
| Albert Park | 24 | 65 | 11 |
| Alberton | | | 167 |
| Albury North | | | 207 |
| Alexandra | | 52 | 110 |
| Allansford | 158 | | |
| Alphington | 33 | 55 | 10 |
| Altona | 14 | | 19 |
| Altona Green | 14 | | 19 |
| Altona North | 15 | 70 | 13 |
| Anakie | | | 54 |
| Anglesea | 64 | | |
| Apollo Bay | | | 143 |
| Ararat | | | 133 |
| Arcadia | | | 105 |
| Ardeer | | | 19 |
| Armadale | 29 | 62 | 17 |
| Arthurs Creek | | 41 | |
| Ascot Vale | 26 | 65 | 7 |
| Ashburton | 32 | 59 | 19 |
| Ashwood | | 57 | 21 |
| Aspendale | 51 | | 39 |
| Aspendale Gardens | | | 39 |
| Attwood | 30 | | |
| Avalon | | 97 | |
| Avoca | | | 127 |
| Avondale Heights | | | 16 |
| Bacchus Marsh | 36 | 86 | 42 |
| Badger Creek | | 4 | |
| Bairnsdale | | 192 | 196 |
| Balaclava | | 64 | |
| Ballan | 52 | 100 | 55 |
| Ballarat | 76 | 124 | 80 |
| Ballarat East | 72 | | 76 |
| Ballarat Mail Centre | 76 | | |
| Ballarat North | | | 81 |
| Ballarat West | 76 | | |
| Balmoral | | | 244 |
| Balwyn | 36 | 53 | 15 |
| Balwyn North | 37 | 52 | 14 |
| Bangholme | 54 | | 41 |
| Bannockburn | 44 | | |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| bangholme | 113 | | |
| Barooga | | | 114 |
| Barwon Heads | | | 71 |
| Baxter | 65 | 74 | 52 |
| Bayswater | 52 | 40 | 33 |
| Bayswater North | 54 | 35 | 36 |
| Beaconsfield | | 49 | 43 |
| Beaufort | | | 106 |
| Beaumaris | 45 | 75 | 43 |
| Beechworth | | | 179 |
| Belgrave | 61 | 45 | 46 |
| Belgrave Heights | | | 47 |
| Belgrave South | | 46 | 44 |
| Bell Park | 32 | | |
| Bell Post Hill | | | 50 |
| Bellbrae | | | 86 |
| Belmont | 39 | 111 | 57 |
| Bena | | 89 | |
| Benalla | | 141 | 131 |
| Bendigo | 110 | 144 | 101 |
| Bentleigh | 36 | | 24 |
| Bentleigh East | 39 | 66 | 26 |
| Berwick | 52 | 52 | 39 |
| Bessiebelle | | 288 | |
| Beulah | | | 270 |
| Beveridge | | | 36 |
| Birchip | 216 | | 207 |
| Birregurra | 78 | | |
| Black Rock | | 77 | 30 |
| Blackburn | 42 | 46 | 19 |
| Blackburn North | | 47 | 17 |
| Blackburn South | 42 | 50 | 24 |
| Boisdale | | | 165 |
| Bolinda | 55 | 83 | |
| Boneo | | | 77 |
| Bonnie Doon | | 81 | |
| Boolarra | | | 118 |
| Boort | 181 | | 172 |
| Boronia | 54 | 39 | 38 |
| Box Hill | 40 | 50 | 19 |
| Box Hill North | 40 | 49 | 17 |
| Box Hill South | | | 17 |
| Branxholme | | | 236 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Braybrook | 22 | 67 | 14 |
| Bridgewater | | | 116 |
| Bright | | | 212 |
| Brighton | 33 | 71 | 21 |
| Brighton East | 33 | 72 | 21 |
| Broadford | 71 | 79 | 57 |
| Broadmeadows | 30 | 54 | 18 |
| Brooklyn | 14 | 69 | 13 |
| Brunswick | | 59 | 4 |
| Brunswick East | | | 5 |
| Brunswick North | 27 | | |
| Brunswick West | 28 | 62 | 6 |
| Bruthen | | | 218 |
| Bulleen | 38 | 52 | 14 |
| Buln Buln | | 69 | |
| Bundoora | 37 | 43 | 23 |
