Edward (Ted) Barton: My Way through the CRB, RCA, VicRoads

Part 2: 1967 to 1977

My Move from Freeway Location to Traffic Design.

In about 1967/68 the Federal Government set up an organisation called the Commonwealth Bureau of Roads in Canberra and Bill Lesley left the CRB to take up a position there. His position in the CRB was advertised and I applied for it and was appointed to take charge of the Traffic Design Section in early 1968 (I think it was).

It was the Boards practice in previous years to send one of its senior engineers, working in the traffic engineering and planning area, to do post graduate study at one of the universities in the USA, notable their work in this field. However at that time Professor Ross Blunden had set up a post graduate (Masters) and a short 'Certificate Course' in Transport Science at the University of NSW and) the Board took advantage of the UNSW course and In 1968 nominated myself and Mr John Glenn to complete the certificate course in Traffic Planning and Control at the University of NSW. I found the course at UNSW very helpful, particularly as my Diploma course at Swinburne did not cover this area of civil engineering at all.

The main work of the Traffic Design Section of T&L at that time involved channelized intersection layout design, mostly on the major arterial roads in Metropolitan Melbourne and in the larger rural cities of Geelong, Ballarat and Bendigo that were on what was called 'Declared Roads' under the Country Roads Act. It also included functional design of the intersection elements of freeway interchanges being planned, (defining the land required so that it could be included in the MMBW Planning Scheme,) or programmed for construction at that time. I had done similar work in Canada with Giffels & Associates during the winter periods when construction work had to close down.

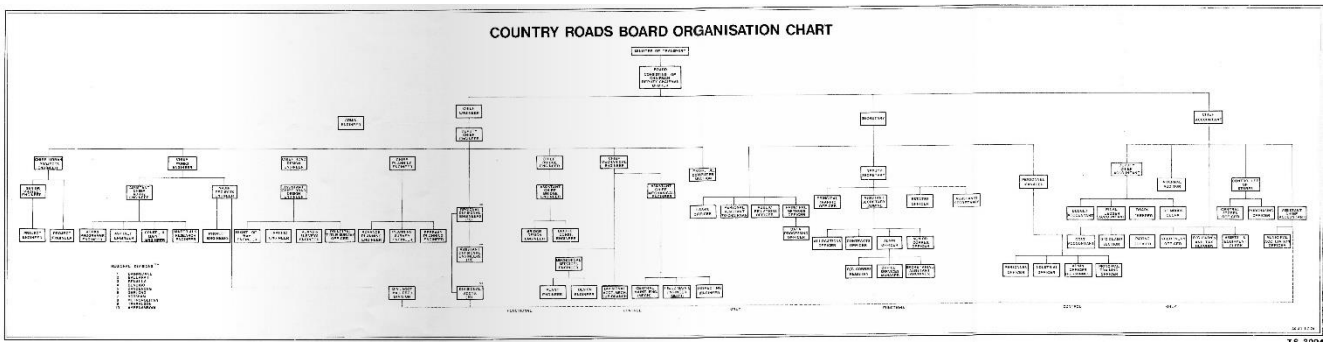
Major Organizational Change in the CRB, 1969 - 1970.

In the late 1960's the Board thought it needed to strengthen its organisation in respect to road planning and traffic management (amongst other things) as part of a major organizational restructuring that took place between 1969 and 1970. As it happened, Don Pritchard, (at the time) Assistant Traffic & Location Engineer was sent to the USA to do a course at Perdu University and as a result in August 1969 I was appointed as Acting Assistant T&L Engineer in his absence. Then due to the restructuring within the CRB, Robin Underwood, who was then T& L Engineer, was appointed to the new position of Chief Road Design Engineer and I was then appointed as Acting T& L Engineer for the time being while Don Pritchard was away in the USA.

