**An investigation into the performance of Adelaide traffic intersections with new alternatives**


A thesis presented by

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## Declaration

I certify that this work does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

**Nikhil Ambekar**

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## Executive Summary

This research paper provides a thorough literature analysis that examines the transmission networks employed in various metropolitan locations, mostly Railway cross line and. Furthermore, appropriate highway traffic management, reduce carbon emissions, and financial advancement are all important factors in preserving network connectivity. Aside from that, various stimulation techniques are used to examine the impact of an accident. Adelaide's existing transportation network efficiency, as well as the numerous elements affecting it, are investigated using efficient transport model factors and latent statistics to develop a better understanding of the network's viability. This section will conclude with a discussion of the gap in the research and how the findings of thisresearch paper will contribute to the current body of knowledge uniquely. Most of the literaturereview comprises the techniques and methods which aid to minimize the unfavorable events of the incidents used in SIDRA modelling approaches. The transport department in Adelaide primarily examines significant transportation projects using MASTEM, a macro-level strategic model (Metropolitan Adelaide Strategic Transport Evaluation Model). Despite its many advantages, it would be unable to recreate and monitor individual vehicle motions, as SIDRA MODEL can readily do. As a result, no SIDRA model of the investigation region is currently available that can provide a thorough assessment of all network components (like individual intersection operation).

Computer simulation is a useful tool for designing and monitoring a motorway and its connectivity networks in a cost-effective method. This is a low-cost way for determining the effects of traffic occurrences. The microsimulation automobile following model, according to many studies, is the most commonly used model for studying the impacts. The main goal of this research is to determine the impact of non-recurring occurrences in Adelaide. Furthermore, there has been no mention of the impact of non-recurring episodes in Adelaide in any article or study paper. As a result, the study will add to the existing body of information. This research paper's secondary goal is to employ microsimulation to determine the effects of lane blockage, incident location, and total time. It is obvious that using a tiny model of a roadway network is advantageous because it is a cost-effective and secure method. This method for analyzing the effects of incidents Aside from that, macrostimulation doesn't necessitate any field or laboratory testing.

The tertiary purpose of this study is to look at the impact of greenhouse gas emissions (CO2 emissions), weight reduction, and extensive assessments of the various elements influencing the transportation design metrics of lane obstruction, incident location, and time. The quaternary purpose of this research paper is to use SCATS technology in a significant incident which aid to find a proper SIDRA technique while doing qualitative cost-benefit analysis. Lastly, this research paper performs a sensitivity analysis of all the findings of the modelling techniques, which aids to identify the long-term effects of unpredictable events. The main Important improvement is LOS delays of between two intersection of Railway crossing. This thesis has content main improving the roadways of travel time, travel distance, delays, cost etc.

# Table of Contents

## List of Figure

## List of Table

# 1. Introduction

## 1.1 Project Background

The metropolitan areas in this intersection of Australia are known for helpless traffic management since long. Adelaide has consistently been blocked during peak hours which shows traffic management asa serious issue. The aim of this study is to coordinate traffic on the streets of Adelaide to reducetraffic congestion. The design of the research is to apply SCATS for estimating and controlling traffic on road, which will necessitate the enhancement of the SCATmodel for examining vehicle position and time. Since the network traffic performance is affected due to vehicle arrival and departure times at intersections. The aim ofthe framework is to enhance road traffic coordination during rush hour. The SCATS system's goals for fusing are to improve traffic coordination and reduce congestion on the route. Research study centers around realities identified with SCATS information quality/ error, planning of guides so that progression of traffic is seen on Pandemic cases, foreseeing travel time, inactive time, waiting time of public transports according and assessment of short transport paths.

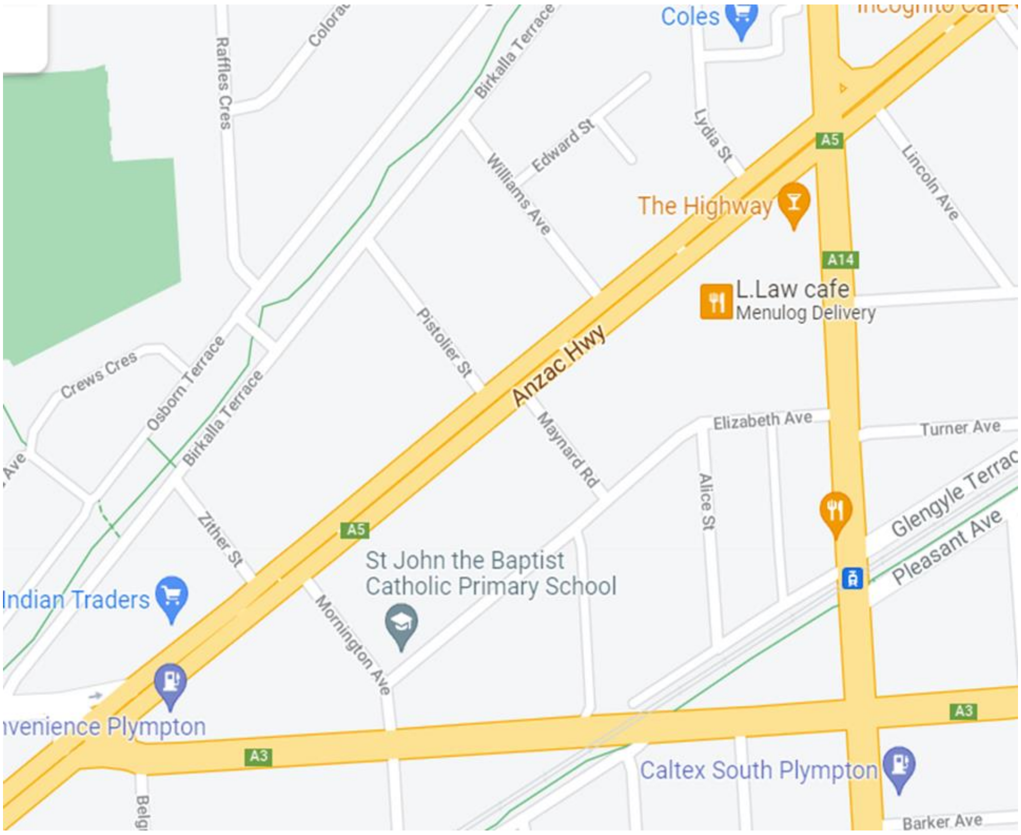


*Figure 1: Study area of triangular intersection Shape*

Above Image shows that my study area for the design of three intersection and analysis of existing condition, Study area - three intersections have joined in triangular shape are very close to each other these are the busiest intersection, especially during peak hours in the morning and afternoon. The railway crossing crosses through one of the intersections, which is the third and most essential reason I collected SCATS data and analysis existing condition by using SIDRA softwareand providing various solution for the reliable traffic flow. In that Introduction main part is three triangular intersection which has railway crossing in two main roadways so i need to improvise traffic LOS, Travel distance, Travel Speed, Delay and Cost etc.

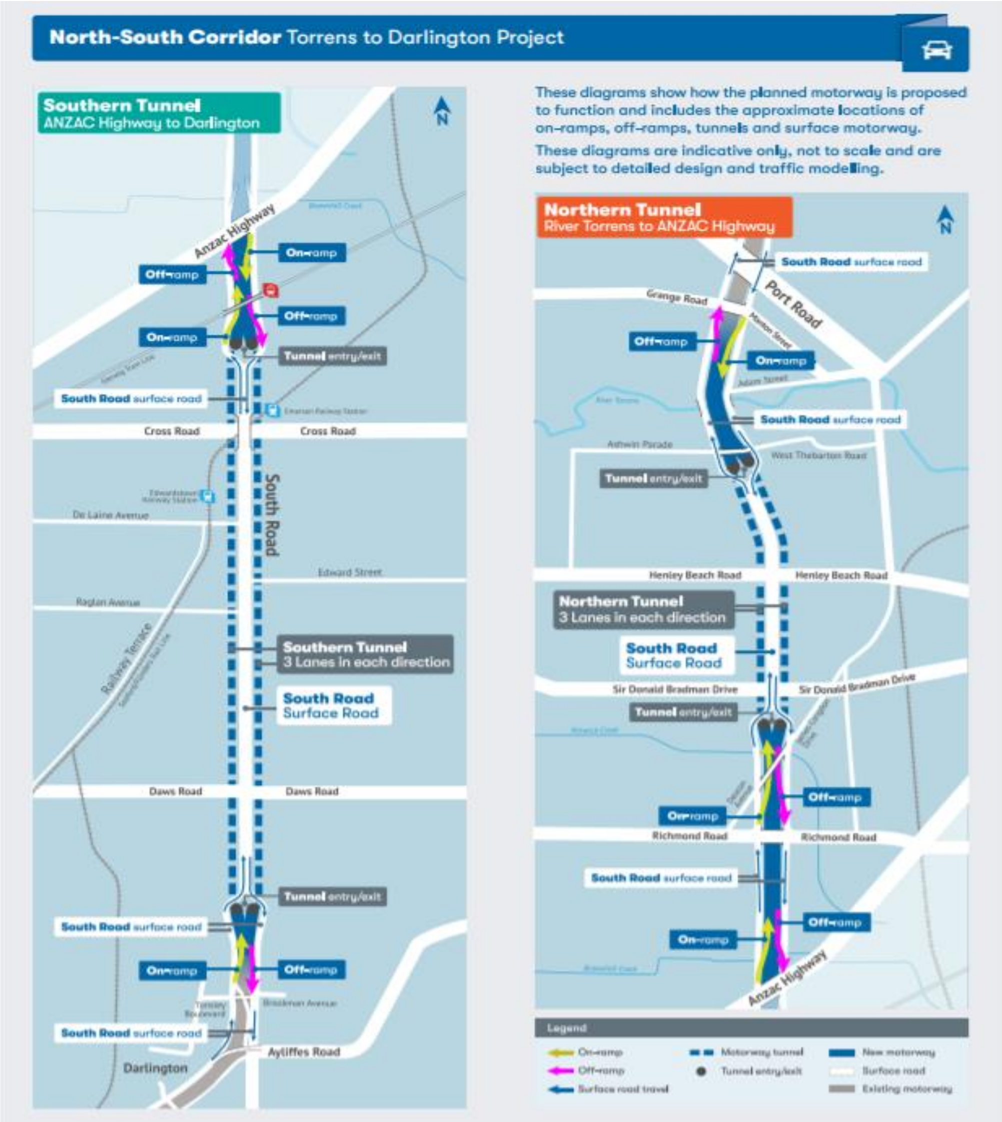


*Figure 1.1 North – South Corridor*

Ref – https://www.dit.sa.gov.au/

Above the Image of North – South Corridor has to explain in 1.2 reasons for the city to cross road and south Extension of North South Corridor

## 1.2 Reasons for The City to cross road and south road Extension Plans

Effective community and stakeholder engagement in the T2D Project necessitates long-term commitment. This include keeping the public informed as the project progresses, listening to community and business issues, drawing on local knowledge, incorporating community feedback into planning and design, and collaborating with the community on City Shaping Projects. The T2D Engagement Campaign, which ran for five weeks in June/July 2021, was part of the T2D planning process.

The campaign's goals were to collect comments on the proposed motorway's functionality, as well as community priorities and concerns, in order to inform the Reference Design and City Shaping Strategy. Raise public knowledge about the T2D initiative. Current use of South Road, which was the subject of the survey. Comments on the proposed on/off ramps for highways. Improvements to South Road and the adjacent regions that should be prioritized. Aspects of community concern for priority management over the project's lifetime. Attitudes in the community. A Reference Design specifies road alignment, tunnel layouts, and motorway access locations at a high level. It simulates highway performance and determines where laydown spaces should be located to facilitate construction activity and store materials and equipment. It takes into account the construction implications, potential challenges, limits, and benefits of various design solutions.

We've been working on a variety of studies that will help us construct the Project Reference Design throughout 2021, including: Ground investigations, Traffic simulations, Assessments of noise, vibration, and air quality, Cultural and heritage assessments, as well as flora and fauna impact assessments. It necessary to make plans for a potential rapid transportation system and underground system and Visitors, corporation, and staff traffic would be separated by a new road network. All modes of transportation, including cars, taxis, bus, pedestrians, and cyclists three intersection have joined in triangular shape are very close to each other these are the busiest intersection, especially during peak hours in the morning and afternoon. The railway crossing crosses through one of the intersections, which is the third and most essential reason will be accommodated by a ring road system. An 'avenue' for pedestrians and cyclists would connect the terminal to the surrounding area.

### 1.3 Sidra and Modelling

SIDRA is the most commonly used intersection modelling software, and it can automatically remove phases from a phase plan if a more viable intersection operation is discovered (Demir, 2020). Because it was built in Australia, it is tuned to Australian conditions when the default values are utilized. It is a model that is used to examine the performance of crossing points and traffic circles. It can handle a wide range of crossing points and layouts. As the driver conduct and vehicle qualities shift by area, likewise, the kind of vehicles is diverse in various nations. There are three stages for ensuring model correctness namely validation, verification, and calibration. The correct issue is properly considered, and verification verifies that it is completed in the proper manner by the model developer. Finally, during calibration, the model's performance is compared to the real observations. The goal of model calibration is to make the gap between model and observation performance as narrow as possible. Bulla-Cruz, Lyons, and Darghan (Bulla-Cruz, Lyons, & Darghan, 2021). In the majority of cases, the simulation is validated using conventional calibration parameter values and the results are compared. In latest days, designs have become more detailed, and their application in transportation planning and design has increased significantly.  means of measuring the traffic efficiency of highway and road frameworks, transit, and pedestrian using a secondary modelling method of individual traffic flow. However, because a time-consuming and resource-intensive work, following to some key values for this form of research will help you achieve a cost-effective Sidra software and investigation.

It is vital to be able to evaluate the tool's limits in order to ensure that it accurately reflects the traffic operations hypothesis. Assure that it will be used in accordance with the project's goal, criteria, and scope of work, and that it can and will be used to respond to the question.

## 1.4 What are SCATS and what is used?

Sydney Coordinated Adaptive Traffic System uses two level order adaptive traffic management technologies to monitor traffic risk management. The SCATS system is a potential method for coordinating lane traffic control scheduling (Wey, 2000). It is used to increase traffic control efficiency by decreasing exemptions, venture times, and station counts. SCATS Access, SCATS Traffic Reporter, and SCATS File Downloader are just a few of the tools that can retrieve data from the SCATS system for demonstration purposes. Signal timings are adjusted in real time by a real-time dynamic traffic control system. (For example, process durations, stage parts and balances) because of variety in rush hour is a primary module of SCATS (Hatami & Aghayan, 2017).

Individual servers at each cross-section are normally in charge of traffic control on two levels: technical and operational. It supervises and oversees the distribution of green times to phases, allowing phases to be extended, cancelled, or skipped, according on traffic demand. The focus of this research is to better coordinate traffic out and about in Adelaide in order to decrease congestion at specific intersections. The purpose of the project is to employ SCATS and micro-simulation to assess and track traffic on the road, which will involve the creation of a SCATS SIDRA model to investigate vehicle space and time management. A traffic management software evaluation using SCATS and a SIDRA model validation are among the projected outputs of the planned study. SCATS and SIDRA modelling by totaling and detaching road corridors are used to evaluate traffic management. Incorporation of GPS for expanding mapping capacities of vehicle-to-vehicle communications, expanding accessibility of information services by organizing through screening and information assessment, and determining situations shown by using SCATS street traffic are also used (Essa & Sayed, 2020). Combining SCATS parameters with SIDRA Modelling to regulate cutting-edge research is inferred.

## 1.5 Expected Results -

Expected results of the postulation are the execution of SCATS Traffic problem during peak time at given intersection. Performance of traffic is measured by Delays, Number of stop and traffic flow of vehicle. Traffic network performance is affecting the travel time of vehicle. SCATS Data is used for the scheduling traffic management. SCATS data is also used to analysis of existing condition of intersection. Study of Level of service at intersection. Analysis of Delays at intersection, providing alternative solution for improvement of traffic problem traffic management which will help in deciding simulation of vehiclesstreet tracker, setting of way, Assessment of maximum queue length, traffic intensity and delayorganization, speed synchronization, simulation of effective time management, and environmental change forecasting.

## 2. Literature Review

The literature review for this thesis focused at transportation networks in different cities and their possible long-term benefits, such as relief from congested roadways, reduce carbon emissions, and financial advancement. In addition, utilizing simulation technologies, certain well-established ways for minimizing accident repercussions will be studied. Furthermore, the latent statistic in conducting this study into the practicability of transport network innovations in Adelaide's metropolitan areas was reaffirmed by differing details about the efficiency of Adelaide's current transportation network, as well as numerous efficient transport micro-simulation factors. This section will end with a comment about the void in the literature and how the analysis in this study will add to the existing body of information in a specific way.

### 2.1 Adelaide City and Traffic Management

In recent decades, transportation system has become a critical aspect in cities, influencing not only people's everyday lives but also societal and economic growth. Because of the increasing traffic congestion, air pollution, travel time, and financial consequences all increase (Ferguson, 1990).

Government agencies are striving to track and alleviate traffic congestion, but the task is tough due to current challenges; traffic jams are difficult to quantify. The intricacy of traffic congestion is reflected in its dynamic and interdependent character. According to the National Highway Traffic Safety Administration, traffic problems can extend from a congested road section to nearby road sections (Bauza, Gozalvez, & Sanchez-Soriano, 2010) Due to these complexity, fully automated traffic congestion analysis is difficult to achieve.

The fundamental disadvantage of the shared transportation root is the huge volume of traffic generated by individual cars on access highways, the high degree of interaction with other traffic, and the consequent high need for parking facilities at the airport (Casey, Zhao, Kumar, & Soga, 2020). This prevalent method of transport may become problematic when traffic congestion or slow-moving traffic flows occur along access routes. Because aeroplane access by automobile uses the same uniform surface transportation network as other forms of transit, it is subject to delays caused by non-airport traffic. Long-term parking near certain major airports can be prohibitively expensive. Adelaide Airport is located in the City of West Torrens, west of Adelaide City Centre. It is located on Commonwealth-owned land that has been leased to AAL in order for the airport to be managed in accordance with the 1996 Airports Act.

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According to the report, although weekday morning and afternoon peaks in Sydney face up to 40%-time lags, holiday travel also results in severe traffic, with delays of up to 30% during the midday peak. The following stage was to do an econometric technique to learn more about the elements that influence network efficiency. Accidents, scheduled activities, and the weather all contribute to traffic congestion in any area. According to the report, transportation infrastructure authorities should invest in a number of measures, including coordinated landscaping and transportation networks, as well as low-cost, high-benefit-to-cost-ratio innovations such as automatic ramp metering and traffic management systems.

Adelaide and Cisco are partnering to see how Internet of Things technology might assist minimize traffic problems, according to (Maalsen, Burgoyne, & Tomitsch, 2018). They're investing in the urban areas stage to see if data and sensors can be used to alleviate common city concerns like traffic congestion and to assess the viability of emerging technologies like driverless vehicles.

Public transportation typically accounts for 5-8 % of travel needs in Australia's largest cities. According to the International Department of Public Transportation, if public transportation is to contribute meaningfully to reducing urban congestion, its usage rate must increase, its consumption rate must rise to at least 12% to 20% in the medium to long term. A significant reason for the lack of participation in the provision of public transportation, according to the Association, is the lack of federal transportation policy support, as stated in a 2003 report to the Senate and House Standing Committees on Environment and Heritage investigation into Low Carbon (Kash & Hidalgo, 2014).

## 2.2 Traffic Congestion and What's Impacts

Non-repeating occurrences, which are characterized by an ephemeral and sudden decrease in limit due to occurrences such as accidents, vehicle movement, and road construction, where the street limit is the most severe changing traffic flow on a particular roadway when all routes are used, account for a significant portion of traffic congestion (Anjum, et al., 2019). While recurring traffic is the result of a street's capacity being insufficient to accommodate traffic demand on a continuous basis, especially during peak periods (Moyano, Stpniak, Moya-Gómez, & Garca-Palomares, 2021). Serious traffic incidents are to blame for massive amounts of traffic congestion.

on society. Primarily, these impacts can be categorized into monetary and ecological ramifications.

According to a report, time spent delayed in traffic in Australia costs people money in the form of lost work hours and excessive transportation expenditures. According to new research by the Council of Australian Governments on the cost of traffic congestion and transportation pollution, the monetary cost of traffic congestion in Sydney is expected to be $7.8 billion, with emissions costing an additional $1 billion (Kazancoglu, Ozbiltekin-Pala, & Ozkan-Ozen, 2021). 60 percent of emissions came from private heavy cars, compared to 14 percent from light vehicles, 18 percent from public transportation, and 0.3 percent from motorbikes.

### 2.2.1 Impacts on Economics

Not only are there huge delays caused by traffic accidents, but the monetary cost and impact on the environment as a result of this is also an important topic of investigation. The cost of delay is divided into three categories: holding time, vehicle operating costs, and ancillary costs like pollutants. When all components of an incident including congestion, crashes, and pollutant impacts are examined, the cost to society is high, according to (Mu & Yamamoto, 2019). During the economic year, the avoided costs of congested in all capital cities in Australia were estimated to be over $16.5 billion (Aminu & Pearse, 2018). Due to a variety of factors such as road conditions, secure infrastructure, and the distance the crashes occur from trauma care facilities, it was estimated that the absolute cost of street car accidents alone cost the city of Adelaide, South Australia, $1.165 billion, or 2.32 percent of the state's total GDP (Retallack & Ostendorf, 2020). Different forms of transportation have varying effects on the environment, and it is critical to distinguish between these modes and analyze the various features in order to internalize external costs. Increased travel time and vehicle replacement are two external expenditures that come as a result of the environmental effects and additional fuel costs due to traffic.

### 2.2.2 Impacts on Ecological

The transportation sector in Australia was accountable for 14% of total pollution, with traffic problems accounting for nearly 90% of that (Bharadwaj, Ballare, & Chandel, 2017). According to a research study of vehicles travelling on Melbourne's Monash Freeway, 95 percent.

$CO_2$ is one of the gases involved in these emissions (Jabbar & Dia, 2019). In 2012, Australia's carbon emissions totalled 91 million tonnes of $CO_2$ equivalents ($CO_2e$), with the transport sector accounting for 15% of that total (Kinnear, Rose, & Rolfe, 2015). $CO_2e$ is a common unit of measurement for the amount of carbon dioxide which have the same effect on global warming as other greenhouse emissions. Given the detrimental consequences of traffic accidents, a study done in Orange County, California (Boarnet & Chalermpong, 2001) revealed that the average non-recurring road traffic collision resulted in a 398.4 kg increase in carbon emissions.