| Buninyong | 80 | | 88 |
| Bunyip | | 54 | 65 |
| Burwood | 34 | 53 | 21 |
| Burwood East | 38 | 49 | 25 |
| Buxton | | 30 | |
| Cabarita | | | 356 |
| Cairnlea | 18 | | |
| California Gully | | | 106 |
| Camberwell | 33 | 59 | 18 |
| Campbellfield | | | 19 |
| Campbells Creek | 93 | | 84 |
| Camperdown | 117 | | 135 |
| Cann River | | | 315 |
| Canterbury | 35 | 56 | 17 |
| Carisbrook | | | 113 |
| Carlisle River | | | 135 |
| Carlton | 25 | 59 | 5 |
| Carlton North | 27 | 59 | 5 |
| Carlton South | | 59 | 5 |
| Carnegie | | | 21 |
| Caroline Springs | 22 | | 23 |
| Carrum | 56 | 70 | 44 |
| Carrum Downs | 58 | 67 | 45 |
| Casterton | | | 269 |
| Castlemaine | | | 81 |
| Caulfield | 33 | 79 | 21 |
| Caulfield East | 33 | | 20 |
| Caulfield South | 33 | 71 | 21 |
| Chadstone | 33 | 59 | 20 |
| Chelsea | 54 | 70 | 41 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Chelsea Heights | | | 39 |
| Cheltenham | 41 | 73 | 29 |
| Chewton | | | 76 |
| Chiltern | | 187 | 177 |
| Chirnside Park | | 23 | 38 |
| Christmas Hills | | | 42 |
| Churchill | 127 | 110 | 114 |
| Clayton | 40 | 60 | 27 |
| Clayton North | | | 25 |
| Clayton South | 44 | 62 | 31 |
| Clifton Hill | 30 | 56 | 7 |
| Clifton Springs | 57 | | 74 |
| Clyde | | | 44 |
| Clyde North | | | 44 |
| Cobden | 122 | | 140 |
| Cobram | | | 172 |
| Coburg | 30 | 56 | 7 |
| Coburg East | 30 | | 7 |
| Cockatoo | | 31 | 60 |
| Cohuna | | | 205 |
| Colac | 87 | 158 | 105 |
| Coldstream | | 14 | 47 |
| Coleraine | | | 246 |
| Collingwood | 28 | 56 | 6 |
| Coolaroo | 33 | 56 | 22 |
| Coragulac | | | 114 |
| Corio | 27 | 99 | 45 |
| Corryong | | | 292 |
| Cowes | 122 | | |
| Cowwarr | | | 137 |
| Craigieburn | 42 | 59 | 30 |
| Cranbourne | 58 | 64 | 45 |
| Cranbourne North | | 64 | |
| Creswick | | | 85 |
| Crib Point | | | 66 |
| Croydon | 54 | 32 | 31 |
| Croydon East | | 32 | |
| Croydon North | | 30 | 33 |
| Croydon South | | 35 | |
| Dallas | 32 | 55 | 20 |
| Dandenong | 48 | 59 | 35 |
| Dandenong North | 46 | 56 | 33 |
| Darnum | | 78 | |
| Darraweit Guim | 68 | | |
| Daylesford | | | 79 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|--------|---------------|------------------|----------------|
| Dederang | | | 215 |
| Deepdene | 36 | 53 | 15 |
| Deer Park | 20 | 65 | 21 |
| Delacombe | 82 | | 85 |
| Delahey | 27 | | 21 |
| Dennington | 168 | | |
| Devenish | | | 152 |
| Devon Meadows | | 65 | |
| Diamond Creek | 44 | 33 | 28 |
| Diggers Rest | | | 23 |
| Dimboola | | | 223 |
| Dingee | | | 139 |
| Dingley | 47 | 66 | 35 |
| Don Valley | | 13 | 67 |
| Donald | | | 191 |
| Doncaster | 38 | 49 | 15 |
| Doncaster East | 43 | 49 | 19 |
| Donvale | 44 | 48 | 21 |
| Dookie | | 159 | 144 |
| Doreen | 49 | 40 | 34 |
| Doveton | 47 | 57 | 34 |
| Dromana | 82 | 93 | 68 |