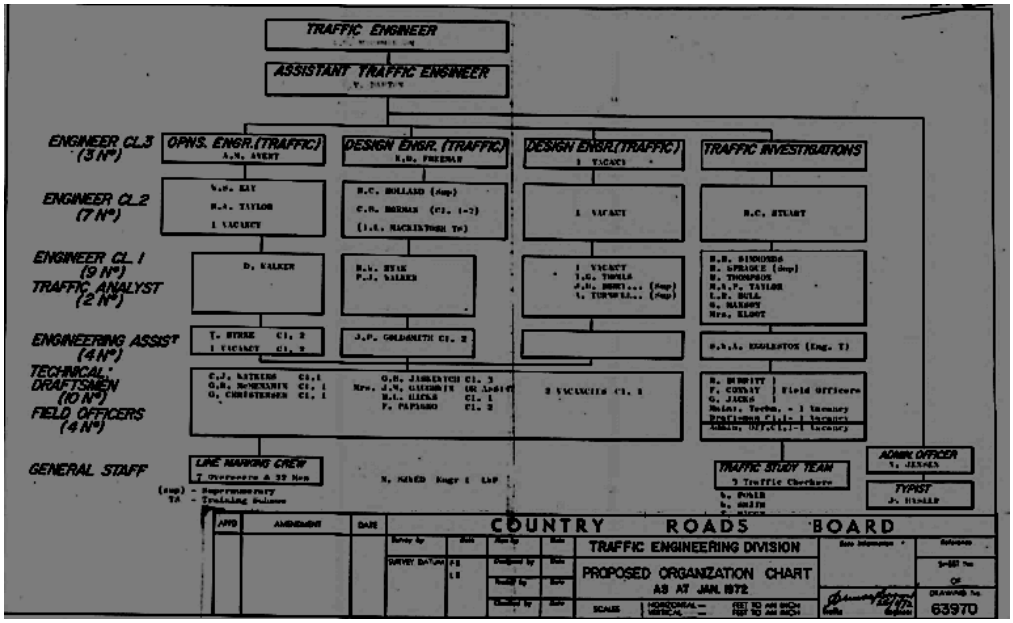
The T&L Division was being abolished under the new CRB structure and replaced by two new Divisions: Road Planning & Programs Division and the Traffic Engineering Division, so my 'Acting T&L Eng. appointment was to last only a short time. In 1970 the restructuring took effect and Don Pritchard, having returned from studies in the USA, was appointed to the position of Planning & Programs Engineer (later renamed the Freeway Planning Division). I had applied for the newly created position of 'Traffic Engineer' (head of the Traffic Engineering Division) and while I had the most experience and training for this 'specialist' type of work and expected to be appointed, Max McPherson, who at that time was Assistant Plans & Surveys Engineer was appointed to the position due to his seniority. Max had no experience or training in traffic engineering work, (he was one of the experienced engineers I had worked with in Benalla Division when I first joined the Board in 1957). He had experience in Regional (construction & maintenance) work and also in Road Design & Surveys and was at least 10yrs senior to me. In those days seniority was a significant factor in management appointments. I was then appointed as Assistant Traffic Engineer and was happy with this. I knew Max well and respected his seniority and he knew and accepted that I had a greater knowledge and understanding of this specialised work than he had and he agreed to me taking

responsibility for all the technical aspects of the work while he would look after the management and administrative aspects of the Division and this suited me fine.

I think the Board and other senior officers in the organisation also accepted this arrangement and came to rely on me rather than Max for all the technical aspects of traffic engineering work. My annual salary for this appointment dated 17 July 1970 was $8796 in the range $8796 to $9394. The overall CRB organisation chart for that time is more or less represented by the 1974 chart shown below. The initial organisation chart for the Traffic Engineering Division, 1972 to 1976, which was located at 89 High St Kew, was as shown below. I don't have an organisation chart for the whole of the CRB with the names of people in the various positions in the organisation at that time, but I think at the time I J (Paddy) O'Donnell was chairman of the Board, R E V Donaldson was Secretary and J D (Jack) Thorpe was the third 'Board Member'.