Because automobiles accounted for over 23% of total global greenhouse gas emissions and transport networks accounted for roughly 87 percent of its total travel carbon emissions, transportation's contribution to greenhouse gases should not be overlooked. the year 2012 (Leighty, Ogden, & Yang). Because no earlier analyses focused on the environmental effects of road and traffic, (Costin, Adibfar, Hu, & Chen, 2018) analysed significant research focusing largely on model architecture challenges. Due to the detrimental effects of severe collisions, vehicle machines become less efficient in congested locations, increasing the rate of exhaust emissions (Reyna, Chester, Ahn, & Fraser, 2015). Australia's transport industry accounts for 14% of the country's nett expenditures, with the transport network accounting for almost 90% of the total. In 2012, a contextual analysis of transport outflows in Australia indicated that they amounted 91 million tonnes of $CO_2$ equivalents ($CO_2e$), with street traffic accounting for 15 percent of this ($CO_2e$ is a unit used to measure carbon dioxide that has a corresponding impact on environmental change). According to an investigation conducted in Orange County, California, a typical roadway collision led to a rise of 398.4kg of $CO_2$ emissions (Bharadwaj, Ballare, & Chandel, 2017).

## 2.3 Traffic Management in Computer Simulation as an Analytical Tool

Under experimental management, the current significant and sophisticated traffic frameworks are unsustainable. As a result, digital simulation of near-optimal traffic flow is practically required for traffic control. Simulation software analysis can only be used to make analytic decisions about road development, type of intersection controls, and the practicality of mechanized traffic management (Gao, Huang, Xie, Xiong, & Du, 2020). Traffic simulation models have been utilized since the emergence of computer technology. A multitude of strategies for measuring disaster consequences involve a computerized traffic simulation approach. The transportation authority's most difficult task is developing an alternative transport plan. Recent advancements in computer technology, particularly the approach of computer simulation models, present yet another enticing route for evaluating possible alternatives prior to adoption (Vehlken, 2020). Transportation infrastructure computer simulation comprises creating models with various computer tools for assessing, organising, and modelling operational aspects of planning phase, as well as computational mathematics of transit systems (Boukerche & Wang, 2020). While these analysis methods are only used in a few research topics, the level of difficulty and depth that may be derived from the models' conclusions grows. Computing SIDRA Modelling is also used to investigate strategy methods, network proper implementation, and transport systems for various forms of transportation. This will make communication between private and public entities much easier.

Computer SIDRA Modelling for traffic analysis has a number of benefits in terms of network efficiency, cost-effectiveness, and security, as well as removing the requirement for on-site traffic flow evaluations.

On a global scale, traffic management results in the involvement of each administrator as offsets in order to maintain a constant flow of traffic flow. Because offsets are dependent on traffic volume and congestion, they must be established as a trade-off between various time demands, or they should most likely be updated to respond to demands imposed via on-line control (Hu & Smith, 2020). Secondly, The issue of traffic flow can be viewed as both a framework control and a structure planning problem. The framework includes the road network as well as other important features of the road limit, such as road width, block length, street parking permits, and the influence of companies and business events (Komninos, 2021). Although the traffic engineer has limited authority over the system design specifications, his purpose is to give recommendations based on significant information concerning decisions that other city officials will be making (Alsrehin, Klaib, & Magableh, 2019). As a result, he should be able to use computer simulation to estimate the impact of approach is to make and population shifts on traffic flow.

Transportation agencies in Australia have long utilised model to create traffic control systems (Alsrehin, Klaib, & Magableh, 2019). Effectively control, such as numerous GPS tracking systems that are separated and dispersed by the operator's business. This is demonstrated by Trans Perth's recently reported "real time arrivals" technology, which records rail and bus arrival times; taxi GPS detection systems exist as well, but are frequently shared directly with the taxi operators (Heyns & Van Jaarsveld, 2017). To combine each of these unique interfaces and better depict the position of cars, access to current public transportation and taxi GPS data is needed. Sensors can also be used to monitor pedestrian movement at crossings by identifying the presence of nearby smart cards. By combining these many interfaces, transit agencies can gain a better understanding of present demand and develop better forecasts of future need, which will help with transport systems (Aminu & Pearse, 2018).

considering a modest data application Another technique is to use predicted strategies to avoid congestion problems, in which prognostic algorithms merge real-time data with historical data sets on traveler behaviors and favorited routes to provide predictive transport infrastructure. Another approach is to design complex public transit routings using Big Data, which creates high-resolution information that may be used to build public transit market maps, resulting in improved resource allocation. Despite the fact that study in this subject is still in its early phases, a number of authors have released studies in this area (Alsrehin, Klaib, & Magableh, 2019).

Despite the fact that Cloud Computing can provide vital information to assess, designing, and upgrading transportation systems, the fact that such a vast volume of data needs a variety of data processing and analyzing is a big roadblock. Because there is so much data accessible, it is necessary to design software and systems that can sort through it and focus on the most important factors that will provide essential inputs into transit prediction patterns. However, combining, displaying, analyzing, and responding to comments is a tough task due to the volume of data, variety of data, and constant changes (Abduljabbar, Dia, Liyanage, & Bagloee, 2019). Real-time data analyses is unattainable because current data analytics systems have limited analysis techniques and reaction times of several minutes. In-memory computer methods have lately been shown to be significantly more efficient than traditional algorithms, with execution rates of roughly one second. Several IT companies are involved in this field, and research are now focusing on it.

## 2.4 Using SIDRA with Assessment of Transportation Network Performance and Modelling Technique

**Why microsimulation**

Although the department of public works uses a macro-level strategy model called MASTEM (Metropolitan Adelaide Strategic Transport Evaluation Model) to evaluate major transport developments in Adelaide, it is not capable of modelling and presenting individual traffic volume, which microsimulation can achieve. As a result, there is currently no microsimulation model of the research region capable of providing a comprehensive summary of all network components, such as individual intersection operation.

Numerical simulations have been widely used to evaluate the efficacy of various traffic infrastructure and management approaches for efficient and environmentally friendly transportation frameworks. Amongst the most critical components in guaranteeing that microsimulation models appropriately represent local conditions is model calibrating and verification. The important to create comprehensive and effective systems that can record the movements of personal vehicles and driver behaviors, as gained through microsimulation modelling, according to (Hong, Chen, & Wu, 2020). As previously stated, macroscopic simulation undervalues automotive emissions on a highway; nevertheless, the microscopic study investigates the effects of individual car hard acceleration on pollution, resulted in a more precise estimation of environmental destruction (Kim, Lee, Shin, & Park, 2020). Moreover, (Schweizer, Poliziani, Rupi, Morgano, & Magi, 2021) show that a microsimulation model structure is the most suited when information on the behaviors of individual vehicles is required. Microsimulation is the most efficient method for analyzing the network-wide effects of traffic incidents and feasible relief solutions in a network, according to (Dabiri & Heaslip, 2018).

The analysis of independent vehicle movement in a rush hour gridlock framework has long been used for traffic analysis, but the collaborative approach between data improvements and traffic design has ushered in a new era of modelling models that are now available for street and transportation managers to analyze complex traffic control (Dashora, Sudhakar, & Marietta, 2020). Complex, congested circumstances are frequently encountered in these applications, which are typically beyond the scope of classic analytical or macro modelling approaches. Microsimulation software Currently, it has skills spanning from perception to computer operation replication. Even though perform certain task can provide experts with valuable information on the current transportation system's performance and anticipated changes, it can also be a time-consuming and asset-intensive process (Dabiri & Heaslip, 2018). The key to obtaining a knowledgeable microsimulation examination is to adhere to specific basic principles for this type of study, such as employing the proper instrument, performing microsimulation analysis when necessary, and guaranteeing precision in addressing the transport task hypotheses (Farrag, El-Hansali, Yasar, Shakshuki, & Malik, 2020).

After some time, the vehicular traffic over a road network is recorded in a microsimulation model at a microsecond interval (Manser, Becker, Hörl, & Axhausen, 2020). This allows for a detailed simulation of vehicular interaction under the impact of a control measure. Despite the fact that this technique is applicable to a wide range of applications, it does require. There are random number generating included, as well as Random number generators are included**,** These models demand more work to calibrate. When comparing to an analytical model like SIDRA, optimizing factors like signal settings is more complex. A microsimulation model could also be a crucial element of a hybrid modelling process that combines a thorough microscopic computation of certain key elements of a prototype (for instance, intersection processes) with analytical models (for example, speed-flow relations for traffic assignment) (Gulhan, Zuysal, & Ceylan, 2020). This method, also known as mesoscopic simulation, provides more data to a model which is mostly used for allocations. A microsimulation model can also be linked to a simulation software.

Determination of Research Study, Scope, and Approaches, Data Collection and Preparation, Base Model Building, Error Detection, Calibrating, Alternatives Analysis, and End Report and Technical Documents are some of the specific tasks (Maheshwary, Bhattacharyya, Maitra, & Boltze, 2020).

The micro analytical model SIDRA Junction created in Australia by Akcelik and Companies is used to determine transportation limitations and other performance requirements (Mfinanga, 2017). This programme will analyse a variety of crossings, including signalised, unsignalized, and circular intersections, using up to eight techniques. Mfinanga (Mfinanga, 2017). Because of SIDRA's flexibility, it can analyse both continuous flow and merge scenarios, providing it to estimate not just limit and other implementation actions straight from the traffic, but also fuels utilized as a part and operating costs. SIDRA, as the most widely used single junction modelling techniques, may automatically remove stages from the phased plan if a more efficient intersection activity is discovered (Dumba, 2017). Alternative's evaluation in a single intersection context has the potential to save time and money. Changing the environment factor, or making it less constrained (having higher capacity). The climatic element encompasses all aspects of the roundabout's environment, including building component, visibility, level, speed, motorist response and aggressiveness, percentage of pedestrian and larger trucks, and parking near the key intersection (Mfinanga, 2017). The advantages of simulating traffic lights with a transport response framework were more clearly highlighted at the junction level in a latest report (Guo, Li, & Ban, 2019). Based on vehicle modelling at signalized crossing sites is more complicated since the dynamics of queue building at the stop line are dependent on arrival rates, output flow rates, and the duration of green time available for express movement. In every case, simulating traffic signals by estimating particular highlights of various SCATS structures can increase the accuracy and precision of findings in specific conditions.

In roundabouts, when there is an amount of research acceptance technique that incorporates both effects from driver responses and structure, a handful of methodologies can be used in SIDRA to model and test its performance and effectiveness, depending on the degree of collecting. Because SIDRA is based on a lane-by-lane analytical method, the network structure in sidra intersection is an iterative process for lane obstruction and capacity constraints (Demir, 2020). To discover a solution, Sidra junction employs a transport network-wide iterative technique.

## 2.5 Transportation Network Performance of Using SCATS Assessment

The most extensively utilized technique for decreasing occurrence consequences is the Sydney Simultaneous Adaptive Traffic System (SCATS), a traffic control mechanism for monitoring and managing congestion (Cuena, Hernández, & Molina, 1995). SCATS useful contributions loop detectors on the roadways to assess traffic flows and volumes, and the data is collected automatically. Usually, these approaches are employed at signal crossings to count each vehicle and their direction of travel.

In the 1970s, the NSW Government of Main Roads developed SCATS, an intelligent transportation system (Wey, 2000). With the introduction of fresh advancements, the project's capacity and applicability have been developed and upgraded since then. Fixed time control is insufficient to reflect SCATS-controlled actions, particularly when the controller'

The frequency of cycles is unreliable, pedestrian volumes are low, and traffic flows and arrival patterns are irregular (Essa & Sayed, 2020). As a result, set time signals are not suggested for microscopic simulation modelling of SCATS-controlled adaptive traffic signals, but they are suitable in simulation models if a high-level strategic planning review is performed. In crowded traffic networks, using SCATS tools in simulation models has shown to be beneficial. The need for traffic models to be used should be balanced against the extra resources and expenses required to incorporate their functions.

It also suggests that surrounding junctions have an impact on each other's functioning, the way SCATS is built up, and how it works to enhance traffic problems in general. Furthermore, neighboring junctions have an impact on one another's functioning (Do, Vu, Vo, & Liu, 2019). In nature, this impact is quite dynamic and changes from one cycle to the next. Commercially accessible software can only take into account the influence of a flexible framework to a limited extent. Though this disadvantage can be somewhat overcome by strengthening assumptions about several key factors for individual junctions, it requires thorough knowledge of the SCATS system as well as regional/local variables. As a result, many traffic analysts fail to understand the usefulness in this and evaluate crossings as if they are confined during evaluation. One of the most typical mistakes is training the programmed to advance the process length for less critical crossings, which understates the wait for minor roads and right turns. When authorizing another traffic light, the current situation frequently causes a discrepancy between the assumptions in the traffic study and the original performance. that disregard the order of the SCATS sub-frameworks, regardless of whether the tool used for the assessment requires it as an important contribution to model setup (e.g., LINSIG). According to (Lertworawanich & Unhasut, 2021), with the latest introduction of microsimulation with SCATS, it is now possible to assess delays, queue length, number of stops, volume, and process time length at every signalized crossing site in the model on a cycle-by-cycle basis. The report describes the connection between signalized sites and examines the influence linked junctions have on each other in both off-peak and overcrowded conditions by evaluating charts generated by high resolution **data monitoring.**

Transport Simulator Technologies in Barcelona, Spain, created and sold is a well-known commercial micro-simulation programme that is frequently used in the transport research sector (Carten, De Guglielmo, & Pascale, 2018). Dynamic models are made possible by the microscopic and mesoscopic simulators. 2021) (Braud et al.). They are capable of managing a variety of road network, including major highways, intercity, ring roadways, throughways, and any combination of these. They also help their consumers in providing traffic simulations or controlling traffic options. Its ability to integrate dynamic and static traffic, as well as its exceptionally quick simulations, set it apart.

The continues to be a source required by Test execution simulators is a set of model parameters that characterizes the study and four types of data, namely network examples, map of the area, specifics of the number of lanes for each section, orient movement for every intersection, speed restrictions for each section, and detectors (Braud, et al., 2021). To achieve proper SCATS connection, it is critical that SCATS tools such as signaling and sensors match to tools, and specific criteria should be observed, such as each SCATS junction being represented by a single SCATS type controller. At least one point of entry 'll address one SCATS junction, and all major roads that address one SCATS junction should use correlations between its SCATS regulator and the relevant crossing points (Braud, et al., 2021).

## 2.6 Developing an Efficient Traffic Control System to Alleviate Traffic Congestion in Adelaide.

People use transport links to go to their intended location on a regular basis all around the world. The ever-increasing overall traffic necessitates the development of an attractive and adaptable structure. It is critical for traffic planners to have a reliable traffic analysis tool in order to construct the viability of a transportation system and make full use of its capabilities. The majority of traffic analysis software are used to examine plans for current and future transportation systems, which can provide a more solid base for decision.

by weighing and contrasting potential options Depends on the user's interest, a variety of tools are accessible to pick from (Vajjarapu, Verma, & Allirani, 2020).

As the cost and discomfort of traffic problems rises, cities all over the world are grappling with how to convey a diverse mobile population. The rise in the cost of gasoline, the desire to reduce greenhouse gas emissions, and authorities coping with speculative requirements from all areas all contribute to a challenging transport policy climate. Sydney, like other major cities, faces comparable transportation challenges. To recruit and maintain business, it must be able to compete with other cities worldwide as well as locally (Bendall & Brooks, 2011). The effective transit of both people and products in a region is a crucial aspect in this regard. Extra advantages from traffic control systems architectures for metropolitan arterial road infrastructure are less obvious, partly because Australian countries are already utilizing this technology and reaping significant productivity and efficiency gains (McLeod & Curtis, 2020). Some benefits can still be gained by using a network management approach to the adoption of both regional road and highway management tools and control access stages.

Transportation Planning Systems can reduce the risk of deaths and the intensity of congestion on motorways and arterial linkages by employing particular strategies such as signalling motorway approaches and monitoring the rate at which vehicles combine with the main freeway traffic stream. Prioritizing certain types of vehicles, such as large vehicles, for highway access Modifying Lane speeds at both metered and unmetered on-ramps where lineups might delay certain groups of vehicles, with the help of changeable messaging signs; restricting those travelers to specified lanes. Limiting specific types of travelers to designated lanes. Improvements in Australia's response to urban congestion charges, notably on national metropolitan corridors, are both justified and doable; both environmental and economic benefits (McLeod & Curtis, 2020). There is a possibility to complete the next stage of traffic control innovations and increase Australia's capacity to handle congestion. Infrastructure and management improvements should be seen as mutually reinforcing components of ways to supplying, managing, and pricing transportation systems in order to improve the efficiency of urban transit systems.

Gradual and continuous raising is the strategy. Australia's road congestion management approach is expected to be the most successful (Anjum, et al., 2019). This will be changeable and change as the parameters on each Auslink route in the city change. It will necessitate careful supervision to ensure that all new solutions are added or updated frequently in reaction to variations in need, as well as expanding on proven successes. More importantly, previous objectively based surveys have not taken into account the instances that have been identified as having overwhelming difficulties in bi-directional non-path based diverse traffic patterns. Furthermore, previous research has primarily focused on backend crashes in path-based homogenous traffic situations, which are prevalent in developed countries. The document designed a methodology that can be used to foster traffic security computational methods and assess protection during immense moves in two-path bi-directional traffic patterns in non-industrial countries, taking into account the growing interest and progress of recreation models' individual's ability to address different options of street offices and to assess their well-being before implementation (Kim, Lee, Shin, & Park, 2020).

The interplay of national pathways with neighboring networks, freight traffic systems, and the administration of local, cross-urban, as well as through traffic flows can all be improved with the right balance of efforts. These include sound development planning decisions, integrated infrastructure design and construction, and other congested management approaches (Ferguson, 1990).

Considerations on a temporal and spatial high priority would be critical for increased traffic density. As part of a bigger plan, evidence suggests that appropriate pricing mechanisms could play an important role in traffic and congestion reduction. In Australia, there are few former and ex-post reviews of congestion control measures. In addition, there are major real - time performance statistics gaps in the area of traffic congestion. analyse how specific measurements and larger programmers are functioning, and even the gains they are achieving, objectively. This is required to ensure that effective traffic-control strategies are implemented (Bauza, Gozalvez, & Sanchez-Soriano, 2010).

The collecting and use of real-time traffic data via appropriate surveillance equipment is crucial for integrating "intelligence" into infrastructure and improving the dependability and efficiency of national corridors. Increased use of proper traffic management systems, coupled into enables efficient of properly managing an entire corridor or networking in actual time, provides a cost-effective opportunity to achieve significant infrastructural and safety improvements.

In the short term, transport production, corporation efficiency, reliability, and community benefits will all benefit. This is especially true when it comes to technology aimed at improving highway performance (Boukerche & Wang, 2020).

Implementation of transportation systems on a whole-of-corridor/network level can also result in gains on metropolitan arterial highways. To guarantee that infrastructure is used to its maximum economic opportunities, explicit policy and management decisions addressing time-based priority access to certain routes where financially justified, such as to increased efficiency vehicles, are a critical domain

According to national and Australian experiences, transportation planning technologies can deliver significant efficiency, reliability, and production benefits on existing infrastructure that is designed to allow continued surveillance (Kockelman, et al., 2017). When implementing these techniques on a route basis, the potential impact on roadways to the freeway and other urban roads in the vicinity of the actively managed roadway, as well as the prospect of shifting congestion avoided on the highway to these local streets, must be addressed.

This emphasizes the significance of assessing their implementation on a sector and correlation analysis and multiple rather than route-by-route, with the option of including preferential access for elevated cars. Adding information across the entire urban road network, similar to the traffic management and quality monitoring technologies used on highways, will improve future operational and strategic management at the corridor and network levels. With such actual info, travelers will be able to make informed judgments about their chosen mode and time of travel (Dabiri & Heaslip, 2018).

Integrated design land use and transportation planning, when combined with other congestion mitigation approaches, can help improve the quality of transport systems. While development planning is a method for attaining transportation goals such as congestion reduction, it is a long-term strategy that yields gradual benefits. According to the integrated use and transport planning committee's judgement, Australia has several shining examples of strategic approach (Kockelman, et al., 2017). There are enough instances of impediments to effective planning and implementation to **make a case.**

## 2.7 Traffic Management System Plans Considering

In Australia and New Zealand, road transport system development has mostly focused on striving to meet needs for motor road transportation by building new roads or expanding the capabilities of current routes. However, it has long been known that improvements in road space are quickly absorbed by latent demand, and that many towns lack the economic capacity to alleviate traffic congestion by providing extra road capacity on a continuous basis. Many metropolitan people have a high endurance for the everyday delays caused by traffic congestion, according to studies in large cities (Stilgoe 2005). What can urban transportation, travel, and accessibility

The increasing interest in green growth reflects a growing knowledge and concern in urban communities about the issues caused by increased traffic, especially car use, as well as the resulting traffic and greenhouse emissions. It is both impossible and undesirable to expand the road network's capability at a rate that will meet rising demand. Apart from the low quality of life for residents who rely on automobiles for everyday transportation, poor air quality, greenhouse gases, and dependency on non-renewable sources of energy are **key concerns.** Preventing regular straightforward driveway accessibility from roadways that would largely serve as transport routes is the single most crucial step towards achieving the clear two-class arterial road/local area separation in new development areas. In an ideal world, traffic routes would be spaced at 0.8 to 1.5 km intervals and might be on new and previously constructed roadway alignments. Similarly, many governments prohibit immediate access to a traffic route when a lower-priority road is a feasible alternative. If action is taken to limit access, there is a broad right of entry between a road and adjacent property. The process of managing where and how access is granted is known as network access.

The facilities for access to and from highways strongly affect the mobility, safety, and amenity of road users and owners of adjacent land. In this light, access company's aim is to obtain a level of interaction between the road and the adjacent land that is compatible with the road's role. Access must be constructed and organized in such a way in which the roadway can safely and efficiently execute its traffic functions.

Roundabout management of the access junction is usually not acceptable if the overall traffic accessing a development is only a small part of the total traffic along a road due to the huge impact on the development it has on all cars travelling along the road. If a development, for example, encounters traffic surges that necessitate a higher level of management than give-way signs can legally provide, traffic signals are a better solution. This could be true of sporting or concert venues. Traffic signals or a roundabout may be acceptable if the access point is the fourth leg of a significant T-intersection.

Workplaces create a lot of travel and, in some cases, a lot of car traffic — from employees, deliveries, and tourists. Corporate travel strategies aim to reduce workplace vehicle usage, particularly private car usage. Workplace travel plans are being promoted in Australia by government agencies, businesses, and community organizations such as universities and hospitals (Travel Smart Australia 2008). While car travel to work is optional in Australia, it is essential in several nations (e.g., the United Kingdom and the United States) for businesses of a particular size. Such groups are expected to create a trip plan that explains the steps they will take.