| Drouin | 88 | 65 | 75 |
| Drouin East | | 65 | 76 |
| Drouin South | | | 79 |
| Drysdale | 55 | | 71 |
| Dumbalk | | | 123 |
| Dunkeld | | | 193 |
| Dunolly | | | 129 |
| Eagle Hawk | | 152 | |
| Eagle Point | | 200 | 205 |
| Eaglehawk | 118 | | 109 |
| Eaglemont | | | 14 |
| Echuca | 172 | 184 | 99 |
| Edenhope | 268 | | 272 |
| Edithvale | 53 | | 42 |
| Eildon | | 58 | |
| Elmore | | | 127 |
| Elsternwick | 30 | 67 | 17 |
| Eltham | 49 | 41 | 26 |
| Eltham  North | 46 | 37 | 30 |
| Elwood | 28 | 67 | 16 |
| Emerald | | 32 | 53 |
| Endeavour Hills | 47 | 53 | 35 |
| Epping | 38 | 51 | 25 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|--------|---------------|------------------|----------------|
| Epsom | | | 108 |
| Eskdale | | 254 | |
| Essendon | 27 | 59 | 9 |
| Essendon North | | 59 | 12 |
| Essendon West | 27 | | 12 |
| Euroa | | 104 | 101 |
| Fairfield | | | 10 |
| Fawkner | 32 | 52 | 14 |
| Fawkner North | 32 | | 14 |
| Ferntree Gully | 51 | 43 | 34 |
| Ferny Creek | | 44 | 44 |
| Fitzroy | | 58 | 5 |
| Fitzroy North | | | 6 |
| Flemington | 24 | 64 | 5 |
| Flowerdale | | 74 | 69 |
| Footscray | 21 | 69 | 9 |
| Footscray West | 22 | 72 | 9 |
| Forest Hill | 42 | 45 | 21 |
| Foster | | | 141 |
| Fountain Gate | | 52 | 39 |
| Frankston | 61 | 72 | 49 |
| Frankston East | | | 49 |
| Frankston North | 61 | 72 | 49 |
| Gardenvale | | | 18 |
| Garfield | | | 62 |
| Geelong | 36 | 107 | 54 |
| Geelong East | 38 | | 57 |
| Geelong North | 32 | | 50 |
| Geelong West | | | 54 |
| Gembrook | | 33 | |
| Gisborne | 44 | | 35 |
| Gladstone Park | 29 | 57 | 17 |
| Gladysdale | | 29 | |
| Glen Huntly | | 68 | |
| Glen Iris | 30 | 58 | 18 |
| Glen Roy | 29 | | |
| Glen Waverley | 41 | 51 | 27 |
| Glengarry | | 120 | 124 |
| Glenhuntly | | | 24 |
| Glenorchy | | | 169 |
| Glenrowan | | | 147 |
| Glenroy | 29 | 55 | 14 |
| Golden Square | 107 | 141 | 97 |
| Goornong | | | 124 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Goroke | 248 | | |
| Grantville | 92 | | |
| Great Western | 143 | 191 | 147 |
| Greensborough | 40 | 39 | 23 |
| Greensborough North | | 39 | |
| Greenvale | 34 | 59 | 22 |
| Grovedale | 42 | | 61 |
| Grovedale East | 42 | | |
| Gruyere | | 16 | |
| Haddon | 89 | | |
| Hadfield | 33 | 53 | 16 |
| Hallam | 49 | 53 | 37 |
| Hamilton | 214 | 262 | 218 |
| Hamlyn Heights | | | 53 |
| Hampton | 38 | 76 | 26 |
| Hampton Park | 52 | 58 | 40 |
| Harkaway | | 46 | |
| Hastings | | 80 | 60 |
| Hawkesdale | 196 | | |
| Hawthorn | 28 | 59 | 14 |
| Hawthorn East | 31 | 59 | 16 |
| Hazelwood North | | | 112 |
| Healesville | 77 | 2 | 61 |
| Heathcote | | | 89 |
| Heatherton | | 69 | 30 |
| Heathmont | | 40 | 28 |
| Heidelberg | 37 | 49 | 14 |
| Heidelberg West | 39 | 52 | 16 |
| Hepburn | | | 105 |
| Herne Hill | | | 56 |