CRB Organisation Chart 1974



Traffic Engineering Division Organisation Chart for 1972

Traffic Engineering Division 1970 to 1975:

At that time the division was organised along 'specialised functional group' lines covering the various types of traffic engineering / traffic management responsibilities allocated to the CRB. These are described as follows:

Traffic Operations Group:
At that time we were developing and enhancing the CRB's road marking (Linemarking) activities, the responsibility for which came into the Traffic Engineering Division, and we were one of the few HQ Divisions that had an actual 'Works' function. All of the mechanical plant for Linemarking /Roadmarking was designed and constructed "in-house" by the Board's Mechanical Engineering Sub-branch located at Syndal (Glen Waverley). David Freeman, who had been looking after the Boards roadmarking activities in the old T & L Division, after a short spell in Traffic Design, came back to the Traffic Operations group including the supervision of linemarking operations. This consisted of about 4 or 5 work units in the field. This work also involved administration of a large contract for Roadmarking Paint and of 'Ballotini' (microscopic glass beads) for making the painted line more reflective under car headlights at night. At that time we were doing a considerable amount of practical research and 'field trials' of different brands of paint and 'thermo-plastic' road marking materials and methods of application. David was also responsible for the design of road traffic signs and other forms of roadmarking such as raise retro-reflective pavement markers (RRPM's) and retro-reflective traffic sign materials. David was also very much involved in committee work for Standards Australia setting up Australian Standards for the use of these items under the old ACORD (Australian Committee on Road Devices) national arrangements. David was our representative on that committee for many years and which ultimately resulted in the publication of the Australian Manual of Uniform Traffic Control Devices AS 1742. (AMUTCD).

*Traffic Design Grou*p:
This group main activity was in the functional design of (at grade) intersections on both urban and rural arterial roads. Initially this type of work was based on practices being used in the USA, especially the Californian Department of Highways Standards, and the US AASHTO manual (often referred to as 'the blue book). Although there was much similarity in climate and other operational conditions between Australia and California there are significant differences that inevitably lead to the development of geometric design standards that better suited Australian conditions. This was a major task of the Traffic Design group and lead to the promulgation of geometric design guidelines for various types of intersection treatments both urban and rural in the CRB road design manuals and design notes at that time. This included the design of 'high-angle' left turn treatments at channelized intersections, the introduction of 5^{th} lane treatments at 4-lane urban arterial road intersections, the new geometric design for modern roundabouts operating under 'gap acceptance' entry procedures, the geometric requirements applicable to the conversion of rural cross-road intersections to (short) staggered 'T junction layouts and the design of cross-road intersections on rural freeways with wide central medians. Much of this developmental work resulted from collaborative discussions amongst staff around the morning and afternoon tea/coffee table (actually the 'pool table') which doubled as a plan display table during work periods. Various traffic operational aspects and problems were exposed, argued and possible treatments and solutions identified.

With the CRB's increasing activity in the metropolitan area in the 1970's, we were involved in more complex intersection treatments and starting to get into complications regarding responsibility for traffic signals, as there was no provisions under the Country Roads Act for the CRB to design, install or operate traffic signals. In the early1970's the (then) Traffic Commission was replaced by the new Road Safety & Traffic Authority (RoSTA) and they had the responsibility to approve the installation of traffic signals (as these devices were classified as Major Traffic Control Devices under the Road Traffic Act) but they did not have any installation and operational function and so traffic signals could only be installed and operated by the Municipal Councils. Most traffic signals were in the Melbourne City Council area but there were increasing numbers being installed in all metropolitan council areas. Complications arose where the Board was (say) duplicating roads like Dandenong Rd, Maroondah Hwy, Princes Hwy West (Geelong Rd) etc., which were intersected by other major arterials, many of which were classed as 'Unclassified Roads' (and therefore under Municipal Council control) and these intersections were being designed (and constructed) by the CRB for traffic signal control but the Board

had to rely on Municipal councils and RoSTA to have the signals installed. The latter's priorities did not always match up with the CRB's works programs and this inevitably resulted in complex intersections designed and built for traffic signal control being opened to traffic without the signals installed. This lead to serious traffic problems and an increasing number of traffic accidents at these locations.

The Railway Level Crossing Abolition program was also preceding well and we prepared the functional design of projects on the Geelong Rd West Footscray (at the time referred to as Mt Mistake), Ballarat Rd Sunshine, Burnley Rd Richmond, Warrigal Rd Oakleigh, North Rd Huntingdale and quite a few rural locations on the major Highways. (This was a relatively small program compared to that of the 2020's and indeed stopped altogether in the 1980's).