## 2.8 **Research Gap**

The literature and research reviewed in this chapter can be used to draw several conclusions. To start with, there is a significant problem with road congestion and the associated environmental and economic effects. As a result, calculating the effects of traffic accidents and creating measures to prevent the bad consequences is extremely valuable. Although the ministry of transport uses a macro-level strategy model called MASTEM (Metropolitan Adelaide Strategic Transport Evaluation Model) to evaluate main transport developments in Adelaide, it is not capable of SIDRA modelling and presenting specific moving vehicles, which SIDRA Modelling can achieve. SIDRA software is a useful tool for measuring the effects of traffic events on highway and local roadways in a safe and expense manner (Alsrehin, Klaib, & Magableh, 2019). The microscopic simulation following model is the most recommended instrument for measuring these implications, according to the specifically deals of research that has employed this technique.

The initial purpose of the study is to look into the effects of railway crossing on the three intersection which is cross road in between marion road. The research clearly shows that assessing the effects of big non-recurring incidents has a lot of merit as well as I have to find out how the traffic flow between three intersections. In this thesis will achieve goals for 3 intersection TS099, TS100, TS101 of Delays, Cost, Travel Time, Travel Distance. so the research will contribute to the existing body of knowledge.

The secondary purpose of this thesis is to investigate the effects of lane blocking, incident location, and duration using SIDRA software. Building a microscopic model of a roadway network has been shown to be the most cost-effective and safe technique of measuring incident impacts because it eliminates the need for on-site monitoring. In addition, the most influential factors in generating a big event in the literature were identified to be lane obstruction, incident duration, capacity reduction, and incident generated delay. as compared to road survey to evaluate to adding extra lane, delays, queue length, cost is most important role in that

The third aim is to measure the monetary impact, capacity reduction, and other critical transport design parameters such as lane blockage, incident location, and duration. According to the literature, the most significant criteria in improving financial costs and car emissions are lane blockage and the related capacity reductions. As a result, achieving this goal will include precisely analyzing incident impacts utilizing important variables identified in the literature, as well as significant transportation technical aspects such as lines, delays, and **transit speeds**

Using SIDRA Modelling approaches, the literature review focuses a significant portion of its time to generating and analyzing methods for reducing the negative effects of occurrences. The fourth purpose of the thesis project is to use SCATS count to a critical incident in order to determine an acceptable SIDRA technique while qualitatively examining the financial analysis. A big crisis will be discovered by testing a variety of different event situations and sites across the network, then implementing methods from a quick emergency management plan to determine the most effective means of minimizing incident **impacts.**

# 3. Methodology

First of all, I have to choose triangular shape intersection which is TS099, TS100, TS101.Then model was created using SIDRA software. The different performance metrics were analyzed using this approach. Due to the fact that microsimulation models do not optimize traffic lights, SIDRA modelling was required for all signalized intersections. A set of future models were generated in mobility simulation to evaluate KPI. On the lane, the SCATS technology is employed to operate an adaptable traffic congestion scheduling system. Because of automated in the vehicle management system, the vehicle transmission rate and idle time were observed to be delayed. A more advanced investigation was conducted using SCATS data.

Due to the lack of data in SCATS for unsignalized intersections, a physical going to site and count survey was conducted. On the lane, the SCATS technology was employed to perform an adaptable road congestion planning strategy. Sidra Junction allows you to prototype many sorts of vehicles (Light Vehicles, Heavy Vehicles, Buses, Motorcycles, Big Trucks, Light Rail / Trams, and Six User Classes) with different purposes. Modeling of priority lanes and bus signals, for example, can be allocated to distinct lanes, lane segments, and signaling phases. We add the traffic values on predefined lanes, as well as the phasing time and signal time, and SIDRA will tell us the level of service on each pathway after the productive calibration. We can then evaluate what kind of enhancements can be made, and we should plan the road based on the traffic data for the future for 20 years and Upgradation. we are building a network consisting of the TS099(Marion Road) and TS100(Cross Road) intersection, Anzac Highway TS101 To Marion Road Triangular intersections shown below. We need to upgrade our infrastructure and increase the quality of service (LOS), as that's the only way out to solve this issue because people on the roadways struggle with tremendous delays. By synchronizing four parameters: network interpretation, calibration power, and calibration demand, the calibration system's efficiency improves. Identical data from the vehicle management programmed is stored in many databases, potentially constituting a security concern. Due to lack of data I have to used manually on-going site survey to evaluate all the data of on TS099, TS100, TS101in the triangular section has a lot of Problem, Delays, Travel Speed and LOS problem etc. I need to improvised it. By using SIDRA software to Provide best alternative to Improvised all these contents.

We were aware that we appeared to have manually evaluated the quantity of traffic in the software, which could be incorrect because we included comparable vehicles changing lanes and straight lanes, both of which are extremely difficult to measure accurately. We do use out-of-date SCATS to have a significant impact on the service quality we identify each year, and the present reality might be even worse. As a result, LOS, Delays, Networking LOS, Cost which I have to improvised by using SIDRA Software.

3.1 Study area

My supervisor gave me this study area, and I designed it using SIDRA software, presenting the essential solutions for these three triangular intersections. I'll be following triangular intersections that I've developed.

- TS099 – Marion Road
- TS100 – Cross Road
- TS101 – Anzac Highway

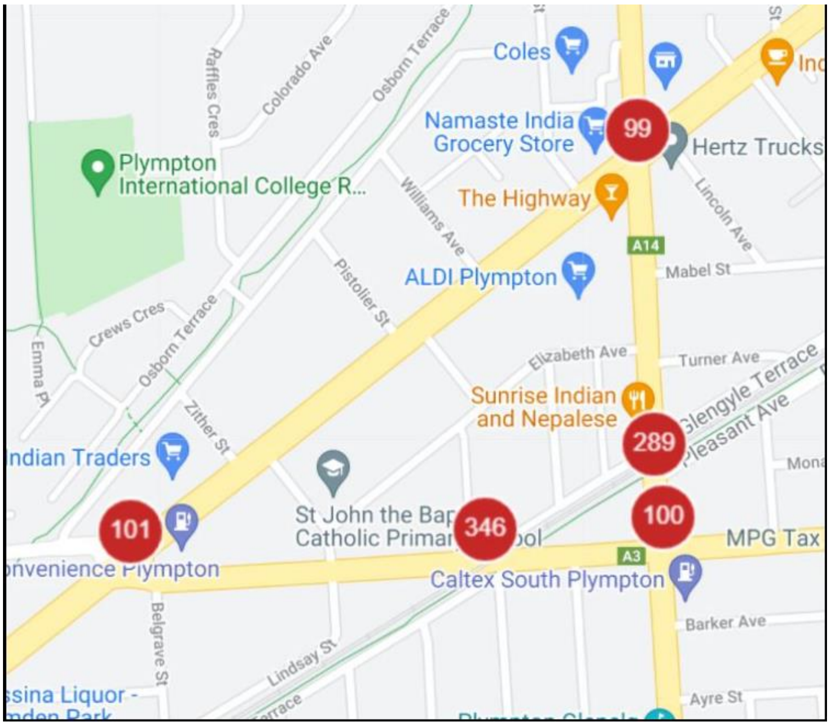



*Figure 2 Study map*

## 4. Data collection and analysis

My supervisor gave me SCATS data, which I analyzed before beginning to create this intersection.

- March 2017 data was used
- Counts available in 5-min intervals for each Scats detector

| datetime | site_no | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15:50:00 | 99 | 39 | 37 | 24 | 35 | 13 | 18 | 19 | 28 | 27 | 3 |
| 15:55:00 | 99 | 39 | 57 | 44 | 54 | 11 | 11 | 37 | 44 | 41 | 4 |
| 16:00:00 | 99 | 32 | 56 | 34 | 55 | 12 | 13 | 28 | 30 | 28 | 2 |
| 16:05:00 | 99 | 54 | 54 | 31 | 55 | 10 | 11 | 30 | 32 | 35 | 4 |
| 16:10:00 | 99 | 25 | 28 | 23 | 26 | 6 | 10 | 20 | 26 | 28 | 2 |
| 16:15:00 | 99 | 20 | 51 | 35 | 49 | 4 | 13 | 32 | 33 | 25 | 4 |
| 16:20:00 | 99 | 26 | 23 | 22 | 28 | 3 | 9 | 21 | 22 | 24 | 5 |
| 16:25:00 | 99 | 29 | 44 | 36 | 43 | 5 | 9 | 23 | 31 | 30 | 3 |
| 16:30:00 | 99 | 14 | 29 | 24 | 29 | 2 | 11 | 22 | 21 | 25 | 5 |
| 16:35:00 | 99 | 27 | 51 | 40 | 54 | 10 | 11 | 30 | 33 | 31 | 2 |
| 16:40:00 | 99 | 30 | 46 | 34 | 42 | 8 | 8 | 12 | 22 | 29 | 4 |
| 16:45:00 | 99 | 31 | 52 | 37 | 49 | 7 | 6 | 24 | 28 | 35 | 4 |
| | | 366 | 528 | 384 | 519 | 91 | 130 | 298 | 350 | 358 | 42 |

*Table 1: SCATS Data for TS099*

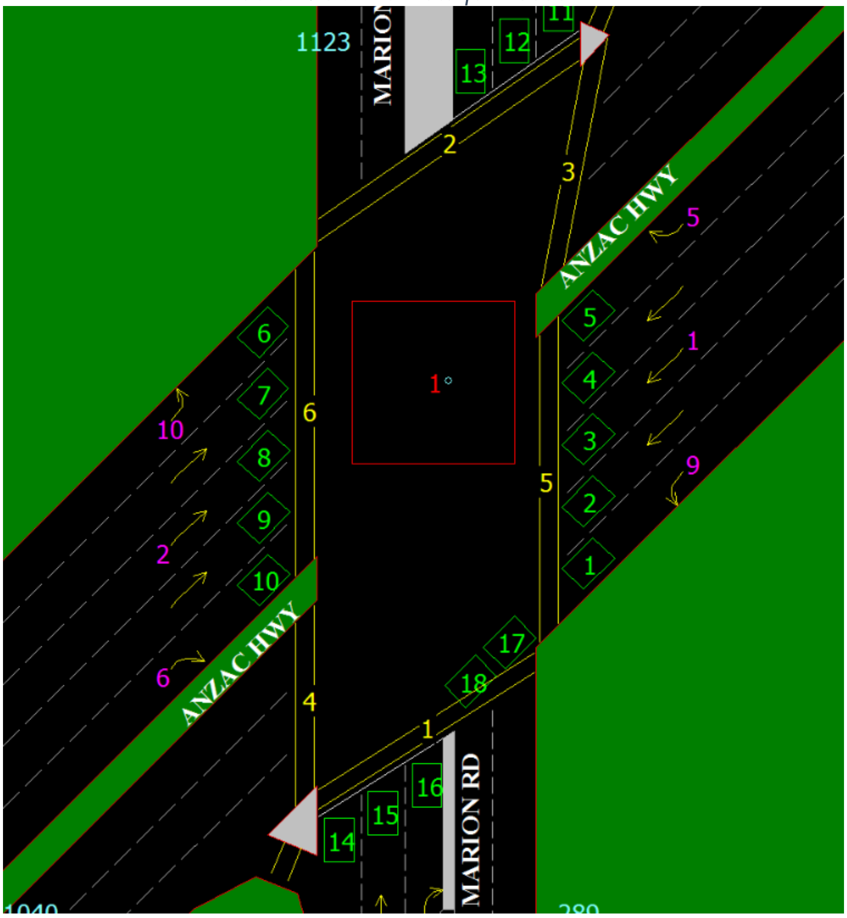



*Figure 3: SCATS images showing detector locations.*

The above figure is showing the detector's location at the TS099 intersection, which counts how many vehicles enter and exit the intersection, allowing designers to choose the optimum time to design. The graph below shows the busiest peak period

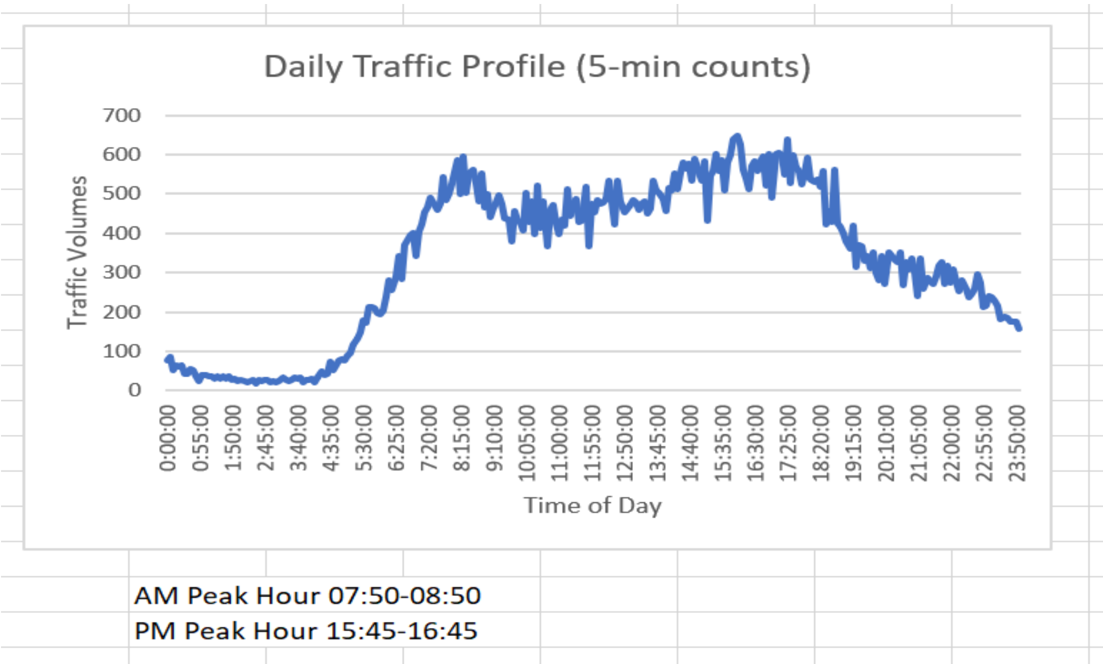



*Figure 4 Busiest peak Hour – TS099 to TS100 Marion Road to Cross Road*

- Total number of vehicles entering TS099 was 2,716,745 for the entire month

As you can see from the graph above, according to the traffic counts, the peak times are 7:50 to 8:50 a.m. and 15:45 to 16:45 p.m. Detector counts were examined, and turning movements were created for use in Sidra. Detector 2, 3, and 4 counts, for example, shows that the total number of through vehicles from the South West approach.

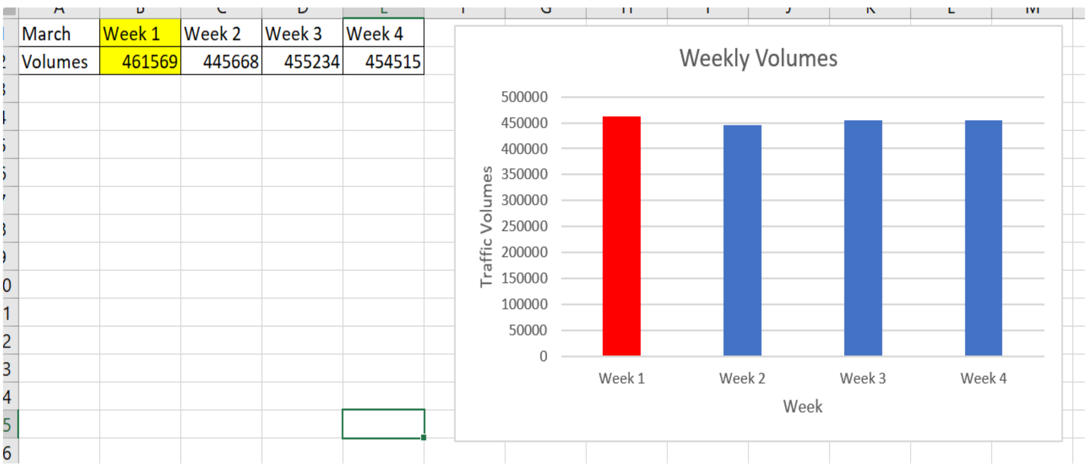



*Figure 4.1 Analysis of Weekly Volumes*

This are Figure 4.1 shows that survey of traffic volume as per the weekly. The which week is busiest to calculate Peak hour as Morning and evening too. As shown in figure week 1 selected

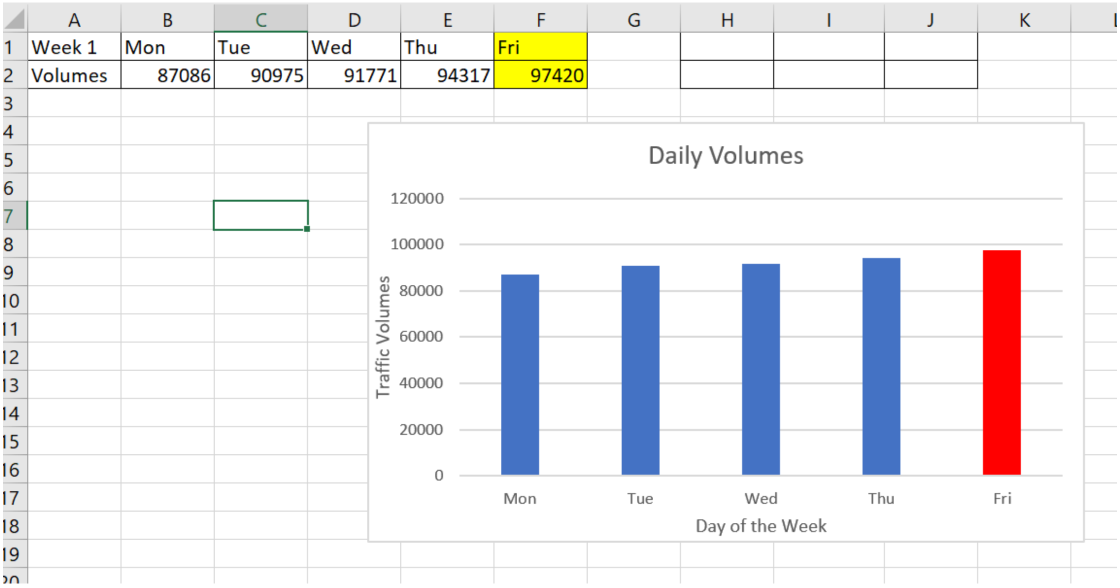
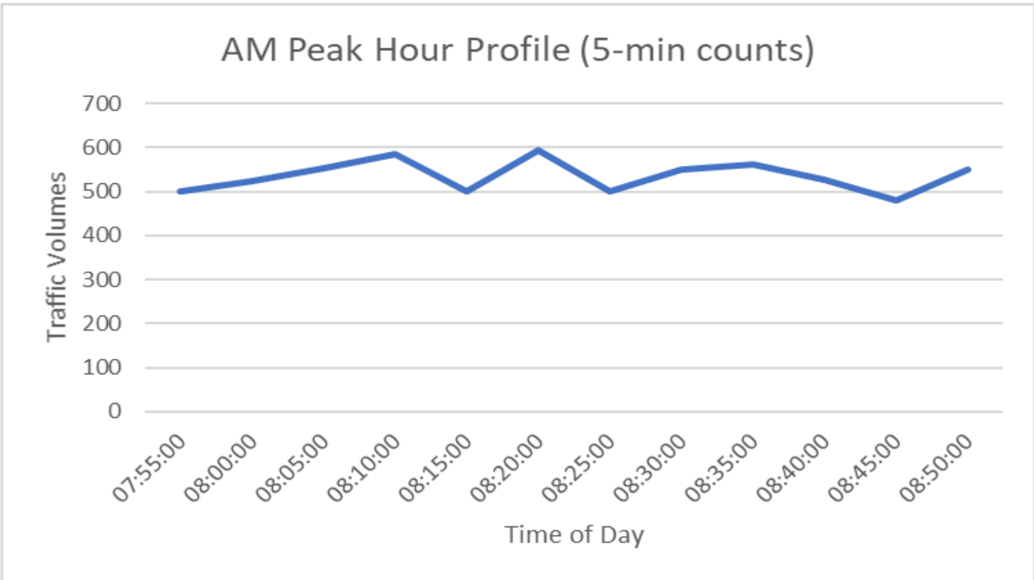



*Figure 4.2 Analysis of Daily Volumes*

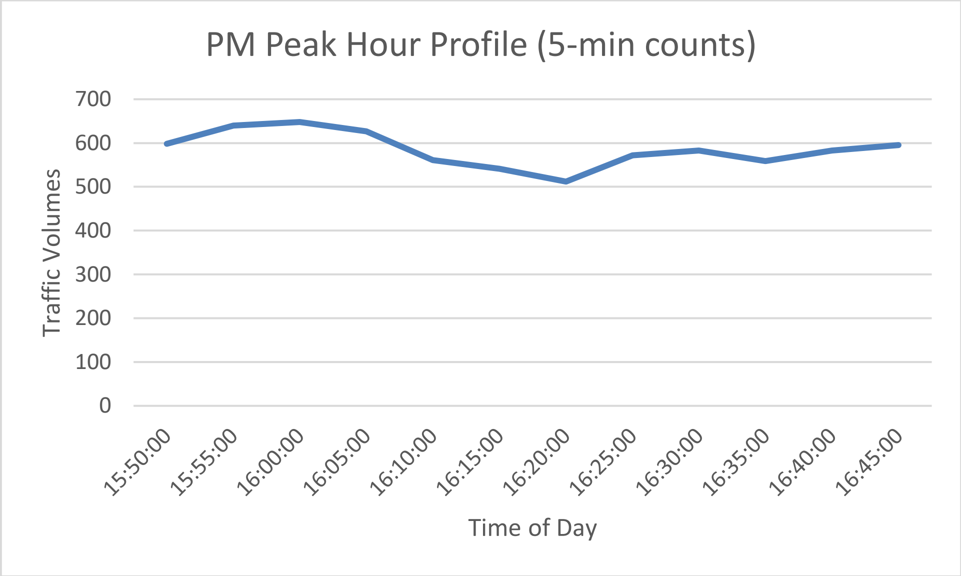
This Figure 4.2 shows that survey of traffic volume as per the Daily days. The which most of the day is busiest to calculate Peak hour as Morning and evening too. Analysis completed to find the busiest weekday for week 1. Friday selected.