| Hesket | | | 49 |
| Heyfield | | 142 | 147 |
| Heywood | | | 246 |
| Highette | 39 | 74 | 27 |
| Highton | 42 | | 60 |
| Hillside | 28 | 65 | 21 |
| Hoddles Creek | | 25 | |
| Holmesglen | 33 | 62 | |
| Hopetoun | | | 272 |
| Hoppers Crossing | 9 | 79 | 26 |
| Horsham | 205 | 242 | 199 |
| Hughesdale | | | 23 |
| Huntly | | | 113 |
| Huon | 239 | | |
| Hurstbridge | | 29 | 34 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Irymple | | | 350 |
| Ivanhoe | 36 | 54 | 13 |
| Ivanhoe East | | 51 | 11 |
| Ivanhoe West | 36 | | 13 |
| Jeparit | | | 250 |
| Kallista | | | 48 |
| Kangaroo Flat | 105 | | 96 |
| Kangaroo Ground | | 25 | 36 |
| Katandra West | | | 142 |
| Kealba | 22 | | 17 |
| Keilor | 24 | 59 | 15 |
| Keilor Downs | 26 | 63 | 20 |
| Keilor East | 22 | 58 | 14 |
| Keilor North | | 61 | 17 |
| Kensington | 24 | | 5 |
| Kerang | | | 203 |
| Kerrimuir | | | 17 |
| Kew | 30 | 57 | 11 |
| Kew East | 34 | 56 | 12 |
| Keysborough | 50 | 66 | 38 |
| Kialla | 131 | | |
| Kilmore | | | 50 |
| Kilsyth | | 32 | 36 |
| Kinglake | 67 | 26 | 51 |
| Kingsbury | | 48 | 18 |
| Kingston | | | 90 |
| Kingsville | | | 12 |
| Knox City | | 48 | |
| Knoxfield | | 48 | 34 |
| Kongwack | | 103 | |
| Koo Wee Rup | | 60 | 63 |
| Koorlong | | | 352 |
| Koroit | | | 196 |
| Korrumburra | | | 97 |
| Kyabram | | | 153 |
| Kyneton | 65 | | 56 |
| Lake Boga | | | 237 |
| Lake Bolac | | | 158 |
| Lake Charm | 227 | | |
| Lake Tyers Beach | | 227 | |
| Lakes Entrance | 237 | | 224 |
| Lalor | 38 | 50 | 21 |
| Lancefield | 66 | | 53 |
| Lang Lang | | | 71 |
| Lang Warren | 59 | 68 | 47 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Langley | | | 62 |
| Lara | 23 | | 42 |
| Lara Lake | | | 42 |
| Latrobe | | 43 | |
| Launching Place | | 16 | 63 |
| Lavers Hill | | | 147 |
| Laverton | 10 | 73 | 20 |
| Learmonth | | | 88 |
| Leitchville | | 221 | |
| Lemnos | | | 142 |
| Leongatha | | 107 | 109 |
| Leopold | 48 | | |
| Lethbridge | 51 | | |
| Lilydale | 64 | 19 | 41 |
| Linbrooke | | 60 | |
| Lindenow | | | 192 |
| Lindenow South | | | 186 |
| Linton | | | 107 |
| Little River | | | 37 |
| Lockwood | | | 94 |
| Londrigan | | | 163 |
| Lorne | 89 | | 108 |
| Lower Plenty | | 48 | 21 |
| Lower Templestowe | 39 | 54 | 16 |
| Lucknow | | 196 | |
| Lysterfield | | 49 | 39 |
| Macarthur | | | 239 |
| Macclesfield | | 25 | 61 |
| Macleod | 42 | 46 | 20 |
| Macleod West | | | 20 |
| Maffra | | | 159 |
| Maidstone | 23 | | 11 |
| Maldon | | | 96 |
| Mallacoota | | | 354 |
| Malmsbury | | | 61 |
| Malvern | 30 | 62 | 18 |
| Malvern East | 33 | 62 | 21 |
| Manifold Heights | | | 55 |
| Mansfield | | 100 | 145 |
| Maribyrnong | | | 12 |
| Marlo | | | 271 |
| Marong | 110 | | 101 |
| Maroopna | | | 126 |
| Maryborough | 129 | | 119 |