Traffic Investigations Group:

Traffic Engineering Division also had the responsibility to organise and carry out the CRB's traffic surveys program, which in the 1960's & '70's included turning movement counts at major intersections, vehicle speed studies (for setting 'speed limits', and the conduct of the Annual March Census. This census involved a 12hr. (7:00AM to 7:00 PM) manual count at some hundreds of intersection locations on the Declared Road System throughout the State, always done on the 2nd Tuesday in March each year. The second Tuesday in March was considered to be the 'average day' for the whole year. During this count, vehicles were classified into several categories: cars, two-axle (rigid) trucks, three or more axle trucks and semi-trailers, cars / trucks towing trailers/caravans , busses, motor cycles, tractors etc. Most of the locations selected had been counted for many years and so we could plot up data over several years and obtain growth rates for various types of vehicles.

However by the mid '70's it was becoming evident that this 'single day' sample of traffic flow each year (in March) did not adequately represent traffic flows at other times of the year, for example on roads in the wheat growing areas there were much higher truck numbers in the 'harvest' periods in January / February, and similar problems in the fruit growing areas. We therefore started developing programs of automatic traffic counting using commercially available traffic recording machines operated on batteries and using pneumatic rubber tubes across the traffic lanes to detect and record vehicles. These early counting machines could be left out on the road for a week or more to record total traffic (both directions) in a given time period. Daily totals could be obtained by reading the simple mechanical digital 'counters' at the same time each day. During the 1970's this progressed further to development and installation of fully automatic recording machines that also recorded a vehicles axles against a continuous time register so that we could get actual hourly and daily flows. Some of these early automatic machines, produced by our own staff were adapted from 'electricity metering' machines producing a 'punched paper' tape and were set up at fixed locations for one or two years. They were serviced by our 'Field Officers' monthly and the punched paper tapes on which the vehicle axle detections were recorded were retrieved and analysed using the CRB's original computer section at Head Office in Kew. Subsequently, as electronic technology improved much more effective traffic recording machines were developed in which road tube detectors were replaced by 'inductive loops' and solid-state data recorders. Permanent counting sites were set up on a proper statistical sampling basis over the whole 'Declared Road' network to provide a much greater degree of statistical accuracy in measuring traffic flows, classifying vehicles and measuring speeds, headways and other traffic flow data. These permanent recording stations were subsequently linked to a central computer recording system at HQ via telephone lines. By the 1980's the March annual Census was becoming redundant and was ultimately phased out and replaced with a comprehensive automatic counting program supplemented with manual turning movement counts as required and other types of traffic surveys.

During this period we also carried out many Vehicle Speed Studies, in the early days using stop-watch and distance measurement (using what was known as an 'Enoscope'), but later using electronic

RADAR equipment. The remaining part of the traffic survey work was the conduct of Origin / Destination surveys and Travel Time Surveys.

Street Lighting Group:
In 1970/71 the Victorian Government amended the Country Roads Act to introduce a scheme to improve the lighting on State Highways later (in 1973/74) extended to Declared Main Roads, to relieve the cost burden of this from municipal councils by introducing an arrangement of cost sharing. The cost of installation and maintenance of street lighting of an approved standard was to be shared 1/3 to Councils, 1/3 to the Electricity supply authority (most generally the SECV) and 1/3 to the CRB. Howard Hobbs (at that time DCE Road Design) was Chairman of a committee formed by the Government to administer the cost-sharing scheme. Applications were submitted by councils through the CRB Regional Divisions and were considered by a committee comprising a member from the SECV, a representative from the MAV (Municipal Association of Vic.) a representative from the CRB as Chairman along with a secretary provided by the CRB. The CRB's Traffic Engineering Division was charged with the responsibility of checking the technical standard of the street lighting design involved in each application and making recommendations to the Street Lighting Committee. I became very much involved in this work, learning the basic principles and practices of street lighting, and subsequently found myself appointed a member of the Australian Standards Association Committee on Public Lighting, leading to the production of the AS1158 in 1986.