- **Analysis completed to determine vehicle volume profiles for each peak period**




*4.3 AM Peak Hour Profile*

This are Figure 4.3 shows that survey of traffic volume as per AM peak Hour Profile 5 Min counts. The which peak hour is busiest to calculate as Morning and evening too. As shown in figure 5 min Counts




*4.4 Pm Peak Hours Profile*

This are Figure 4.3 shows that survey of traffic volume as per PM peak Hour Profile 5 Min counts. The which peak hour is busiest to calculate as Morning and evening too. As shown in figure 5 min Counts

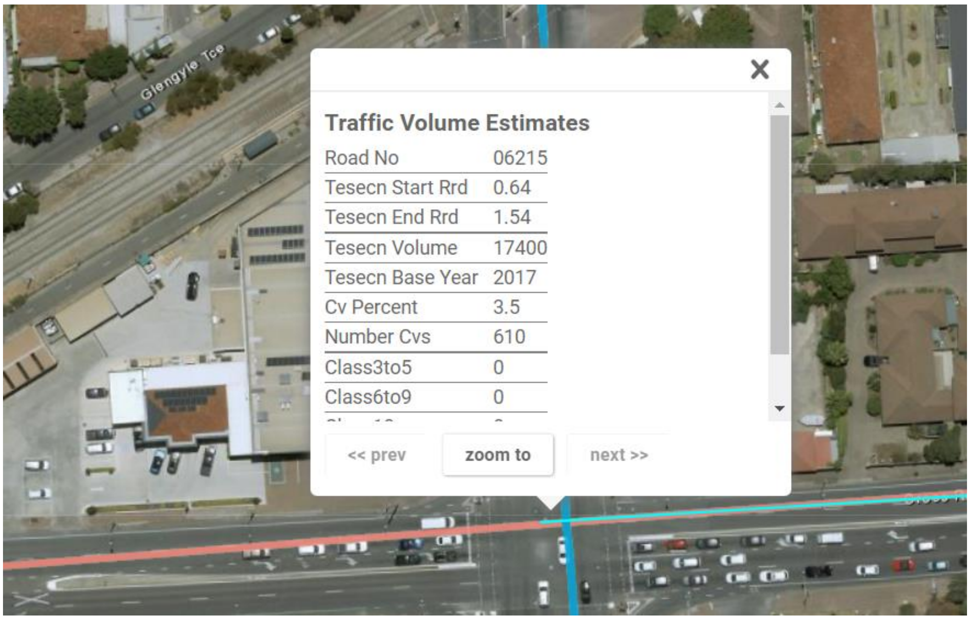



*Figure 5: DPTI's Map of CV Traffic Estimation*

Number of Cars and heavy vehicles are taken in consideration of design modelling and heavy vehicle percentage is used from DPTI's Map viewer for cv Percent https://www.dpti.sa.gov.au/traffic_volumes.

Figure removed due to copyright restriction

*Figure 6: Traffic growth in Australian cities*

The above graph depicts traffic growth in Australian metropolitan centers from 2002 to 2020. For example, traffic in Adelaide increased 18% from 2002 to 2021, therefore it increased 1% each year in Adelaide, so I used 1% for future traffic data analysis (Department of transport and regional service bureau of Transport and regional economics)

DATA Collection –

The full data collection requirements are outlined in Section 8 APPENDIX B – DATA COLLECTION. Data available from the Department must be formally requested, in writing, to DIT.RoadTrafficData@sa.gov.au, and DIT.TrafficOpsData@sa.gov.au

Ref – (SIDRA and Dipti.SA.Gov)

The shared lane survey is missing for intersections TS099, I went there personally during peak hours, from 7:50 to 8:50 AM and 15:45 to 16:45 PM took 1-hour interwall Counts of vehicle for each approach, which I subsequently used in SIDRA modelling.

*Figure 7 Manual Counting from SW approach*

*Figure 8 Manual Counting from East Approach*

**SCATS Counts for all intersection TS099, TS100, TS101**

Some of the intersections in this signal pashing data do not have a turning sign. I had to go to the real location and conduct a survey of turning signs as well as vehicle volumes.

TS099 AM and on-site survey data including

| TS 099 | East | | | West | | | North-East | | | South-West | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AM PEAK HOURS | Left | Through | Right | Left | Through | Right | Left | Through | Right | Left | Through | Right |
| Total | 199 | 817 | 44 | 188 | 1536 | 23 | 56 | 813 | 168 | 32 | 1149 | 425 |
| Light | 191 | 766 | 40 | 180 | 1459 | 18 | 52 | 779 | 161 | 27 | 1105 | 409 |
| Heavy | 7 | 29 | 2 | 5 | 54 | 2 | 2 | 29 | 5 | 2 | 40 | 15 |
| Buses | 1 | 22 | 2 | 3 | 23 | 3 | 2 | 5 | 2 | 3 | 4 | 1 |

TS099 PM

| TS 099 | East | | | West | | | North-East | | | South-West | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PM PEAK HOURS | Left | Through | Right | Left | Through | Right | Left | Through | Right | Left | Through | Right |
| Total | 366 | 1431 | 91 | 130 | 1006 | 42 | 54 | 1000 | 186 | 30 | 940 | 342 |
| Light | 322 | 1363 | 87 | 122 | 947 | 37 | 50 | 959 | 179 | 24 | 903 | 329 |
| Heavy | 12 | 50 | 2 | 5 | 36 | 2 | 2 | 35 | 5 | 2 | 33 | 12 |
| Buses | 2 | 18 | 2 | 3 | 23 | 3 | 2 | 6 | 2 | 3 | 4 | 1 |

## TS100 AM

| TS 100 | North | | | South | | | West | | | East | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AM PEAK HOURS | Left | Through | Right | Left | Through | Right | Left | Through | Right | Left | Through | Right |
| Total | 76 | 1008 | 28 | 52 | 1468 | 211 | 46 | 381 | 198 | 35 | 481 | 164 |
| Light | 72 | 998 | 24 | 49 | 1439 | 202 | 44 | 372 | 191 | 30 | 459 | 158 |
| Heavy | 3 | 36 | 2 | 2 | 52 | 6 | 2 | 14 | 5 | 2 | 18 | 5 |
| Buses | 1 | 26 | 2 | 1 | 23 | 3 | 2 | 5 | 2 | 3 | 4 | 1 |

## TS100 PM

| TS 100 | North | | | South | | | West | | | East | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PM PEAK HOURS | Left | Through | Right | Left | Through | Right | Left | Through | Right | Left | Through | Right |
| Total | 67 | 1607 | 47 | 52 | 1348 | 211 | 36 | 440 | 226 | 38 | 449 | 189 |
| Light | 64 | 1517 | 43 | 49 | 1326 | 202 | 32 | 429 | 218 | 33 | 429 | 183 |
| Heavy | 3 | 57 | 2 | 2 | 48 | 6 | 2 | 16 | 6 | 2 | 16 | 5 |
| Buses | 1 | 33 | 2 | 1 | 26 | 3 | 2 | 5 | 2 | 3 | 4 | 1 |

## TS101 AM

| TS 101 | North-East | | | South-West | | | North-West | | | South-East | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AM PEAK HOURS | Left | Through | Right | Left | Through | Right | Left | Through | Right | Left | Through | Right |
| Total | 68 | 805 | 89 | 42 | 1640 | 198 | 46 | 380 | 58 | 35 | 339 | 52 |
| Light | 64 | 760 | 84 | 39 | 1560 | 189 | 42 | 361 | 51 | 30 | 323 | 46 |
| Heavy | 3 | 29 | 3 | 2 | 58 | 6 | 2 | 14 | 5 | 2 | 12 | 5 |
| Buses | 1 | 16 | 2 | 1 | 22 | 3 | 2 | 5 | 2 | 3 | 4 | 1 |

## TS101 PM

| TS 101 | North-East | | | South-West | | | North-West | | | South-East | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PM PEAK HOURS | Left | Through | Right | Left | Through | Right | Left | Through | Right | Left | Through | Right |
| Total | 46 | 1500 | 91 | 32 | 951 | 245 | 36 | 425 | 46 | 32 | 245 | 48 |
| Light | 43 | 1435 | 86 | 29 | 899 | 233 | 32 | 405 | 39 | 27 | 232 | 42 |
| Heavy | 2 | 53 | 3 | 2 | 34 | 9 | 2 | 15 | 5 | 2 | 9 | 5 |
| Buses | 1 | 12 | 2 | 1 | 18 | 3 | 2 | 5 | 2 | 3 | 4 | 1 |

*Table 2 – Scats total Counts of all Intersection*

This Table No 2 – SCATS total Counts of All intersection TS099, TS 100, TS 101 AM and PM Data which all over turning counts of all the Direction which is shown in above the figure, each of Direction shown different Count of Vehicle Volumes

**Scats Phasing Analysis –**

- SCATS phasing data used for the same AM and PM peak periods

```
Friday 10-March-2017 07:51 SS   5M+ PL 4.4  PV  46.4 CL  120 +0 RL 115' SA 19  DS 136
 Int   SA/LK   PH  PT!  DS  VO  VK!  DS  VO  VK!  DS  VO  VK!  DS  VO  VK! ADS
   99 S  15  '  1  40!  -        -!  48   9  11!  42   7   8!  39   8   9!   42
   99 S  16  '  2  40!  -        -!  87  18  18!  88  18  20!  92  20  21!   90
   99 S  17     5   0!   0   0   0!  -        -!  -        -!  -        -!    0
   99 S  18     6   0!   0   0   0!  -        -!  -        -!  -        -!    0
   99 S 153  ' DE  41!  33   7   6!  46  10  10!  -        -!  -        -!   67
   99 S 154  ' EF  51!  97  21  23!  97  22  25!  -        -!  -        -!   88
   99 S 287  '  D  26!  54   7   7!  -        -!  -        -!  -        -!   42
   99 S 288  '  F  36> 104  16  20!  -        -!  -        -!  -        ->  104
   99 L   7  '  2  40!  -        -!  87  18  18!  88  18  20!  92  20  21! 1820
   99 L   8  '  1  40!  -        -!  48   9  11!  42   7   8!  39   8   9!  880
A=<31>  B=1  C=1  D=26  E=10  F=33  G=1
```

*Figure 9 – Scats phasing Analysis*

- Phasing data averaged across the peak hours as recommended by DIT Sidra development manual

| AM Peak | A | B | C | D | E | F | G | CL |
|---|---|---|---|---|---|---|---|---|
| TS099 | 38 | 0 | 0 | 29 | 12 | 41 | 0 | 120 |
| TS100 | 60 | 0 | 0 | 22 | 24 | 0 | 16 | 120 |
| TS101 | 45 | 1.2 | 1.2 | 38 | 38 | 0 | 0 | 120 |

| PM Peak | A | B | C | D | E | F | G | CL |
|---|---|---|---|---|---|---|---|---|
| TS099 | 36 | 0 | 0 | 32 | 18 | 32 | 0 | 120 |
| TS100 | 57 | 0 | 0 | 24 | 23 | 0 | 18 | 120 |
| TS101 | 48 | 0 | 0 | 43 | 31 | 0 | 0 | 120 |

*Table 3 – Phasing Data of Am and PM*

- Input phasing data into Sidra

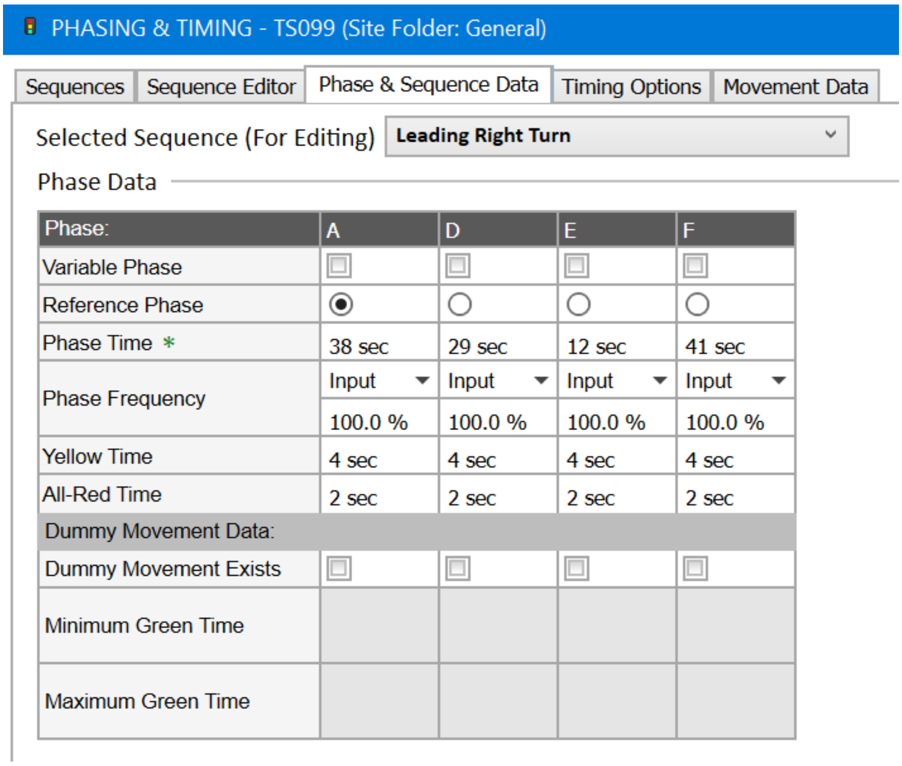



*Figure 10 - Phasing and Timing Data input*

In the models submitted to the Department, the Variable Phase boxes should not be checked. SIDRA will not determine the phase sequence, which must reflect the actual phase sequence and signal groups displayed by SCATS®. When overlap phasing sequences are evaluated with variable phase configurations, the resulting phase sequence should be set in the model before it is delivered to the Department. Ref – (SIDRA and Dipti.SA.Gov)

- Check Sidra phasing output

## PHASING SUMMARY

**Site: ANZAC [TS099 (Site Folder: General)]**



New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated    Cycle Time = 120 seconds (Site User-Given Phase Times)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times specified by the user**
**Phase Sequence: Leading Right Turn**
**Reference Phase: Phase A**
**Input Phase Sequence: A, D, E, F**
**Output Phase Sequence: A, D, E, F**

### Phase Timing Summary

| Phase | A | D | E | F |
|---|---|---|---|---|
| Phase Change Time (sec) | 0 | 38 | 67 | 79 |
| Green Time (sec) | 32 | 23 | 6 | 35 |
| Phase Time (sec) | 38 | 29 | 12 | 41 |
| Phase Split | 32% | 24% | 10% | 34% |

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

**Output Phase Sequence**

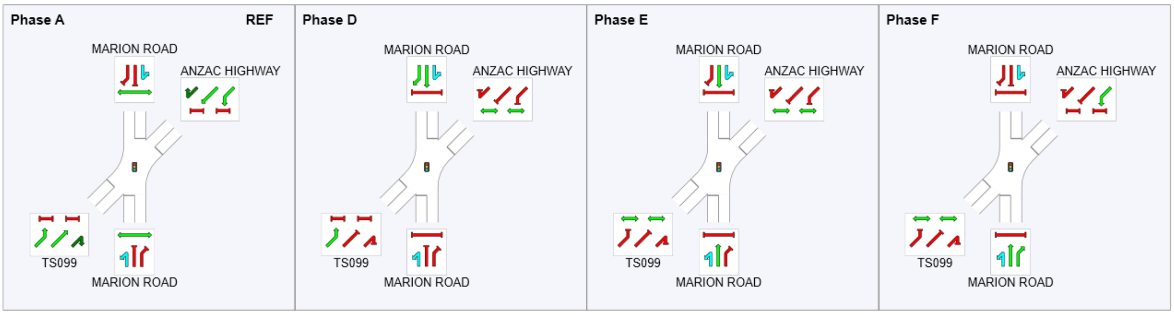



*Figure 11 - SIDRA Phasing Output Data*

REF- DIT.RoadTrafficData@sa.gov.au.
Sites where the current cycle time is less than the maximum can only be analyzed up to the SCATS® Summary's maximum cycle time setting. Unless otherwise indicated in contract papers or approved by the Department, the user-defined cycle time for new signal installations should be 120 seconds. If 120 seconds or the required value is not possible, the alternative must be documented in reports.

Ref – (SIDRA and Dipti.SA.Gov)

**Model Building of Existing Condition –**

Ref – (SIDRA and Dipti.SA.Gov)

The method for designing the existing circumstances for every other intersection is detailed in the paper above. For three intersections, we started a step-by-step method. The steps following will show you how we went about doing this.

Intersection –

We were required to enter a site analysis as well as change all existing approaches and details for those specific approaches due to junction data (for instance, distances). For signaling, we even have used an Area Type Factor.

Movement Definitions –

The capacity factor vehicle categories at the intersection, as well as which particular vehicles use the intersection, are defined by movement definitions (for fairly obvious reasons, buses, heavy vehicles, light vehicles, bicycles). We also had to apply source movements, movement names, and turn designations.

Lane Geometry Data –

This component of the intersection involved a selective approach, which included additional lanes for approach and exits as well as strip islands. It also included the removal of lanes where necessary. The intersection's geometry as it was at the time. This included lane configuration information, as well as any particularly distinctive lane types, approaches, and grades as needed. We must also establish the lane disciplines, or which directions and turns are permitted at specified crossing portions.

Pedestrians –

Pedestrians are concerned with the classification of various types of crossing and pedestrian movements, as well as the types of monitoring at junctions (signals of selection, unsignalized or automatically set). We used SIDRA functionalized default moving and timing data for pedestrians.

Volumes –

We used SCATS counts for all detectors and calculated the peak hour for modelling. We also calculated total turning counts for each individual turn over the time period indicated. We also had to test the detector sites for the junction layouts and the SCATS operating board, and we were directed to analyze the turning proportions using manual turning counts for sharing lane detectors and missing detectors. We also had to determine the proportions of light and heavy vehicles using manual turning counts. Ref – (SIDRA and Dipti.SA.Gov)

Priorities –

Using all types of movement and identifying any conflicting movements were top priorities (i.e., giving way or the priority movements actually required at the intersection). This encompassed both autos and pedestrians.

Gap acceptance –

Two-way sign power and configurations that followed the SIDRA general standard were among the gaps that were accepted. Both of the options used in the procedure were set to default.

Vehicle Movements Data –

Two-way sign power and configurations that followed the SIDRA general standard were among the gaps that were accepted. Both of the options used in the procedure were set to default. Ref – (SIDRA and Dipti.SA.Gov)

Phasing and Timing –

Modifying multiple types of sequences (for example, red – stop, green – run) was required for phasing and timing. For existing situations, we used 'user-provided phase times' and classified the data as 'phase and sequence data.' If the signal connection was to be maintained, we utilized 'user-given cycle time,' or 'practical cycle time,' which was 120 seconds if the linked signal was not to be preserved. Ref – (SIDRA and Dipti.SA.Gov)

Demand and Sensitivity –

Demand and sensitivity required conducting a useful life analysis for current and final scenarios over the next ten years in order to assess future junction efficiency.

Reference – *(https://www.dpti.sa.gov.au/__data/assets/pdf_file/0009/365895/Traffic_Modelling_Guidelines_SIDRA_Intersection_Version_2_0_August_2021.PDF)*

## 5. Result and Analysis SIDRA modelling for each intersection

The Three Triangular intersections of Marion Road to Cross road (TS 100) and Marion Road to Anzac Highway (TS 101) that we were assigned the task with modelling for this major assignment. Both intersections showed unusually bad performance after initial modelling with SIDRA–each with major delays, queues and LOS. Which is to be emphasized that the two intersections we modelled are in fact also two of Adelaide 's busiest outbound intersections–and railway crossing between two roads, we are interpreting these intersections for TS 099 at their peak times (7:50–8:50) and (15:45-16:45) for TS 100.

**Existing Intersection -**

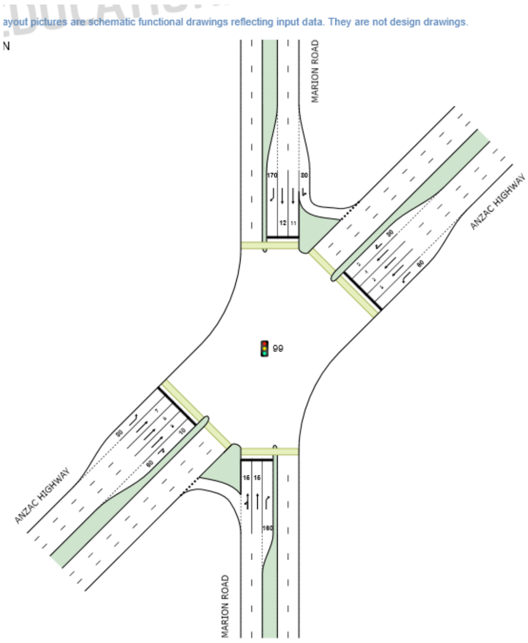



*Figure 12- Intersection TS099*

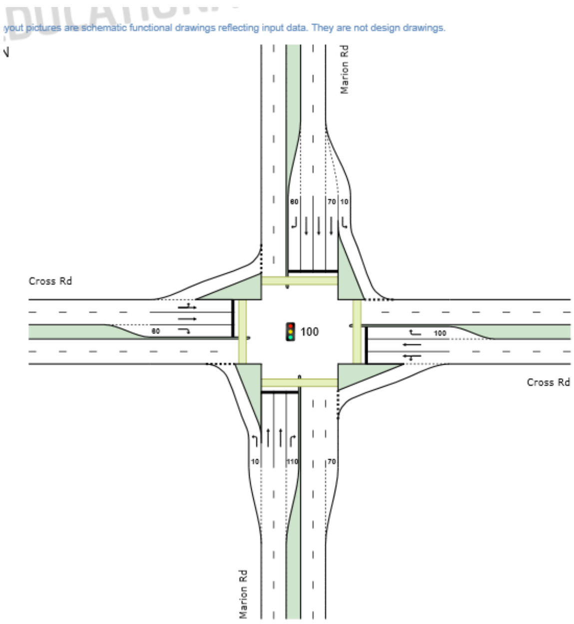



*Figure 13- Intersection TS100*

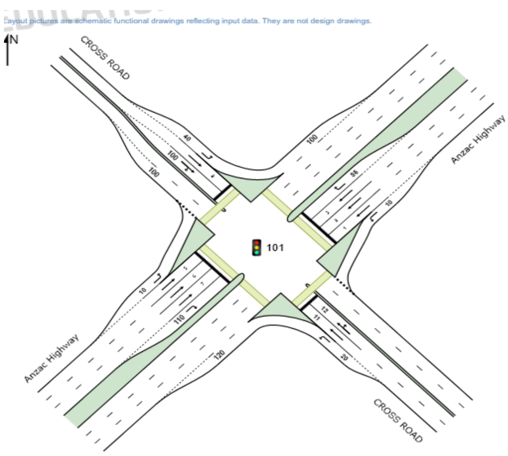



*Figure  - Intersection TS101*

### 5.1 Level of Service Existing Model 2017

The level of service is the most important aspect of this project, as is their participation in the development. In 2017, the level of service on the particular intersection and lanes was worsening. From the railway crossing main south road LOS D and south-west roadways to Anzac highway LOS E, level of services (LOS) along the midblock parts of the Marion Road intersection. On the non-stop motorway of the south-west roadway and the Anzac highway roadway, there were considerable operating challenges. Southwest road from main south road to Cross road has conducted LOS E, and the crossroad intersection connector has performed LOS E. The intersections of Anzac highway and Marion driveway have slightly poor LOS, as shown in the following image.