| Marysville | | 27 | |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| McKinnon | 36 | | 24 |
| Meadow Heights | 35 | | 23 |
| Melbourne | 23 | 61 | 5 |
| Melbourne East | | | 8 |
| Melbourne North | 23 | | 4 |
| Melbourne South | 22 | 65 | 10 |
| Melbourne West | | 64 | 6 |
| Melton | 32 | 78 | 34 |
| Melton South | 32 | 80 | 37 |
| Melton West | 35 | | 37 |
| Mentone | 43 | 71 | 31 |
| Menzies Creek | | | 49 |
| Merbein | | | 361 |
| Meredith | 60 | | |
| Merijig | | | 161 |
| Mernda | 46 | 43 | 31 |
| Merrigum | | | 142 |
| Merwell | | | 111 |
| Mickleham | | | 27 |
| Middle Park | 25 | | 12 |
| Mildura | | | 355 |
| Mill Park | 40 | 46 | 26 |
| Millgrove | | 21 | |
| Miners Rest | | | 81 |
| Minyip | 231 | | 228 |
| Mirboo North | 126 | | 114 |
| Mitcham | 44 | 41 | 21 |
| Moe | 112 | 95 | 100 |
| Monbulk | | 27 | 53 |
| Mont Albert | 39 | 52 | 18 |
| Montmorency | 45 | 45 | 24 |
| Montrose | | 28 | 40 |
| Moolap | 43 | 115 | |
| Moonee Ponds | 27 | 62 | 7 |
| Moorabbin | 40 | 70 | 27 |
| Moorooduc | | 80 | |
| Mooroolbark | 62 | 26 | 39 |
| Mooroopna | | | 126 |
| Mordialloc | 47 | 70 | 35 |
| Mordialloc East | 47 | 70 | 35 |
| Moreland | 30 | 56 | 7 |
| Moreland South | | | 7 |
| Moriac | 52 | | |
| Mornington | | 84 | 60 |
| Mortlake | 146 | | 165 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Morwell | | 106 | 111 |
| Mount Beauty | | | 236 |
| Mount Clear | 79 | | 83 |
| Mount Dandenong | | 34 | 47 |
| Mount Egerton | | | 67 |
| Mount Eliza | | 84 | 61 |
| Mount Evelyn | 68 | 23 | 46 |
| Mount Martha | | 23 | 64 |
| Mount Waverley | 38 | 55 | 26 |
| Mountain Gate | | | 34 |
| Moyhu | | | 167 |
| Mt Cottrell | | 79 | |
| Mulgrave | 44 | 60 | 32 |
| Mulgrave North | | 60 | 32 |
| Murrabit | | | 226 |
| Murrayville | | | 269 |
| Murrumbeena | | | 24 |
| Murtoa | 206 | | 210 |
| Myrtleford | | | 186 |
| Nagambie | | 102 | 88 |
| Nar Nar Goon | | | 57 |
| Narracan | | 100 | |
| Narre Warren | 51 | 52 | 39 |
| Narre Warren North | | | 39 |
| Narre Warren South | | | 44 |
| Nathalia | | | 156 |
| Natimuk | | | 219 |
| Neerim South | | 56 | 84 |
| Nerrina | 73 | | |
| Netherby | | | 273 |
| New Gisborne | 46 | | |
| Newborough | 113 | 96 | 101 |
| Newcombe | 40 | | 59 |
| Newham | | | 49 |
| Newhaven | 109 | 95 | 97 |
| Newport | 19 | | 12 |
| Newstead | 105 | | 95 |
| Newtown | 37 | 108 | 55 |
| Nhill | | | 248 |
| Nicholson | | | 206 |
| Niddrie | 25 | 58 | 13 |
| Nilma | | | 80 |
| Noble Park | 49 | 65 | 37 |
| Noble Park North | 43 | 59 | 31 |
| Noorat | | | 152 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|--------|---------------|------------------|----------------|
| Norlane | 27 | | 46 |
| Norlane West | | | 46 |
| Northcote | 33 | 58 | 9 |
| Northland | | 53 | |
| Northlands Centre | 34 | 58 | |