At this time I was becoming increasingly concerned about various road safety issues and particularly about the number of road crashes that involved vehicles running into electricity poles and street lights and traffic sign posts. I began pressing for the use of lighting pole and sign post types that would reduce the likelihood of death or injury if they were impacted in a crash. I was first introduced to the possibility of frangible ('break-away') type lighting poles and sign posts by Mr. Bob Field, a roadside safety engineer from the Highways Department in California, USA. I think he was working with the CRB on temporary appointment. He convinced me to consider the introduction of 'Slip- base' poles for street lights along the lines of what was being done in California and, with the expertise and equipment from the Materials Research Division, we carried out some full scale crash tests using a heavy weight suspended on a pendulum arm as the crash object (rather than a car). These tests (which figured in a short TV appearance showing an actual test) proved the viability and effectiveness of slip base arrangement and especially the safe disconnection of the electricity wires powering the lights. These new type poles were then introduced at appropriate locations on Freeway projects. Freeway projects were chosen initially as there were concerns about the pole falling on Pedestrians during a crash etc. and pedestrians were prohibited from freeways so the problem didn't arise. Subsequently after much argument between the CRB and the SECV and Municipalities and RoSTA, the use of slip base poles and other types of 'frangible' poles became quite common, both on freeways and on other arterial roads.

In the late 1960's and the early 1970's the controversial issue of "Priority Roads" was being debated in Victoria.

Based on my experience in Canada, at various meetings and forums I strongly argued for a network of arterial roads in which traffic on the major road had priority over side (minor) road traffic by virtue of placing STOP or GIVE WAY signs and pavement marking on the side road approaches at all non-signalised intersections on arterial roads. This would effectively displace the existing "Give Way to the Right" rule which treated all roads as equal in respect to priority and encouraged much 'through traffic' to take side road routes, mostly residential streets, as short cuts. The 'Give Way to Right' rule degraded residential amenity and resulted in inefficient arterial road operation and to increased crashes. The abandonment of this long standing rule was opposed by some academics and even some people in the Traffic Commission/RoSTA at that time and by many Municipal Councils who thought that they would be asked to pay for it, (as the signing and roadmarking would predominantly be on

Unclassified Road approaches to intersections rather than on the (Main) Declared Road approaches). I recall that in about 1974 myself and Neil Sache, (from RoSTA), were directed to investigate and report to the two organisations on a method for introducing 'Priority Roads' in Victoria. We finished our report about the middle of 1974, which recommended a procedure and practice for the introduction of Priority Roads. This was about the same time the then Premier of Victoria, Rupert Hamer, was scheduled to make a trip to the UK. At that time I was the CRB representative on the RoSTA Speed Limits Committee and the Chairman of RoSTA (Mr. Jim Westland), asked me if there was anything in the traffic management field that we could suggest Mr. Hamer look into while in the UK. I suggested he look at how Priority Roads had been dealt with in England. The Victorian Government had agreed that Priority Roads should be introduced and when Mr. Hamer returned from his trip to the UK in about September that year he (the Victorian Government) directed that we should introduce Priority Roads in exactly the same way as was done in the UK. This is more or less what we in the CRB had recommended, but we were not happy about his direction that we should do it exactly as done in the UK with respect to the type road markings at 'Stop' and 'Give Way' signs, rather than the slightly different markings that had been agreed nationally in the Australian Standard AS1742. Notwithstanding this, RoSTA insisted that the Premier should have his way regarding the roadmarking and we were further directed that the Priority Road System be implemented in the Melbourne Metropolitan area before Christmas 1974. This deadline was quite impractical and the CRB convinced the Government that it would be completed by Easter 1975.