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | South | Northeast | North | Southwest | |
| LOS | D | D | D | F | E |

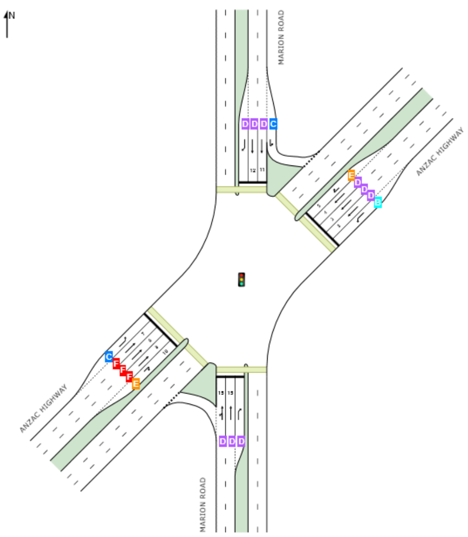



*Figure 14- Los Existing TS099*

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | South | East | North | West | |
| LOS | E | E | C | D | D |

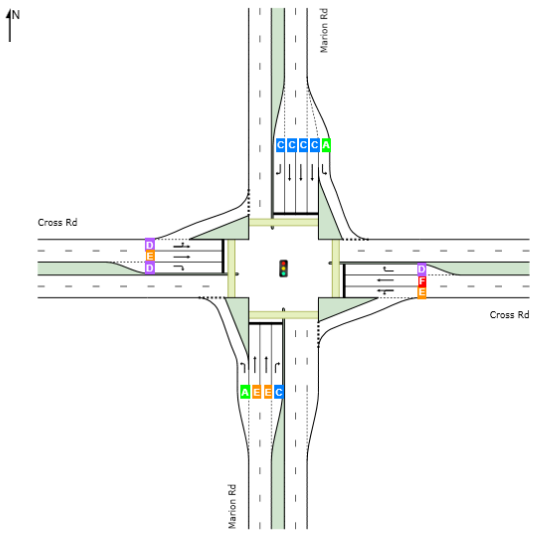



*Figure 15- Los Existing TS100*

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | Southeast | Northeast | Northwest | Southwest | |
| LOS | D | C | D | E | D |

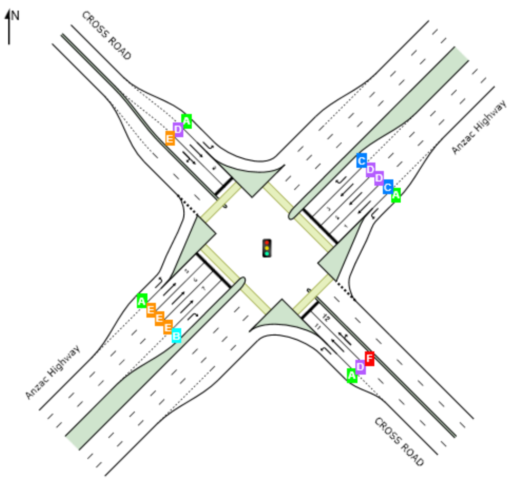



*Figure 16- LOS Existing TS101*

**The Reason Modelling All of Intersection –**

The benefit of performing a SIDRA design life study on an existing system is that it allows you to understand how the junction might perform in future years (e.g., 20 years from now) if no intersection enhancements are made due to high traffic flow growth (e.g., 1% per year). The primary reason we want to do a SIDRA design life study on the favored plan is to see how well it will work in the future (e.g., there will be any spare capability after 10 years from implementation of the recommendations). Furthermore, not only existing traffic volumes, but also future predicted (or assumed) volumes can be used to distinguish between present and desired systems, allowing for adequate cost-benefit evaluations.

It allows for too much clarity when evaluating significant growth opportunities, and it often narrows down the paths via which such advancement can be made more effectively. This provides a platform for decision-making based on evidence and reasoning.

As mentioned during the simulation phase, we were able to achieve pretty large reductions in the factor. To achieve improved efficiency, several features of Three junctions have been optimized.

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | South | Northeast | North | Southwest | |
| LOS | C | C | D | D | D |

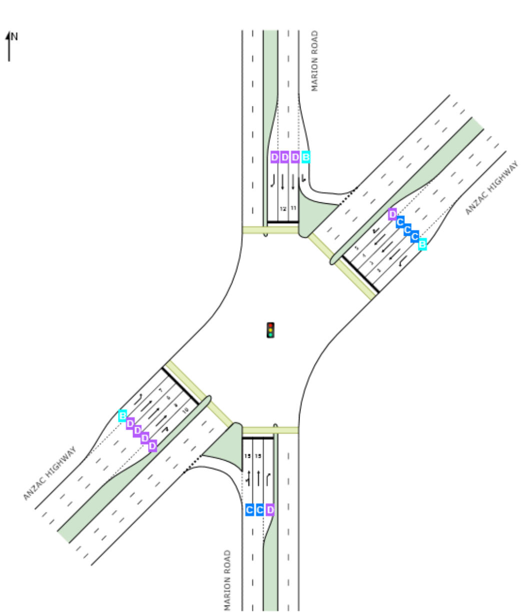



*Figure 17 - LOS Optimized TS099*

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | South | East | North | West | |
| LOS | E | E | C | E | D |

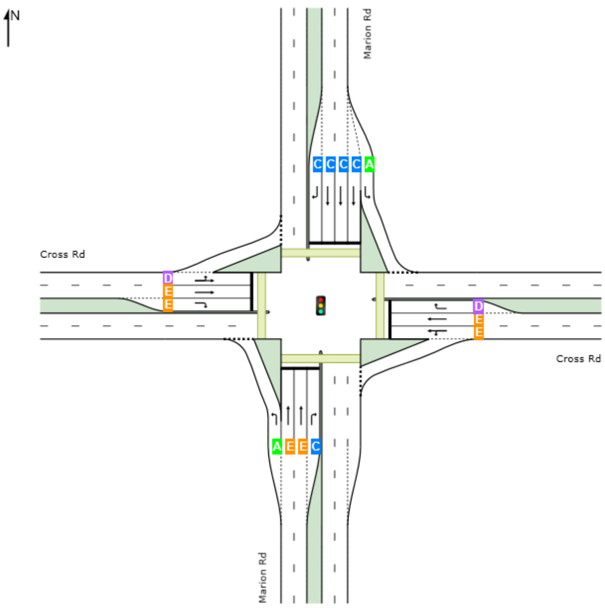



*Figure 18- Los Optimized TS100*

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | Southeast | Northeast | Northwest | Southwest | |
| LOS | C | B | C | C | C |

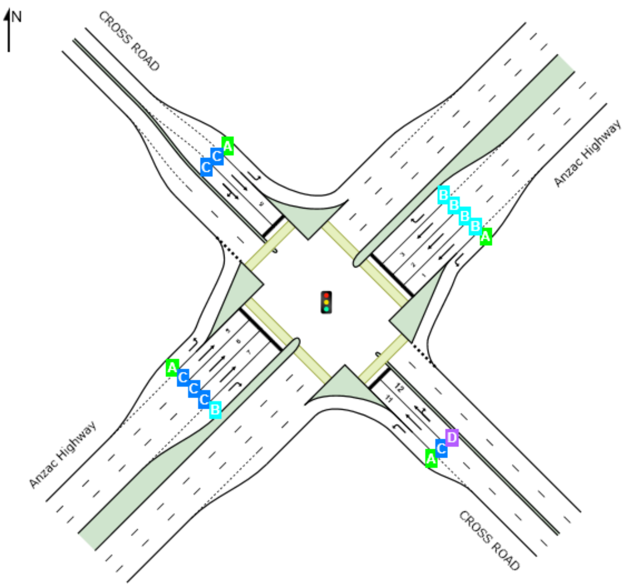



*Figure 19 - Los Optimized TS101*

<u>Some important improvements are done in comparison to the current intersection service to achieve the essential better functioning intersection, as illustrated below.</u>

| **Intersection** | **Changes** |
|---|---|
| TS099 | ➢ Intersection rotated so that Marion Rd is North-South<br>➢ Short left lane from North changed to 80m<br>➢ Lane discipline changed on Marion Rd (see Google)<br>➢ Right turn lane from North 170m<br>➢ Right turn lane from South 160m<br>➢ Left turn lane from South-West short 80m<br>➢ Left turn lane from North-East short 60m<br>➢ Right turn lane from North-East short 80m<br>➢ Exit lanes on Anzac Hwy changed to 3<br>➢ Left turn slip lanes on Marion Rd changed to “High angle”<br>➢ Median islands adjusted on all four approaches<br>➢ Pedestrian crossings across Anzac Hwy changed to “Staged Crossings”<br>➢ Growth rate per year changed to 1%<br>➢ “Priorities” fixed<br>➢ “Phasing fixed”<br>➢ Phase times for PM inputted<br>➢ Lane discipline on North fixed |

| | |
|---|---|
| TS100 | ➢ Driving on the right selected instead of driving on the left. The whole intersection needed to be re-done |
| TS101 | ➢ Short turn lanes specified as per Google maps<br>➢ Lane discipline fixed<br>➢ Median islands adjusted on all four approaches<br>➢ Pedestrian crossings across Anzac Hwy changed to “Staged Crossings”<br>➢ “Priorities” fixed<br>➢ “Phasing fixed”<br>➢ Phase times for PM inputted |

*Table 4 – Three Intersection of these Changes*

Upgrade all Three Intersection for check LOS in below down –

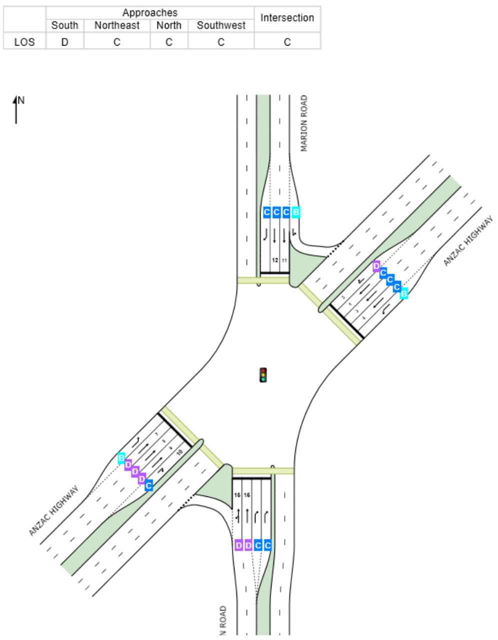



Figure 20 – LOS Upgrade TS099

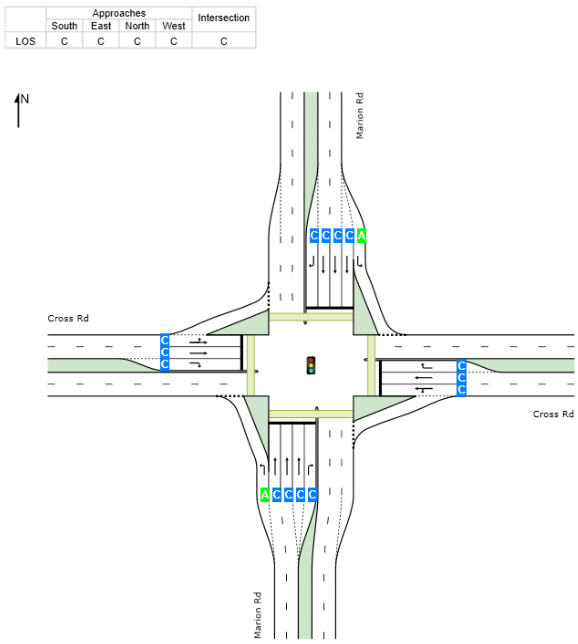



Figure 21- Los Upgrade TS100

| | Approaches | | | | Intersection |
|---|---|---|---|---|---|
| | Southeast | Northeast | Northwest | Southwest | |
| LOS | C | B | C | C | C |

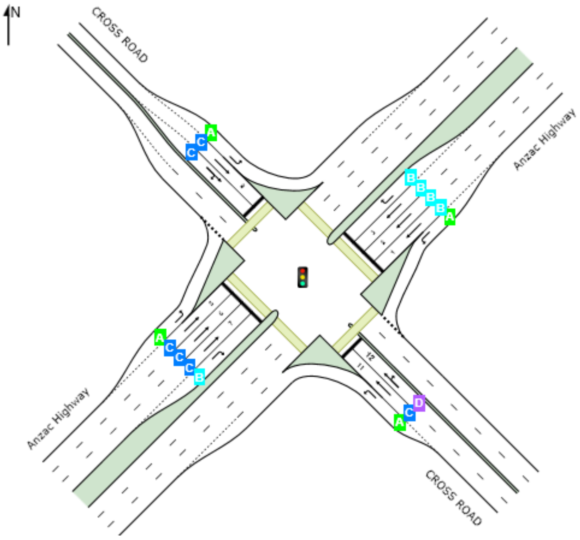



*Figure 22 – Los Upgrade TS101*

**Table of LOS After 20 years**

| **Particulars** | **Existing Model LOS** | **Optimised Model LOS** | **Upgrading Model LOS** |
|---|---|---|---|
| **Intersection TS099 LOS** | E | D | C |
| **Intersection TS100 LOS** | E | D | C |
| **Intersection TS101 LOS** | D | D | C |

*Table 5 – all Intersection of LOS after upgrading*

**LOS –** The level of service is largely used as a limit control for developed models in order to ensure that the scenario is feasible. The minimal requirement for crossings in personal strategic for the upcoming design year is LOS D as a performance metric. However, level of service can be utilized to show a rough contrast between the base case and the eventualities. It's useless for testing best estimate models. REF- (Dipti.SA.Gov)

These are two critical factors for the project's long-term viability and forecasting, and we're seeing the modeling life requirement that we build the intersection with and the adaptability that we can use to estimate the future value of the service level and delays. This is also highly valuable in predicting crucial gaps and the progress that needs to be made.

We have increased the intersection demand to 20 years because we know that if we put the money in this project, it will provide a good level of service for the next 20 years, and we also realize that traffic is increasing at a rate of 1% to 2% each year. Both crossroads are designed to accommodate anticipated traffic increases over the next 10 years, and while some of the roads provide poor service, altogether, they provide excellent service for future scenarios.

For the intersection TS099 level of service C is as seen below during the next 20 years. And Level of service C for intersection TS100. As well as level of service C for intersection TS101.

## 5.2 SIDRA Network Development –

Traditional data analysis link-based types of networks, where lines represent lane groups and traffic conditions of particular lanes are aggregated and thus lost in more collected traffic units, the network model proposed for SIDRA INTERSECTION is a lane-based micro-analytical model.

**Uses of network model:**

- For coordinated signal systems, determine the length of the network cycle, phase timings, and offsets.
- It enables users to create a detailed lane-base network, complete with signalized and sign-controlled roundabouts and intersections.
- To allow the user to keep track of the lane movement flow ratios in order to decide whether or not to use the exit lane.

**Lanes Modelling:**

While calculating individual lane capacities, lane flows, and lane queues is important for evaluating the efficiency of a single intersection, it becomes even more important when modelling tight spaced interactions. In circumstances of tight intersections, lane capacity, lane flows, and lane queues for downstream and upstream concepts may become mutually interactive, necessitating the use of a lane-based method for reliable network modeling and simulation. When we first set up the network geometry configuration, it was red, which meant there weren't enough lanes, so we added an approach lane in TS 099 to TS100 and TS101. The network configuration was now in red.

**SIDRA Network 2017 Vs 2037**

The road network within this study region is depicted in the transit system at the back of the report. This project is a critical link in the network, and it is expected to have a substantial environmental and economic impact. The junctions of Sidra with the project's corridor include, Marion roadway, Cross Road and Anzac highway. Marion road to Cross drive non-stop motorway with railway crossing roadways intersection with these three main roads. This intersection TS099, TS100, TS101 are mainly connected triangular intersection.

As the TS099 to TS100 in between two intersections have main problem of railway crossing so which I have to evaluate of those intersection with delays, LOS, Average Flow of vehicles.

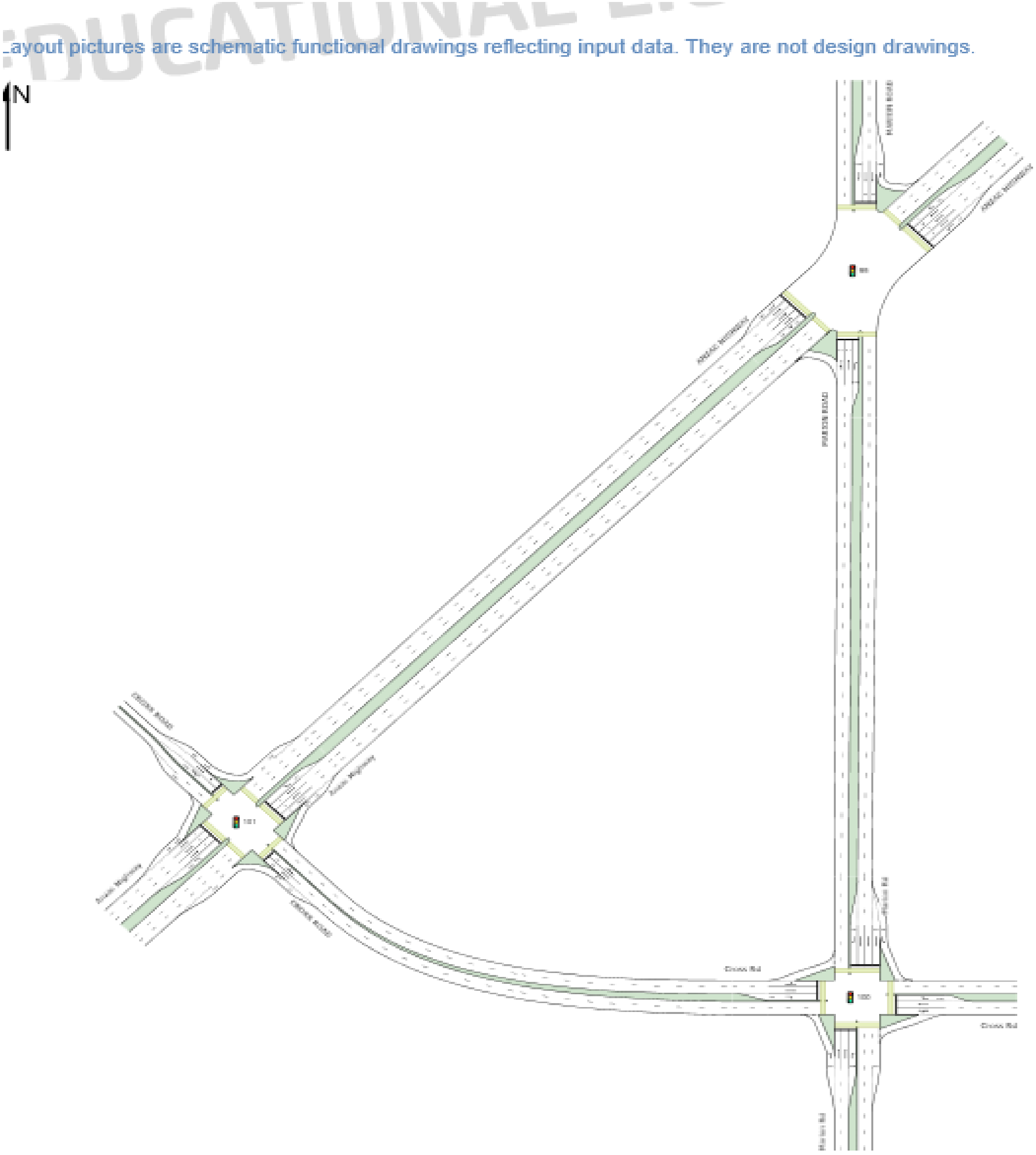



*Figure 23 - Existing Network Model*

**Existing Network Model of LOS – (2017)**

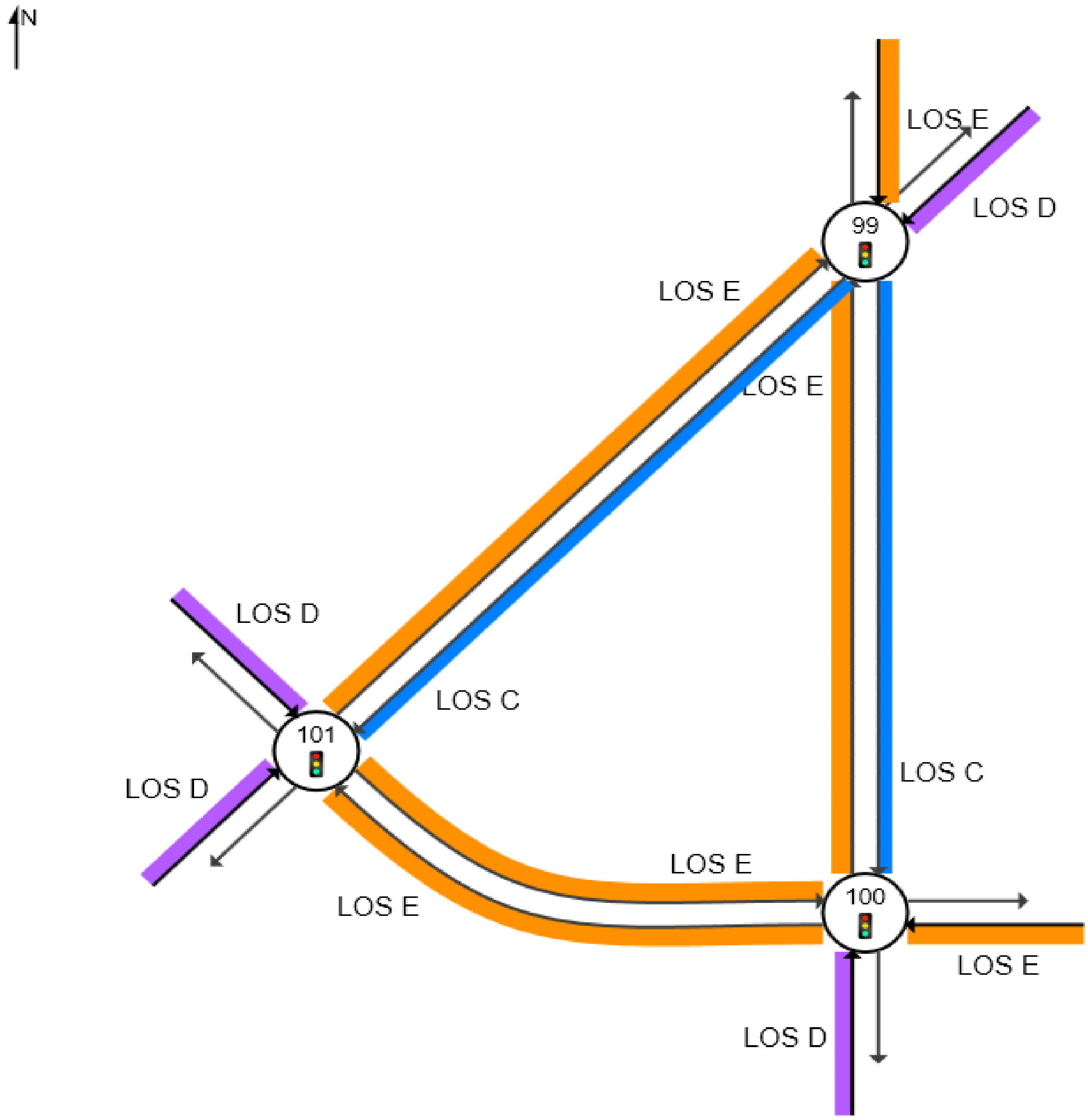



*Figure 24- Los of Existing Network Model*

The level of service is the most important aspect of this project, as is their participation in the development. In 2017, the level of service on the particular intersection and lanes was worsening. From the railway crossing main south road LOS D and south-west roadways to Anzac highway LOS E, level of services (LOS) along the midblock parts of the Marion Road intersection. On the non-stop motorway of Marion roadway and Marion roadway, there were serious operating challenges. There are railway crossing between road of Southwest Road from main south road to Cross road had a significantly worse LOS, and the crossroad intersection connector had a significantly worse LOS. There was slightly bad LOS displayed by the intersections of Anzac highway and Marion driveway, which are indicating in the above image.