| Notting Hill | 38 | | 26 |
| Nowa Nowa | | | 237 |
| Nth Reservoir | | | 14 |
| Nullawarre | | | 178 |
| Numurkah | | | 145 |
| Nunawading | | 44 | 20 |
| Nyora | | 87 | 88 |
| Oak Park | | 58 | 11 |
| Oaklands | | | 20 |
| Oakleigh | 35 | 62 | 23 |
| Oakleigh East | 38 | | |
| Oakleigh South | | 65 | 26 |
| Ocean Grove | 57 | 129 | 76 |
| Orbost | | | 262 |
| Ormond | 35 | 68 | 23 |
| Ormond East | | | 23 |
| Orrvale | | | 121 |
| Ouyen | 299 | | |
| Pakenham | | 45 | 50 |
| Panton Hill | | 27 | 38 |
| Park Orchards | 48 | 40 | |
| Parkdale | | 71 | 32 |
| Parkville | 24 | 59 | 2 |
| Pascoe Vale | 29 | 57 | 11 |
| Pascoe Vale South | | 59 | 7 |
| Patterson Lakes | 54 | | 42 |
| Paynesville | | | 210 |
| Pearcedale | | 72 | 51 |
| Penshurst | 192 | | 211 |
| Phillip Island | | 95 | |
| Point Cook | 7 | | 22 |
| Pomonal | | | 169 |
| Poowong | | | 90 |
| Porepunkah | | | 206 |
| Port Fairy | | | 202 |
| Port Melbourne | 20 | 66 | 10 |
| Portarlington | 63 | | 82 |
| Portland | 234 | 305 | 252 |
| Portland South | 234 | | |
| Prahan | 27 | 63 | 15 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Prahran East | | 63 | 15 |
| Preston | 34 | 53 | 11 |
| Preston East | 34 | | 11 |
| Preston West | 34 | | 11 |
| Princes Hill | 27 | | |
| Puckapunyal | | | 72 |
| Pyalong | | | 69 |
| Pyramid Hill | | | 183 |
| Queenscliff | | | 82 |
| Rainbow | | | 275 |
| Raywood | | | 124 |
| Red Cliffs | | | 343 |
| Red Hill | | 93 | |
| Redan | | | 82 |
| Research | | 31 | 32 |
| Reservoir | 36 | 48 | 14 |
| Reservoir East | | | 14 |
| Reservoir North | | | 14 |
| Richmond | 27 | 60 | 11 |
| Richmond North | | | 11 |
| Riddells Creek | 47 | | 37 |
| Ringwood | 49 | 37 | 26 |
| Ringwood East | | 37 | 28 |
| Ringwood North | | 37 | 28 |
| Ripplebrook | | 37 | |
| Robinvale | | | 349 |
| Rochester | | | 140 |
| Rockbank | 26 | | |
| Rokeswood | | | 107 |
| Romsey | | 87 | 46 |
| Rosanna | | 47 | 16 |
| Rosebud | | 95 | 72 |
| Rosebud West | | | 77 |
| Rosedale | | | 134 |
| Rowville | | 52 | 38 |
| Roxburgh Park | 37 | 56 | 24 |
| Rupanyup | | | 195 |
| Rushworth | 130 | | 117 |
| Rutherglen | | | 182 |
| Rye | | | 85 |
| Sale | | 148 | 153 |
| Sandringham | 40 | 76 | 27 |
| Sassafras | | 45 | 46 |
| Scoresby | | 49 | 34 |
| Sea Lake | | | 230 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Seaford | | | 47 |
| Sebastopol | 80 | 128 | 84 |
| Seddon | | | 11 |
| Selby | | | 49 |
| Seville | | 19 | |
| Seymour | 104 | 80 | 71 |
| Shelford | 58 | | |
| Shepparton | 135 | 136 | 122 |
| Shepparton East | | | 126 |
| Silvan | 71 | | |
| Simpson | 123 | | 141 |
| Skipton | | | 122 |
| Skye | | | 46 |
| Smeaton | | | 97 |
| Smythesdale | | | 97 |
| Somers | | 92 | |
| Somerton | | 52 | 22 |
| Somerville | | | 56 |
| Sorrento | | | 88 |