**New Upgrade Network Level of service 2017 vs 2037 –**

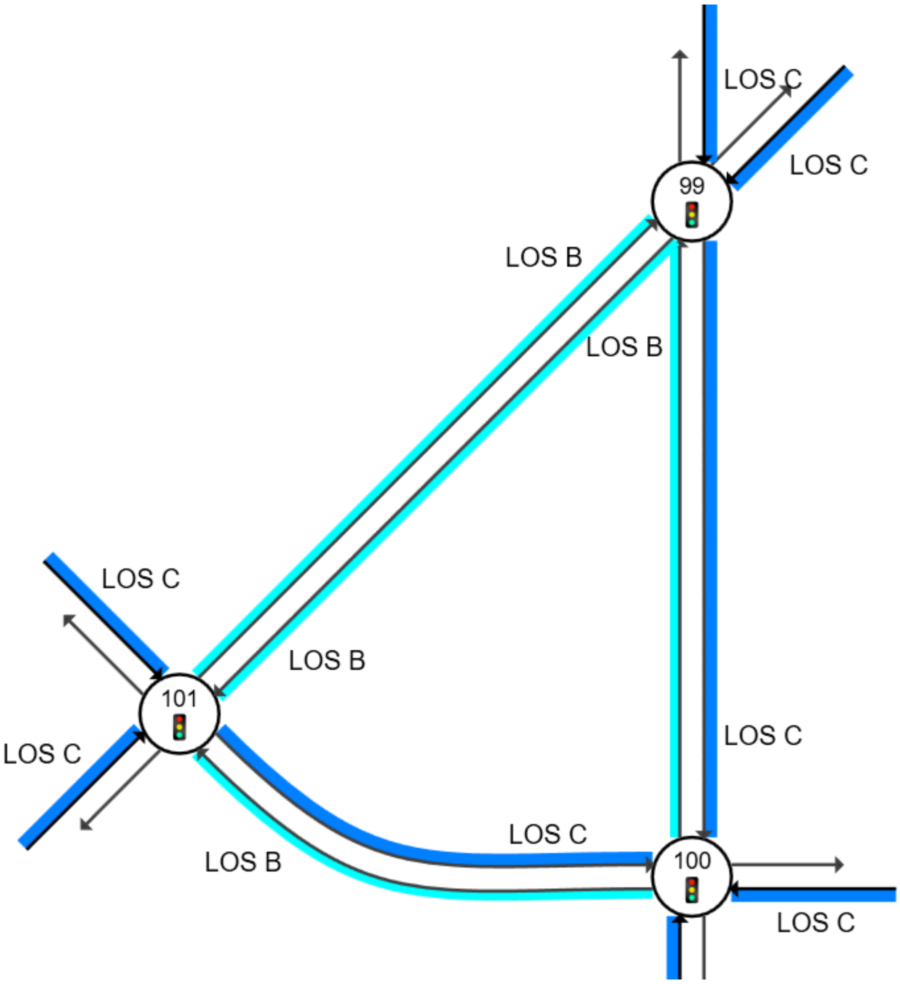



*Figure 25 – Los of Optimised and upgrade of Network Model*

In the 2037 model development, the level of service will be performed more accurately and high accuracy for future project upgrades. In 2031, all intersections and lanes function well in comparison to 2015, with the exception of one or two lanes. The level of service (LOS) will shift from LOS E to LOS C at the junction of Marion Road and Cross Road, and from LOS E to LOS B at the junction of Anzac Highway and Marion Road. On the non-stop motorway of Marion Road and crossroad, there will be several difficulties to overcome. One easy concept would be to do the cross junctions from Anzac Road to Marion Road in the same manner as the 2017 LOS E. But the other hand of Cross Road junction connector indicated the LOS E, which would turn to LOS C.

**Upgrade Network LOS of 20 Years -**

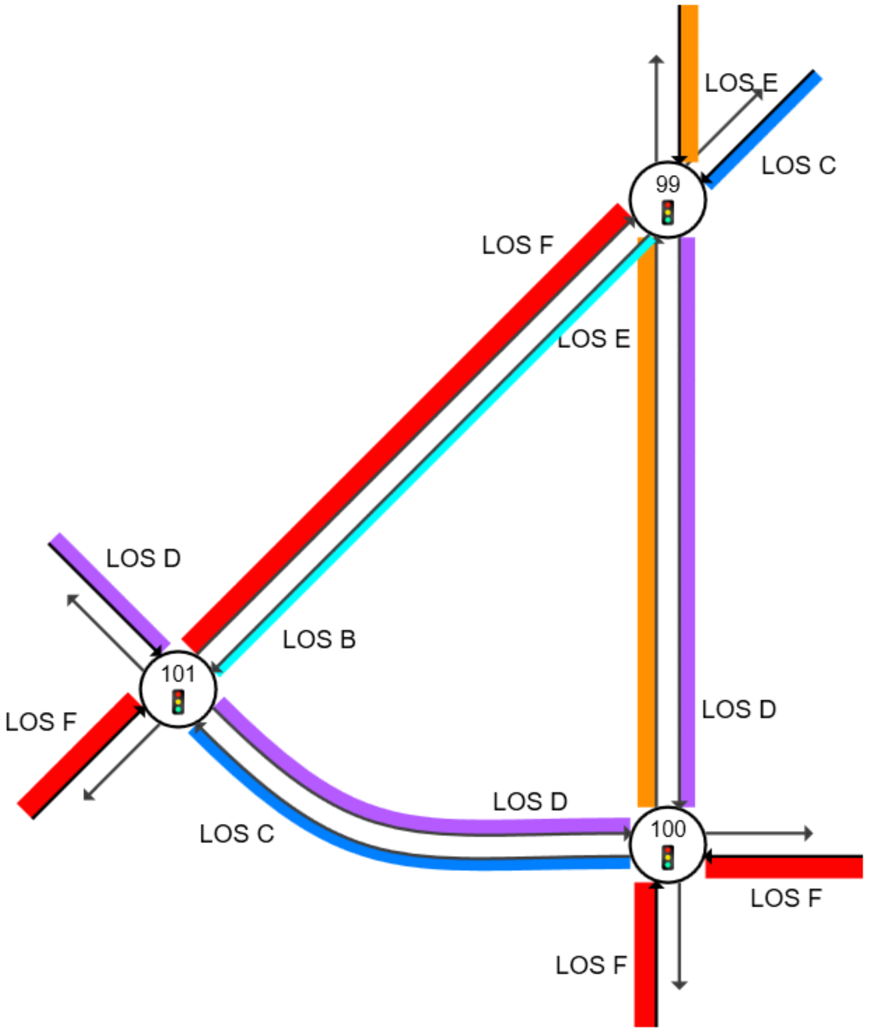



*Figure 26 – Los of Upgrade Network after 20 years*

**5.3 Delay**

There were highly commendable problems revealed by the output of the delays in the present model scenarios of 2017 and specifically compute the delays of 2017 network modelling (control results). The 2017 network delays are depicted in the following network control graphic, as well as the numbers in the table of delays. The following graphic plainly shows that there are a number of lanes that do not meet the network delay criteria. As can be seen in the figure, the network's starting point reflects 53.2 delays between Marion Road TS099 and Cross Road TS100. The number of delays has been found mostly at the Marion Road intersection and the Cross Road TS100 intersection, such as from the west side from Marion Road indicates 67.9, and at the intersection TS100 junction, the number of delays displays in the following image, such as from Anzac Highway from west to east and east west found with 67.8 and 62.1 delays respectively.

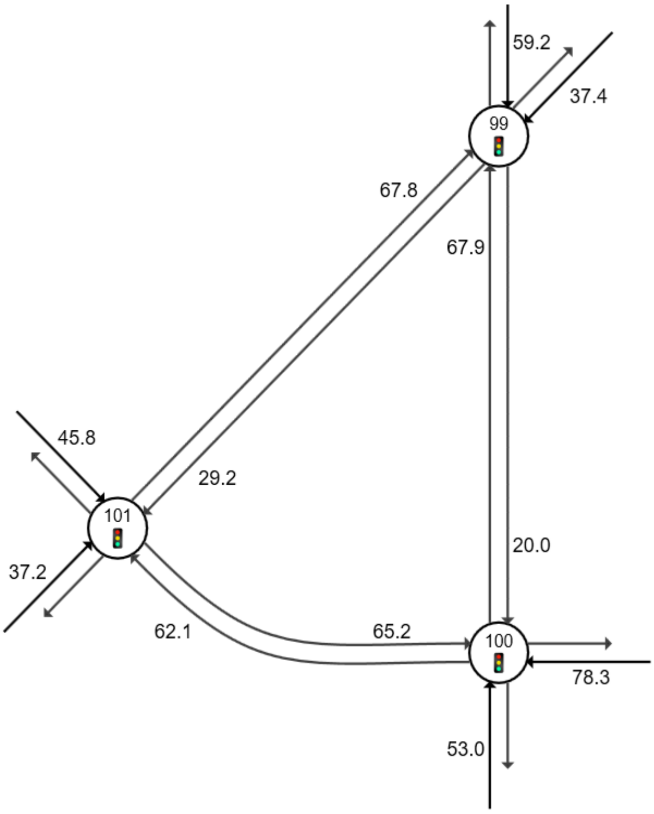



*Figure 27 - Existing Delay Network 2017*

There are fewer delays detected in the portion of the crossroad intersection. At the section of Cross road intersection there are a smaller number of delays found between TS099 to TS100 which is 20.0 and 37.4.

**New Develop Network and After Upgrades**

The network's starting point reflects 31.4 delays between Marion Road TS099 and Cross Road TS100. The number of delays has been found mostly at the Marion Road intersection and the Cross Road TS100 intersection, such as from the west side from Marion Road indicates 13.4, and at the intersection TS100 junction, the number of delays displays in the following image, such as from Anzac Highway from west to east and east west found with 12.6 and 14.4 delays respectively. There are fewer delays detected in the portion of the crossroad intersection. At the intersection of TS100 to TS101 there are too much change delays which is 12.4 and 37.4.

After Changing the length of queue, adding extra lane, phasing and time etc. this are the main component to improving delays of upgrade intersection.

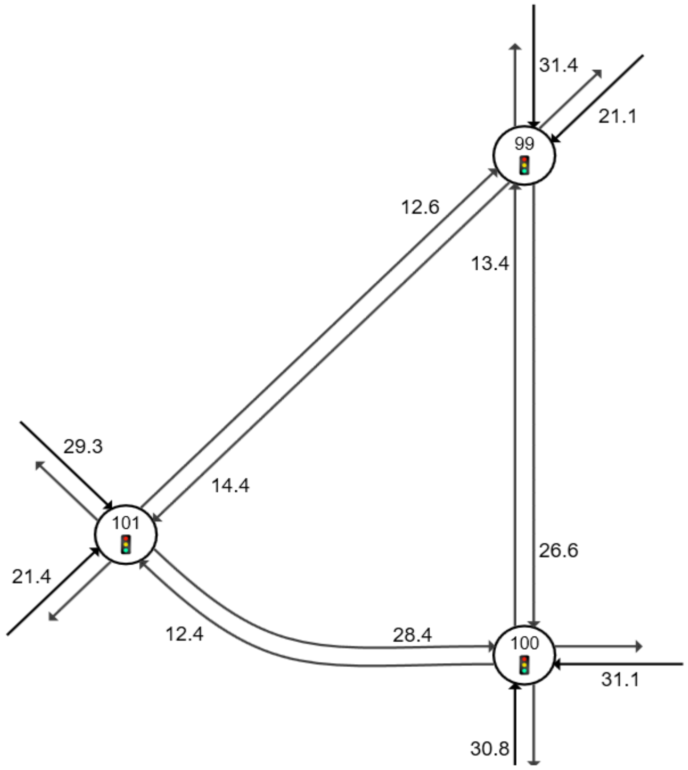



*Figure 28 – Optimised and Upgrade Network Delays*

There are fewer delays detected in the portion of the crossroad intersection. At the intersection of TS100 to TS101 there are too much change delays which is 12.4 and 37.4. After Changing the length of queue, adding extra lane, phasing and time etc. this are the main component to improving delays of upgrade intersection

**After 20 years upgrade network diagram**

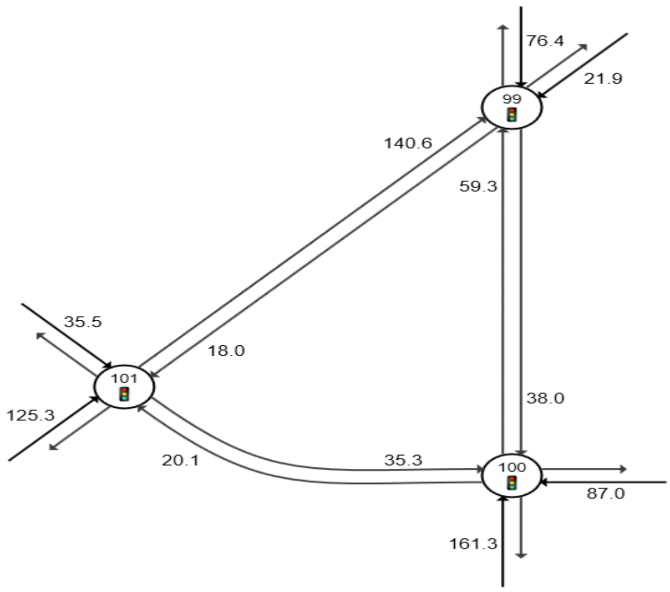



*Figure 29 - After 20 years Upgrade Network Delay*

Some of the intersections are getting worse in delays but as compare to upgrading intersection up to 20 years delays should be fine.

**Existing Network Table of Delays –**

| | | | |
|---|---|---|---|
| **Delays Total (Total)** | 189.97 veh-h/h | 15.32 ped-h/h | 320.80 pers-h/h |
| **Delay Control (Average)** | 51.2 sec | 69.3 sec | 50.7 sec |
| **Delay Control (Worst Lane)** | 94.6 sec | | |
| **Delay Control (Worst Movement)** | 94.6 sec | 69.3 sec | 94.6 sec |
| **Delay Geometrical (Average)** | 1.0 sec | | |
| **Stop-Line Delay (Average)** | 50.2 sec | | |

*Table 6 – Existing Network of Delays* *SIDRA SOFTWARE Result*

**Upgrade Network Table –**

| | | | |
|---|---|---|---|
| **Control Delay (Total)** | 81.79 veh-h/h | 6.52 ped-h/h | 141.74 pers-h/h |
| **Control Delay (Average) -** | 22.0 sec | 29.3 sec | 22.4 sec |
| **Control Delay (Worst Lane)** | 42.6 sec | | |
| **Control Delay (Worst Movement)** | 42.6 sec | 29.3 sec | 42.6 sec |
| **Geometric Delay (Average)** | 1.0 sec | | |
| **Stop-Line Delay (Average)** | 21.0 sec | | |

*Table 7 – Optimized and Upgrade Network Delays* *SIDRA SOFTWARE Result*

**What is Delay** - The total vehicle delay or travel time (vehicles hours per hour) and the number of car stops are the major measures of performance comparison output by SIDRA models (vehicles per hour). Only if crossings are treated similarly as independent controls can these measures be compared.

The decrease in main street traffic junction delays was accompanied by an increase in delays for other approaches. This was to be expected, given SCATS decreased the green time allotted for these techniques while increasing the Existing Increasing Delays is **51.2 Sec** red duration. However, because of the high volume of traffic on the major street, the average junction delay dropped After upgradation Control Delays 22 Sec.

### 5.4 Travel Time of Existing Network and Upgrade Network Intersection

Travelling time has been identified by Aust roadways guidelines as an essential network performance indicator, and road authorities and the Department of Development of Transportation and Planning are now conducting regular travel time studies. The traditional method of gathering travel time data from SIDRA software is to classify data as they travel over the 2017 road network and upgrade the 20-year plan. Some groups have created instrumented automobiles that integrate global positioning systems (GPS) with time and position data for performing trip time surveys.

**Travel Time and Speed Data –**

| | | | |
|---|---|---|---|
| **Travel Speed (Average)** | 28.5 km/h | 3.2 km/h | 26.9 km/h |
| **Travel Distance (Total)** | 10296.6 veh-km/h | 155.4 ped-km/h | 17085.6 pers-km/h |
| **Travel Time (Total)** | 361.6 veh-h/h | 48.6 ped-h/h | 653.9 pers-h/h |
| **Desired Speed (Program)** | 60.0 km/h | | |

*Table 8 – Existing Data of Travel Time and Speed Data*

After Existing model of intersection travel speed and travel time are really worse as shown in above the table

The travel time savings ranged from 6.6 percent to 31.8 percent. During the AM peak hour, travel time (peak direction) decreased by 7.9% (average travel speed increased from 28.5 km/h to 40.7 mph), while travel time (non-peak direction) decreased by 20.3 percent. The travel time (peak direction) improved by 7.8% during the evening peak hour (the average speed Improved from 26.9 km/h to 37.4 km/h). The evening commute time was reduced by 7.2 percent.

**Travel Time and Speed Data of Upgrade –**

| | | | |
|---|---|---|---|
| **Travel Speed (Average)** | 40.7 km/h | 3.9 km/h | 37.4 km/h |
| **Travel Distance (Total)** | 10318.8 veh-km/h | 155.9 ped-km/h | 10115.2 pers-km/h |
| **Travel Time (Total)** | 253.6 veh-h/h | 39.8 ped-h/h | 457.2 pers-h/h |
| **Desired Speed (Program)** | 60.0 km/h | | |

*Table 9 – Optimised and Upgrade Data of Travel Time and Speed Data*

After upgrade all three intersection it should be fine and improve for Travel speed up to 40.7km/h

**Travel Time and Speed Data of After 20 years**

| | | | |
|---|---|---|---|
| **Travel Speed (Average)** | 21.2 km/h | 3.9 km/h | 20.6 km/h |
| **Travel Distance (Total)** | 12253.6 veh-km/h | 187.0 ped-km/h | 20340.3 pers-km/h |
| **Travel Time (Total)** | 578.9 veh-h/h | 47.8 ped-h/h | 986.2 pers-h/h |
| **Desired Speed (Program)** | 60.0 km/h | | |

*Table 10 – After 20 years Data of Travel Time and Speed Data*

The average travel and cycling times along sections of a route are measured in this study between 2017 and 2031, while information on the location, duration, and source of delays is collected. The design pace of the project is shown in the table below.

In the upgrade network models, the design speeds for the Three Intersection Road Network should be 60 km/h.

| Table Design Speeds | |
|---|---|
| **Element** | **Design Speed (km/h)** |
| Motorway Not stop | 60 |
| Ramps On | 60 after the approach gore, 60 priors |
| Ramps Off | 60 after the exit gore, 60 priors |
| Road surface of Main South Road | 60 |
| Roadways of Local Council maintained | 60 |
| Other DPTI arterial roads | 10km/h higher than current posted speed |
| Shared use path | 25 |

*Table 11 -Design Speeds* (Ref- Dipti and SIDRA SA. GOV)

## 5.5 Cost Saving Scenarios

I can see that there are very few gaps with this level of service, and it saves a lot of money, and we didn't spend too much money on this by constructing tunnels or bridges. We just added an extra lane, a short and slip lane, which is less expensive than flyovers yet provides excellent service to road users. Design the intersection and perfect the geometry. Geometry has been adjusted to fit the intersection.

Existing Cost Data –

| Network Performance - Annual Values | | | | | | |
|---|---|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Pedestrians** | | **Persons** | |
| Demand Flows (Total for all Sites) | 64,08,000 | veh/y | 3,84,000 | ped/y | 1,09,21,340 | pers/y |
| Delay | 91,108 | veh-h/y | 7,388 | ped-h/y | 1,53,873 | pers-h/y |
| Effective Stops | 53,82,716 | veh/y | 3,69,410 | ped/y | 90,56,950 | pers/y |
| Travel Distance | 49,42,367 | veh-km/y | 74,575 | ped-km/y | 82,01,191 | pers-km/y |
| Travel Time | 1,73,547 | veh-h/y | 23,323 | ped-h/y | 3,05,210 | pers-h/y |
| Cost | 92,13,690 | $/y | 6,43,717 | $/y | 98,57,407 | $/y |
| Fuel Consumption | 6,37,163 | L/y | | | | |
| Carbon Dioxide | 15,11,104 | kg/y | | | | |
| Hydrocarbons | 158 | kg/y | | | | |
| Carbon Monoxide | 1,660 | kg/y | | | | |
| NOx | 2,640 | kg/y | | | | |

*Figure 30 – Existing Cost Data*

Cost of Existing Network Model is 92$B/year as shown in above figure, Ultimately, almost all of these changes are feasible when seen from a practical standpoint; nevertheless, many of them will cost significant sums of money and require a significant amount of time and work. For any transportation engineer, the difficulty is not simply to figure out exactly what has to be changed to make the intersection more usable, but also to be practical and assess possible reduction options against any associated hazards and costs.

After Upgrading all Intersection Network Model Cost Data –

| Network Performance - Annual Values | | | | | | |
|---|---|---|---|---|---|---|
| **Performance Measure** | **Vehicles** | | **Pedestrians** | | **Persons** | |
| Demand Flows (Total for all Sites) | 77,03,424 | veh/y | 4,60,800 | ped/y | 1,31,22,200 | pers/y |
| Delay | 1,78,501 | veh-h/y | 3,754 | ped-h/y | 2,91,043 | pers-h/y |
| Effective Stops | 1,12,11,710 | veh/y | 4,22,359 | ped/y | 1,85,28,660 | pers/y |
| Travel Distance | 58,81,720 | veh-km/y | 89,775 | ped-km/y | 97,63,341 | pers-km/y |
| Travel Time | 2,77,861 | veh-h/y | 22,937 | ped-h/y | 4,73,379 | pers-h/y |
| | | | | | | |
| Cost | 1,44,94,920 | $/y | 6,33,063 | $/y | 1,51,27,980 | $/y |
| Fuel Consumption | 9,16,763 | L/y | | | | |
| Carbon Dioxide | 21,72,974 | kg/y | | | | |
| Hydrocarbons | 244 | kg/y | | | | |
| Carbon Monoxide | 2,306 | kg/y | | | | |
| NOx | 3,851 | kg/y | | | | |

*Figure 31 – Upgrade Cost Data*

After Upgrading the Network Model which is adding different scenarios. Developing those intersection, changing data, phasing and timing etc. I have to saving cost after Upgradation per year is **1.4 $ Cr/year.**

**So, we don't need to construct Bridge and tunnel while making upgradation.**

# 6.0 Conclusion

For the intersection TS099 level of service C is as s during the next 20 years. And Level of service C for intersection TS100. As well as level of service C for intersection TS101.

Non-recurring incidents should be included in the real time of traffic management, and the system should use modelled data to create alternatives whenever such incidents occur, according to the findings. This was to be expected, given SCATS decreased the green time allotted for these techniques while increasing the Existing Increasing. Delays is **51.2 Sec** red duration. However, because of the high volume of traffic on the major street, the average junction delay dropped After upgradation Control Delays **22 Sec**.

The travel time savings ranged from 6.6 percent to 31.8 percent. During the AM peak hour, travel time (peak direction) decreased by 7.9% (average travel speed increased from 28.5 km/h to 40.7 mph), while travel time (non-peak direction) decreased by 20.3 percent. The travel time (peak direction) improved by 7.8% during the evening peak hour (the average speed Improved from 26.9 km/h to 37.4 km/h). The evening commute time was reduced by 7.2 percent.

SCATS data can be used to analyses the current condition and design of an intersection using SIDRA software. It shows that delays and LOS are very bad in almost all intersections, and that upgrades such as adding an extra lane or upgrading according to cost-effectiveness can help reduce traffic congestion at intersections and provide dependable traffic flow during peak times.

After Upgrading the Network Model which is adding different scenarios. Developing those intersection, changing data, phasing and timing etc. I have to saving cost after Upgradation per year is **1.4 $ Cr/year**. In the thesis, we don't need to spend a lot of money on bridges or tunnels, but we do need to create and upgrade intersections to reduce delays, losses, travel time, and costs. The TS099 and TS100 in between that railway crossing which is most difficult task to improvised. But I have to improvised between two intersection that is LOS, Delays, Travel time Travel Speed and Cost and as per the whole Criteria Cost saving is the main point of the Thesis.

## Future Recommendation –

It develops the SIDRA software Model as a safe and cost-effective method for investigating such situations and delivering relevant views. This study also addresses the environmental concerns produced by traffic congestion, which is in keeping with the Australian government's aim to maintain sustainability in all of its processes. Secondly, we don’t need to construct bridge, tunnel, fly over because I was doing 20 years upgrading of three intersection which is quite cost saving for next 20 years.

This Cost saving is very important to maintaining road per yearly which helps to Australian Government