| South Morang | | | 28 |
| South Yarra | 25 | 63 | 13 |
| Southbank | 21 | 63 | 8 |
| Spotswood | 16 | | 9 |
| Springvale | 44 | 59 | 32 |
| Springvale South | 46 | 61 | 34 |
| St Albans | 23 | 62 | 19 |
| St Albans South | | 62 | 19 |
| St Albans West | 23 | | 19 |
| St Arnaud | | | 169 |
| St Kilda | 26 | 64 | 13 |
| St Kilda East | 27 | 64 | 15 |
| St Leonards | | | 82 |
| Stawell | | | 156 |
| Stratford | | | 163 |
| Strathdale | | 148 | 106 |
| Strathewen | 61 | 34 | |
| Strathfieldsaye | | | 105 |
| Strathmerton | | | 160 |
| Strathmore | 27 | 59 | 10 |
| Sunbury | 38 | 70 | 29 |
| Sunshine | 19 | 66 | 18 |
| Sunshine North | | 61 | 18 |
| Sunshine West | 16 | 65 | 18 |
| Surrey Hills | 36 | 54 | 20 |
| Swan Hill | 258 | | 249 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Swan Marsh | 258 | | |
| Sydenham | 29 | 65 | 21 |
| Syndal | | 51 | 26 |
| Talbot | | | 115 |
| Tallangatta | | 239 | 228 |
| Taradale | | | 66 |
| Tarneit | 13 | | 25 |
| Tarrington | | | 213 |
| Tarwin Lower | 143 | | |
| Tatura | 133 | | 120 |
| Taylors Hill | | 66 | |
| Taylors Lakes | 27 | 62 | 18 |
| Tecoma | | | 44 |
| Templestowe | 43 | 53 | 20 |
| Templestowe Heights | 43 | | |
| Terang | 133 | | 152 |
| The Basin | | 36 | 39 |
| The Patch | 68 | 41 | 51 |
| Thomastown | 35 | 48 | 19 |
| Thomastown East | | 48 | 19 |
| Thornbury | 34 | 56 | 10 |
| Thornbury East | | | 10 |
| Thorpdale | | | 101 |
| Timboon | | | 153 |
| Tongala | | | 168 |
| Toolamba | | | 118 |
| Toolangi | | 17 | |
| Toongabbie | | | 129 |
| Tooradin | | | 56 |
| Toorak | 27 | 62 | 15 |
| Tootgarook | | | 81 |
| Torquay | 52 | | 71 |
| Tottenham | | 71 | |
| Trafalgar | | 87 | 92 |
| Traralgon | 128 | 112 | 117 |
| Trentham | | | 63 |
| Truganina | 9 | | |
| Tullamarine | | | 15 |
| Tyabb | 70 | 78 | 57 |
| Tyers | | 110 | |
| Ultima | | | 236 |
| Underbool | | | 329 |
| Upper Beaconsfield | | 49 | 45 |
| Upper Ferntree Gully | | | 38 |
| Upwey | 59 | 49 | 42 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|---|---|---|---|
| Vermont | | 44 | 24 |
| Vermont South | 42 | 48 | 25 |
| Viewbank | | 49 | |
| Violet Town | | | 115 |
| Waaia | 165 | | |
| Wahgunyah | | | 187 |
| Wallan | | | 39 |
| Wallington | | | 71 |
| Walpeup | | | 309 |
| Wandin | 76 | 19 | |
| Wandin North | | 20 | |
| Wandong | | | 44 |
| Wangaratta | 168 | 165 | 155 |
| Wantirna | 47 | 44 | 30 |
| Wantirna South | 47 | 45 | 30 |
| Warburton | | 24 | 74 |
| Warracknabeal | | | 243 |
| Warragal | 92 | 70 | 79 |
| Warrandyte | | 44 | 25 |
| Warranwood | | 35 | 31 |
| Warrenheip | | | 72 |
| Warrnambool | 164 | 236 | 182 |
| Watsonia | 41 | 44 | 19 |
| Wedderburn | 149 | | 139 |
| Wendouree | 77 | | 80 |
| Wendouree West | | | 80 |
| Werribee | 5 | 82 | 28 |
| Werribee Plaza | 9 | | 28 |
| Wesburn | | 19 | 69 |
| Westmeadows | 29 | 58 | 16 |
| Wheelers Hill | 41 | 54 | 28 |
| White Hills | | | 105 |
| Whitfield | | | 182 |
| Whittington | 43 | | 61 |
| Whittlesea | 55 | 47 | 40 |
| Whorouly | 185 | | 172 |
| Williamstown | 20 | 76 | 16 |
| Winchelsea | 63 | | 82 |
| Windsor | 27 | 63 | 14 |
| Wodonga | | 209 | 199 |
| Wonga Park | | 25 | 36 |
| Wonthaggi | | 103 | 103 |
| Woodend | 54 | | 45 |
| Woolsthorpe | | | 203 |
| Woori Yallock | | 14 | 58 |

| Suburb | Werribee Time | Healesville Time | Melbourne Time |
|--------|---------------|------------------|----------------|
| Wunghu | | 153 | |
| Wycheproof | | | 181 |
| Wyndhamvale | 10 | | 33 |
| Yackandandah | | | 206 |
| Yallambie | 42 | 47 | |
| Yallourn North | | 107 | |
| Yarra Glen | | 14 | 48 |
| Yarra Junction | | 17 | 67 |
| Yarragon | | | 85 |
| Yarram | | | 162 |
| Yarrambat | | 36 | 30 |
| Yarraville | 17 | 70 | 10 |
| Yarrawonga | 196 | | 182 |
| Yea | | 52 | 85 |
| Yellingbo | | 20 | 61 |
| Yinnar | | 114 | |
| Yinnar South | | 119 | |

# Appendix L

## *Critical values of the Rank Sum for the Wilcoxon Signed Rank Sum Test for Matched Samples[6]*

We reject the null hypothesis if $T \leq$ the table value.

| $n$ | $\alpha = .05$ | $\alpha = .025$ | $\alpha = .01$ | $\alpha = .005$ | | $n$ | $\alpha = .05$ | $\alpha = .025$ | $\alpha = .01$ | $\alpha = .005$ |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1 | – | – | – | | 28 | 130 | 117 | 102 | 92 |
| 6 | 2 | 1 | – | – | | 29 | 141 | 127 | 111 | 100 |
| 7 | 4 | 2 | 0 | – | | 30 | 152 | 137 | 120 | 109 |
| 8 | 6 | 4 | 2 | 0 | | 31 | 163 | 148 | 130 | 118 |
| 9 | 8 | 6 | 3 | 2 | | 32 | 175 | 159 | 141 | 128 |
| 10 | 11 | 8 | 5 | 3 | | 33 | 188 | 171 | 151 | 138 |
| 11 | 14 | 11 | 7 | 5 | | 34 | 201 | 183 | 162 | 149 |
| 12 | 17 | 14 | 10 | 7 | | 35 | 214 | 195 | 174 | 160 |
| 13 | 21 | 17 | 13 | 10 | | 36 | 228 | 208 | 186 | 171 |
| 14 | 26 | 21 | 16 | 13 | | 37 | 242 | 222 | 198 | 183 |
| 15 | 30 | 25 | 20 | 16 | | 38 | 256 | 235 | 211 | 195 |
| 16 | 36 | 30 | 24 | 19 | | 39 | 271 | 250 | 224 | 208 |
| 17 | 41 | 35 | 28 | 23 | | 40 | 287 | 264 | 238 | 221 |
| 18 | 47 | 40 | 33 | 28 | | 41 | 303 | 279 | 252 | 234 |
| 19 | 54 | 46 | 38 | 32 | | 42 | 319 | 295 | 267 | 248 |
| 20 | 60 | 52 | 43 | 37 | | 43 | 336 | 311 | 281 | 262 |
| 21 | 68 | 59 | 49 | 43 | | 44 | 353 | 327 | 297 | 277 |
| 22 | 75 | 66 | 56 | 49 | | 45 | 371 | 344 | 313 | 292 |
| 23 | 83 | 73 | 62 | 55 | | 46 | 389 | 361 | 329 | 307 |
| 24 | 92 | 81 | 69 | 61 | | 47 | 408 | 379 | 345 | 323 |
| 25 | 101 | 90 | 77 | 68 | | 48 | 427 | 397 | 362 | 339 |
| 26 | 110 | 98 | 85 | 76 | | 49 | 446 | 415 | 380 | 356 |
| 27 | 120 | 107 | 93 | 84 | | 50 | 466 | 434 | 398 | 373 |

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[6] (Witte 538)