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# Appendix A SCATS Drawing

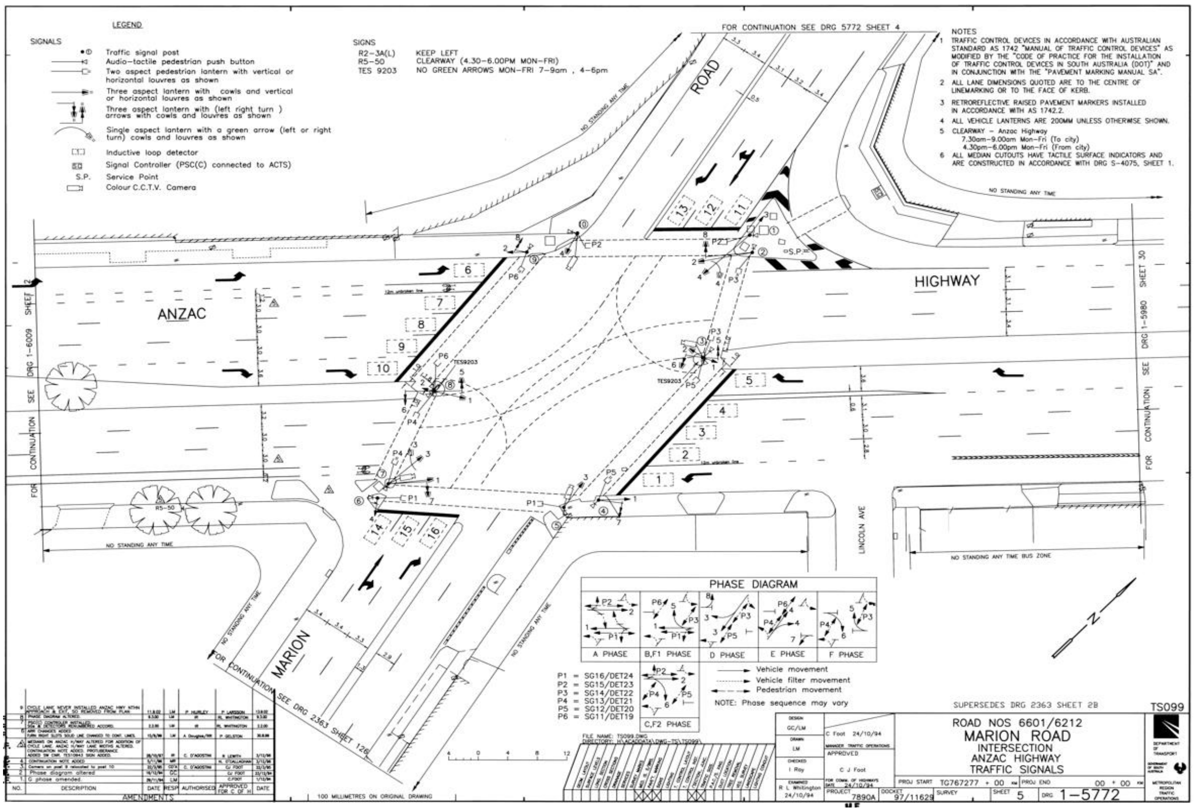

*Figure 32 SCATS Drawing for TS 099*

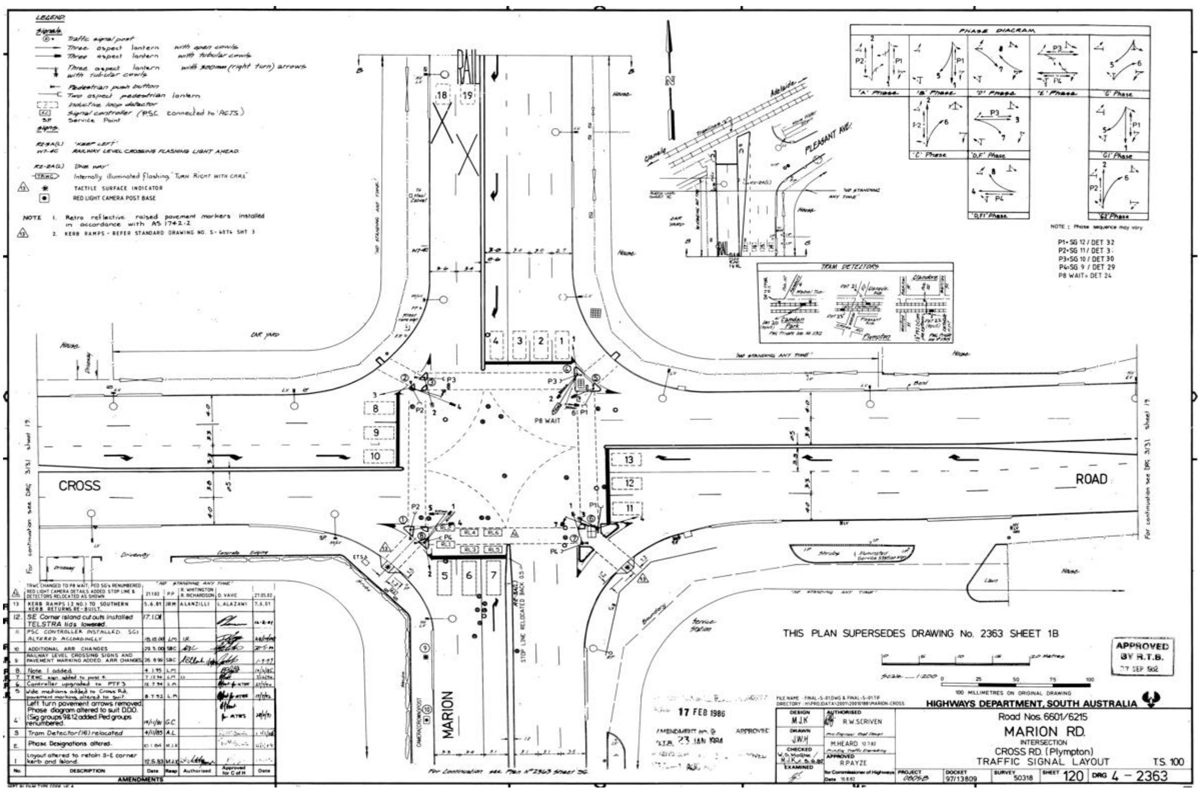

*Figure 33  SCATS Drawing for TS 100*

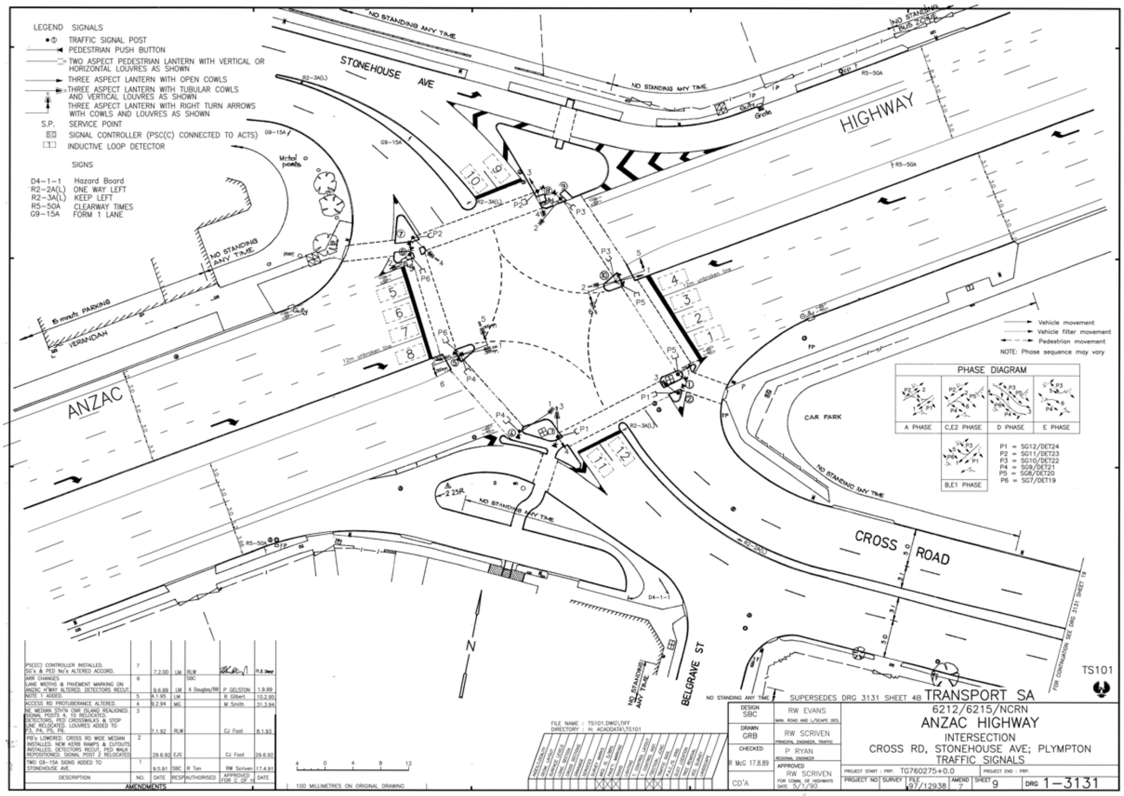


*Figure 34 SCATS Drawing for TS101*

Appendix B SIDRA Software result Delays

**TS099AM**

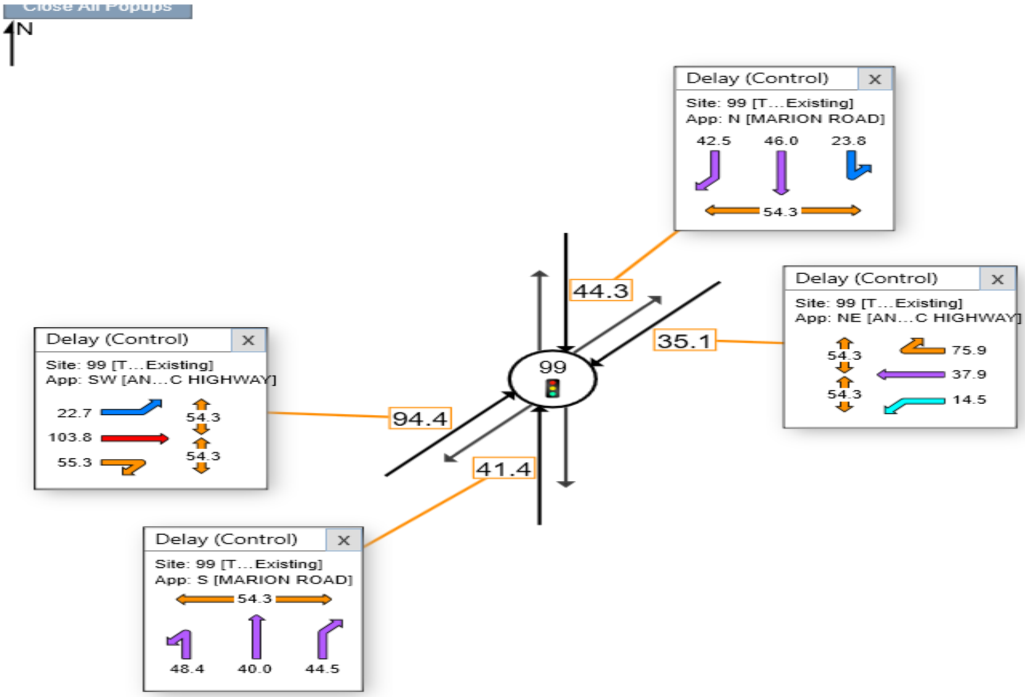


*Figure 35 Existing delay for 2017*

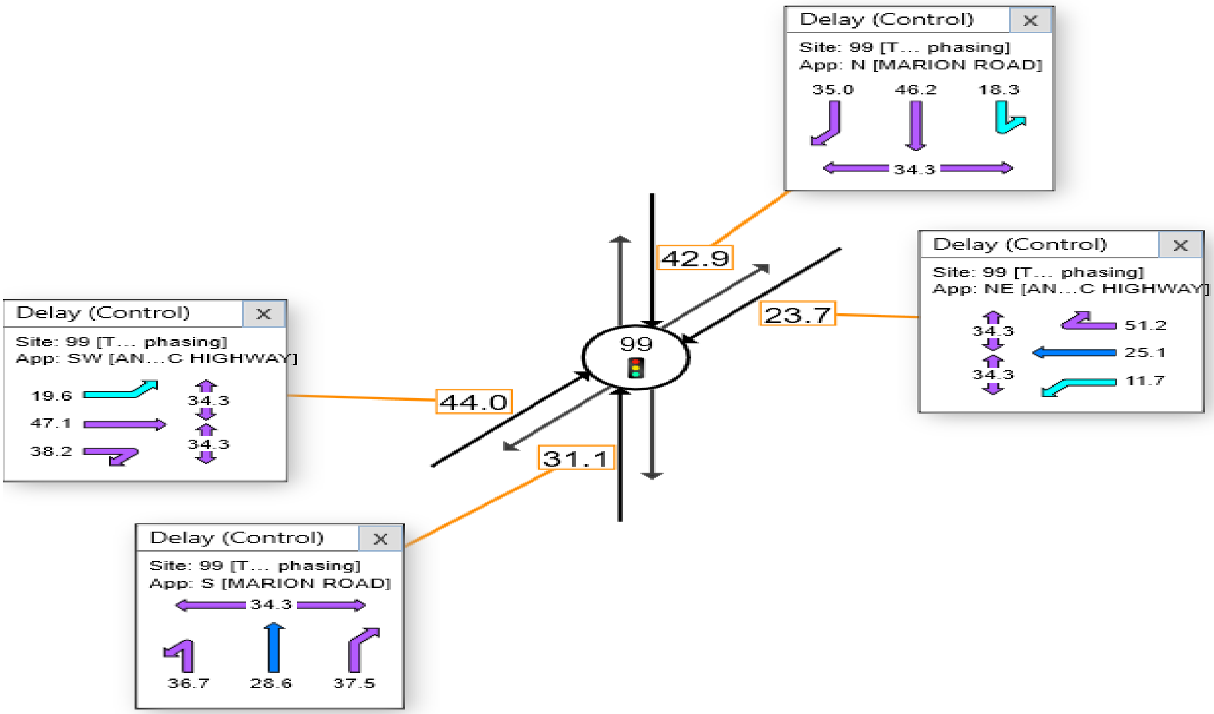


*Figure 36 Optimised of Delays*

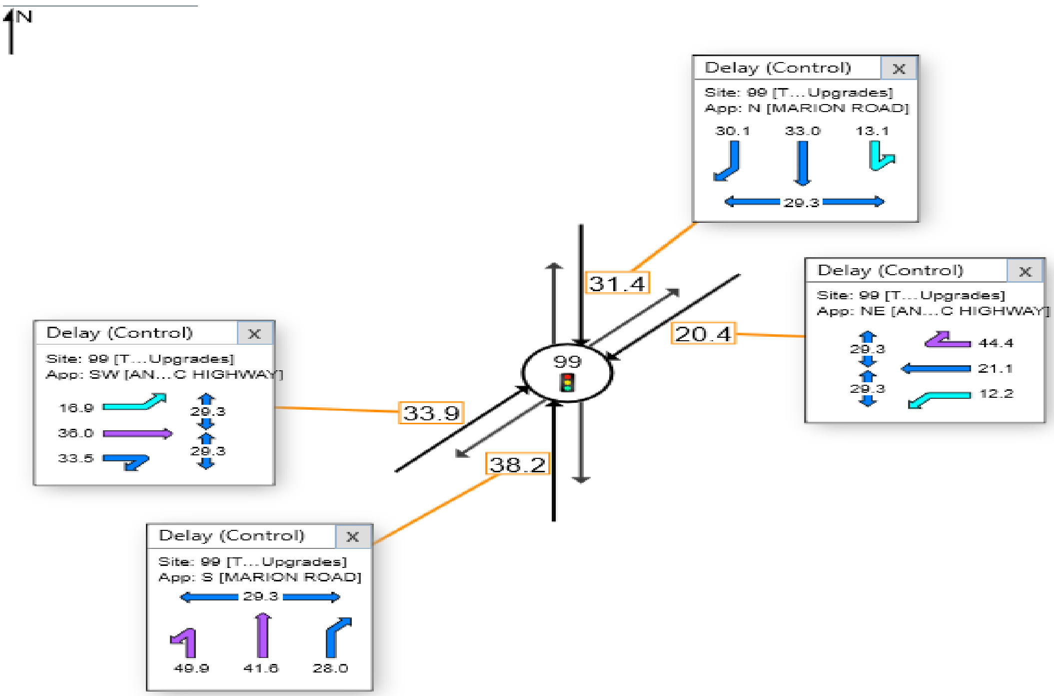


*Figure 37 Upgrade delays*

## TS099 PM

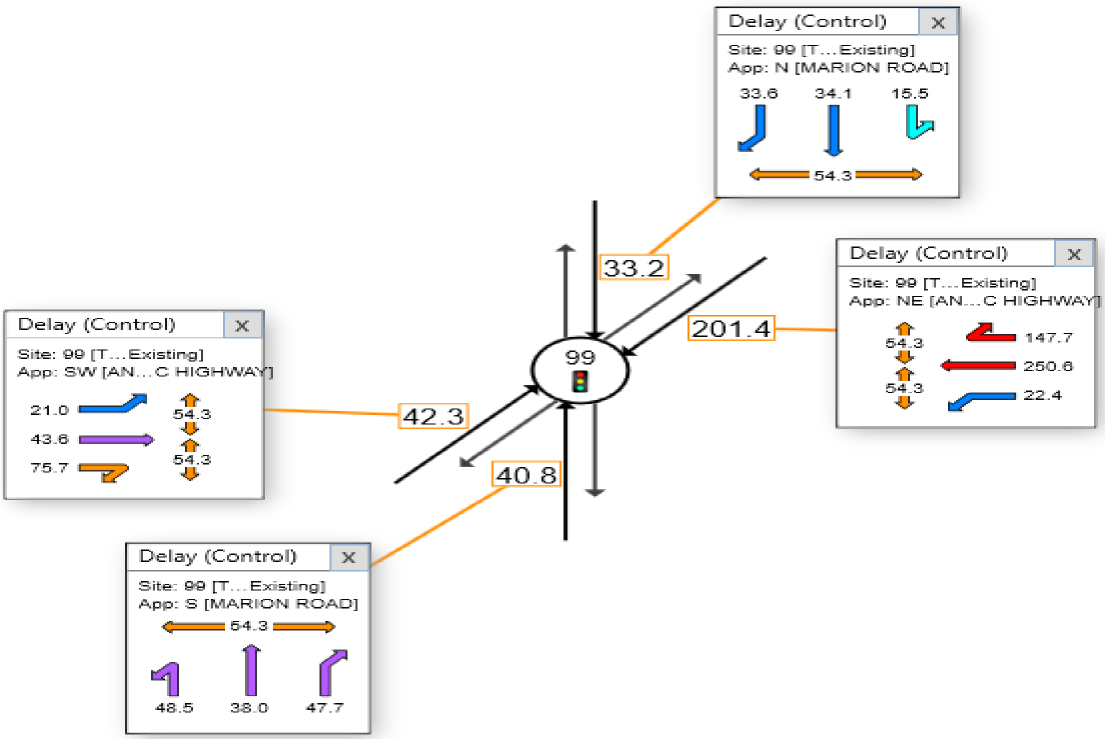


*Figure 38 Existing delays PM 2017*

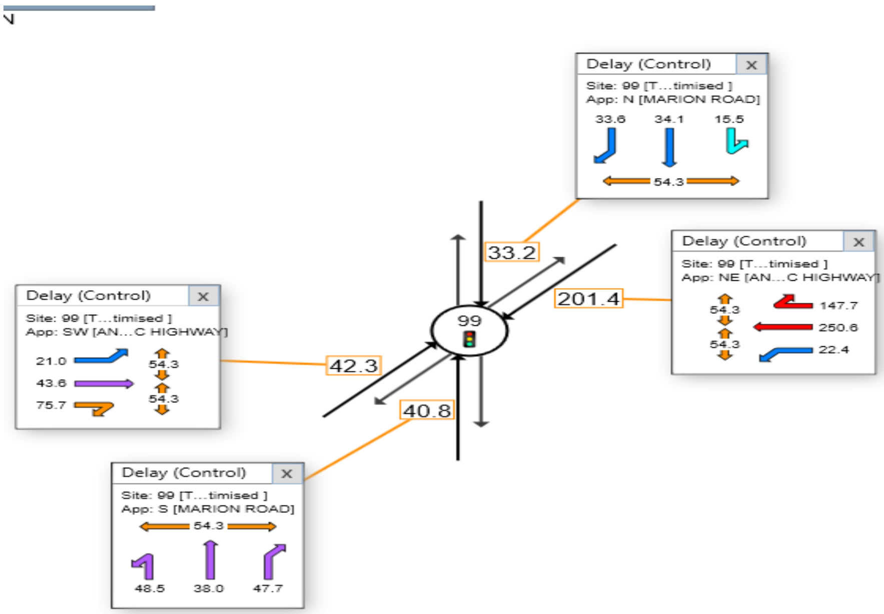


*Figure 39 Optimised delays PM 2017*

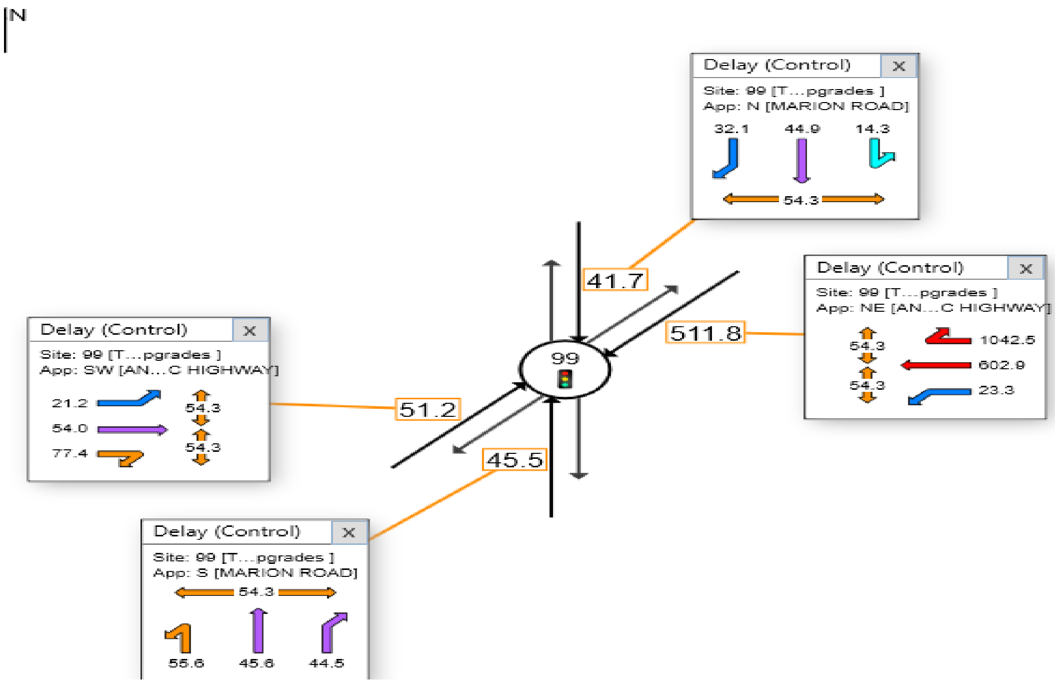


*Figure 40 Upgrade delays PM 2017*

**TS100 AM**

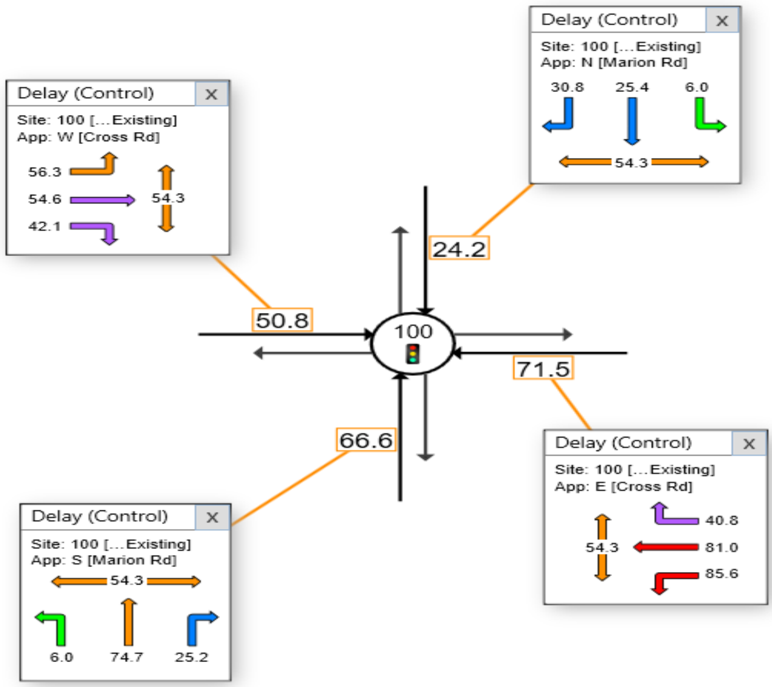


*Figure 41 Existing Delays of TS100*

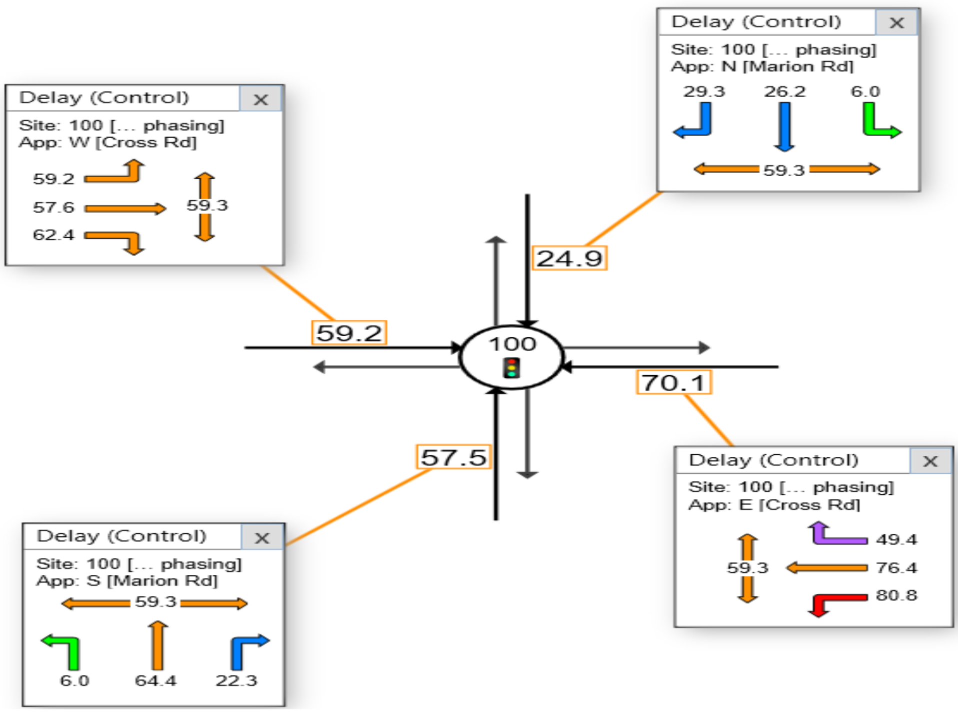


*Figure 42 Optimised Delays of TS100*

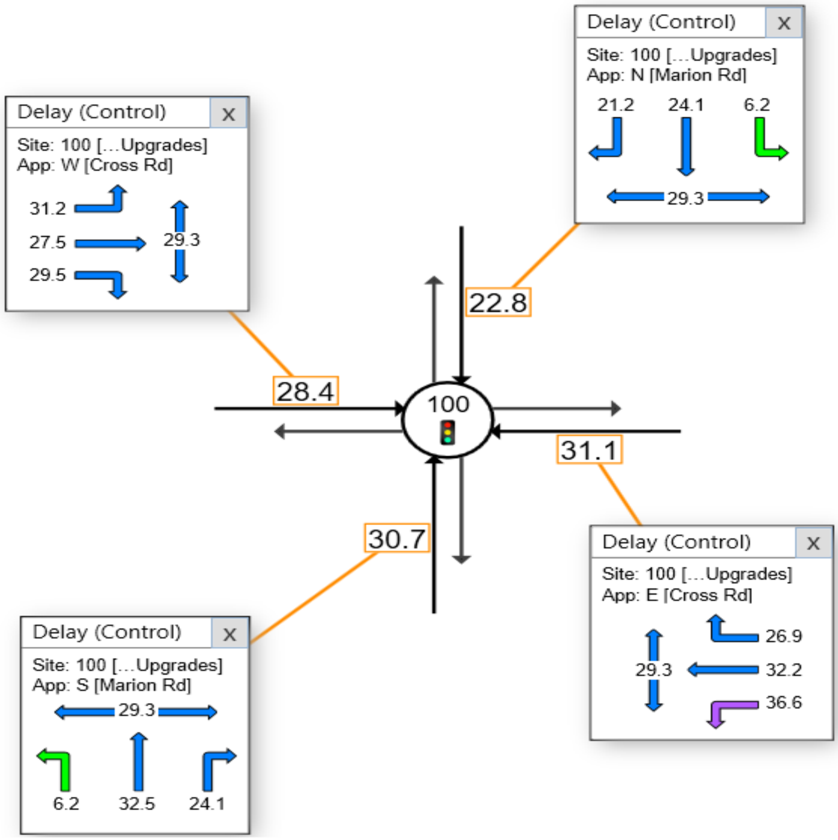


*Figure 43 Upgrade Delays*

Appendix B Level of service by using
SIDRA Software **TS099AM**
LOS of TS099, TS100, TS101

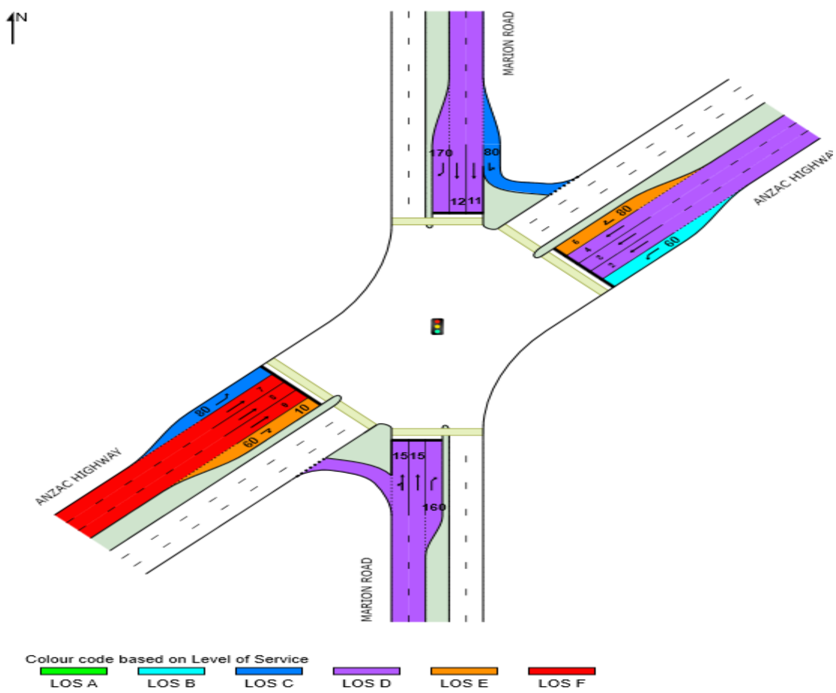


*Figure 44 Existing LOS of TS099*

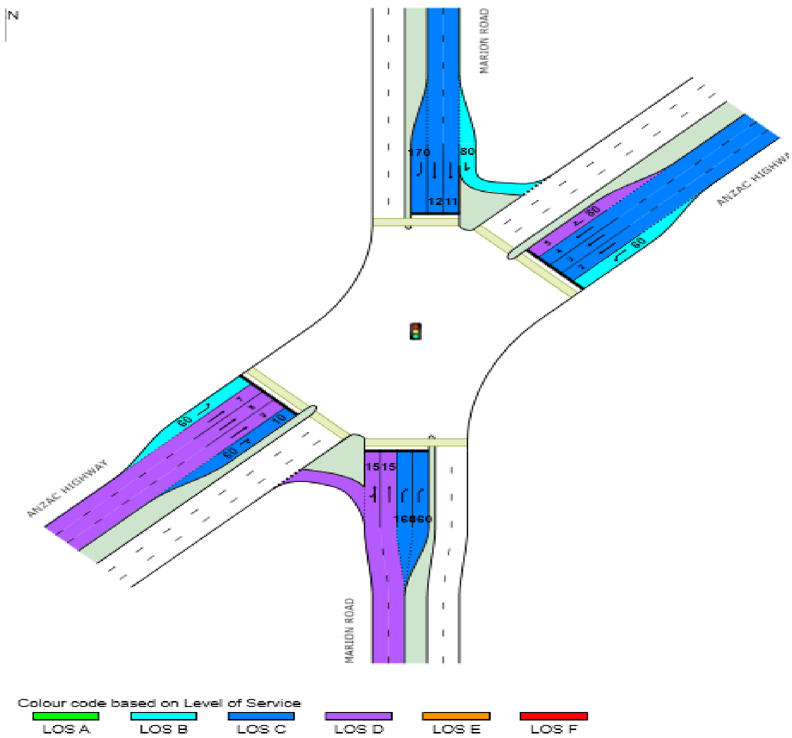


*Figure 45 Upgrade LOS of TS099*

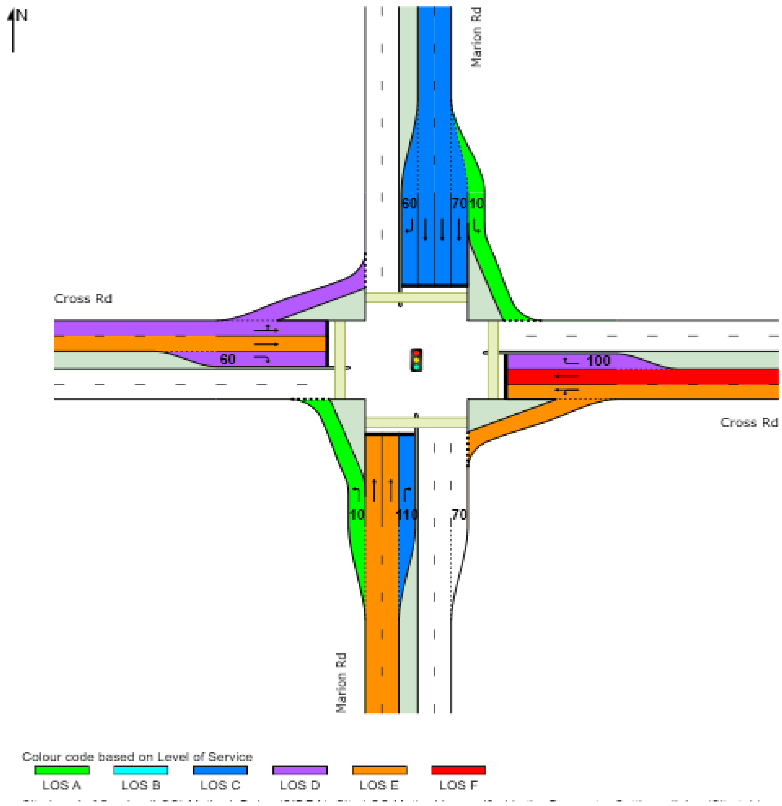


*Figure 46 Existing LOS of TS100*

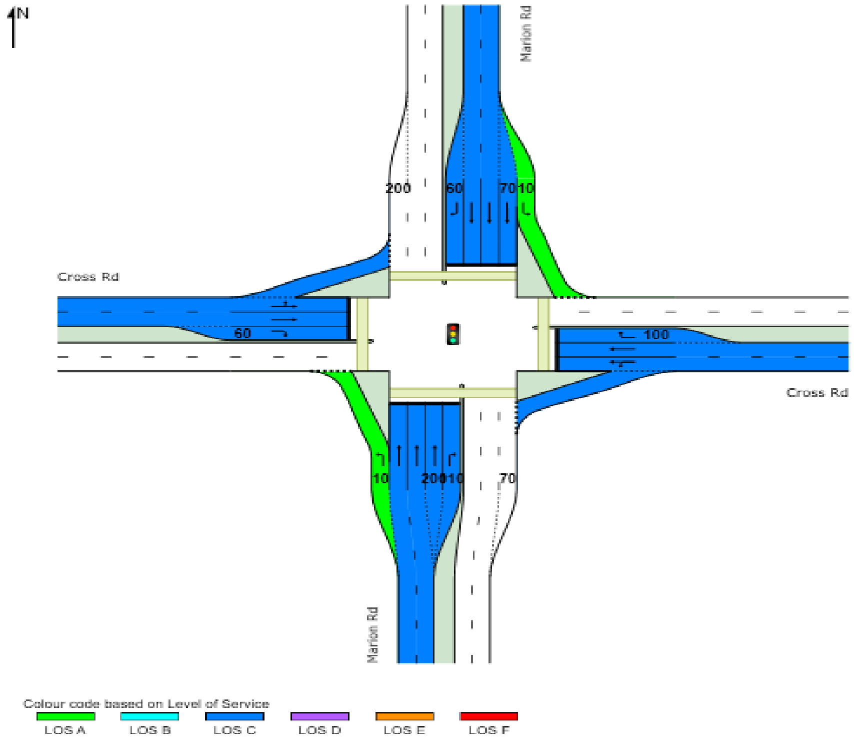


*Figure 47 upgrade LOS of TS100*

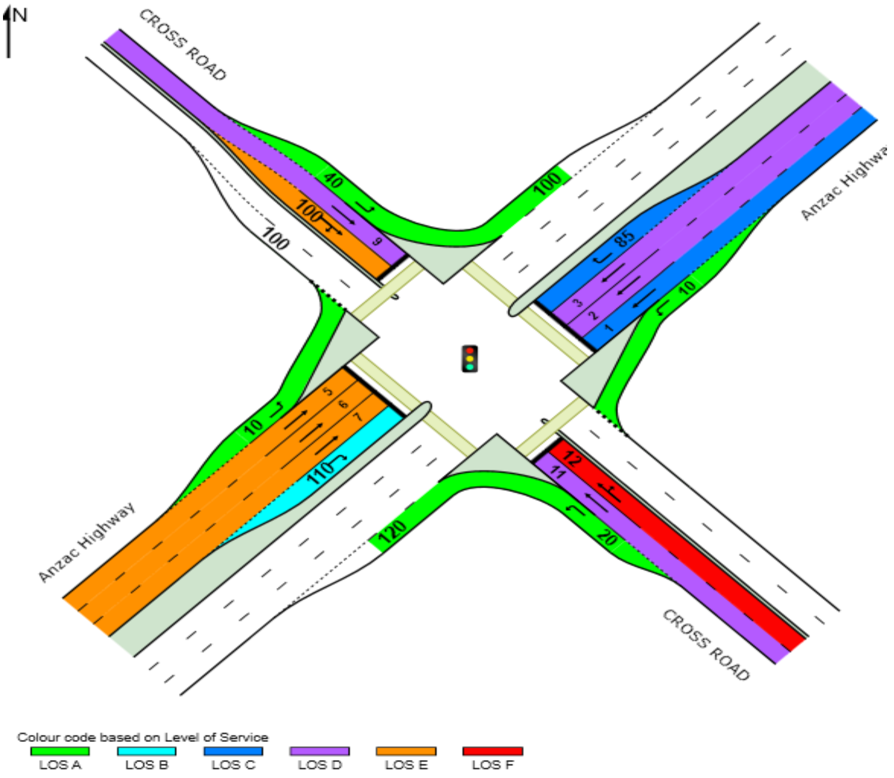


*Figure 48 Existing LOS of TS101*

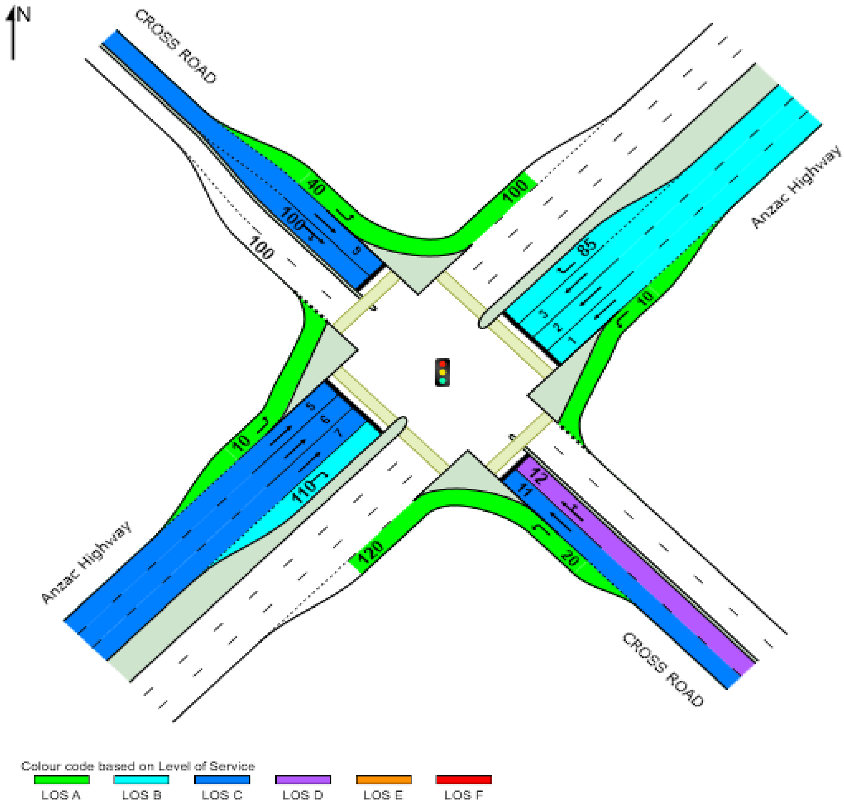


*Figure 49 Upgrade LOS of TS101*