The CRB was responsible for its implementation under what was called the METCON Program. As the work mostly involved supply and installation of signs and associated road-markings, my Traffic Engineering Division (TED) was heavily involved in the work. STOP and GIVE WAY signs and pipe posts were purchased under bulk contracts from the various sign manufacturers and installation teams, set up by the CRB's Metropolitan and Dandenong Divisions, carried out the sign installation work with the Traffic Engineer's roadmarking units doing the roadmarking. A new roadmarking machine, called the 'METCON' machine, was designed and built by the Board's Mechanical Sub-branch at its Syndal workshops, was used by for this work. This machine, (pictured below), allowed automatic painting of the twin STOP and GIVE WAY lines (in conformity with the UK system) by making just one pass along each side of the Arterial (Priority) Road without having to enter the side roads. This reduced the initial installation and subsequent maintenance costs of these markings tremendously.

The overall METCON program was completed on schedule by Easter 1975 and then extended to the remainder of the State over the next couple of years under what was called the STATCON program. The overall State program was completed by the introduction of the 'T-junction' Rule in the Road Traffic Regulations by RoSTA, which eliminated the need for installing signs and markings at the many T-junctions. Notwithstanding the introduction of the T junction rule, I held the view that we should continue to use STOP or Give Way signs at T junctions on Arterial roads as there were many locations where it was difficult for drivers to know whether they were approaching a T junction or a cross-road intersection. At that time we had a policy of eliminating cross-road intersections on rural arterial roads with staggered T junctions designed with only a minimal offset in the alignment of the minor road approaches. Also on the local street system there were many locations where there was only a slight stagger in the alignment across an intersection drivers would be unsure whether they were at a T junction or a cross-road intersection

and we considered that these intersections required signs and markings to control the minor road traffic.

One of the main controversies associated with the introduction of the Priority Roads System was about how to deal with the intersection of two priority roads, especially in urban areas, and particularly in the Melbourne metropolitan area. In Melbourne, most of these would need traffic signals to be installed and in the inner suburbs many of these intersections were already signalised. The cost of installing the hundreds of sets of new traffic signals was very high and it required RoSTA approval with the costs being borne by Municipal Councils. Councils were not happy about paying for extra traffic signals etc. as the need for these arose out of a Government Program, not one of the councils making. Also at that time the CRB was pressing the State Government to give them statutory power to finance and install traffic signals as part of the road improvements necessary on various 'feeder routes' taking traffic to and from the (then under construction) Westgate Bridge. RoSTA also wanted to be responsible for the installation of traffic signals (not just their 'approval' as a "major traffic control item"), and wanted special funding to do so. The Government gave RoSTA funding to subsidize Councils for the installation of traffic signals under the STATCON program but installation work still had to be done by Councils.

The CRB gains authority to design, install, maintain and operate traffic signals.

At the time when the Westgate Bridge was under construction the CRB was negotiating with municipal councils about problems of traffic management on the 'feeder' routes to the bridge. Councils were opposed to bearing the costs associated with the increased traffic in these routes. In 1969/70 this resulted in the Country Roads Act being amended to give the CRB authority to carry out road improvement works on "approach routes to freeways" (in particular the Westgate Bridge) in the same way as they already had on 'Direct Control Roads' such as State Highways. These new powers included power to install, operate and maintain Traffic Signals.

In 1974/75 the Victorian Government decided to rationalise the major road building and management responsibilities in the Melbourne Metropolitan area and this lead to the transfer of the 'Highways' functions of the MMBW to the CRB. This involved the transfer of a considerable number of engineers from the MMBW to the CRB and Brian Negus, Kerras Burke and J Cribbin came into TED forming our initial traffic signals group.

At that time and following the opening of the Westgate Bridge I was heavily involved with liaison and negotiations involving the Boards Metropolitan Division, local Municipal Councils and the Westgate Bridge Authority on traffic management problems associated with the high traffic flows on the 'feeder routes' to the new bridge. This continued over a number of years both before and after the bridge opened to traffic as a Toll Road, as at that time, the Westgate Freeway from the new bridge to Kingsway was under construction and required considerable traffic management actions on various routes feeding traffic to and from the eastern end bridge toll booths (near Todd Rd.) and the newly constructed Johnson St (Charles Grimes) Bridge.

Increased involvement in Road Safety Improvements:

In the mid 1970's the Federal Government introduced a new funding category to encourage road improvement works aimed at road safety and traffic management. They labeled this Program 'TERSIP' (Traffic Engineering and Road Safety Improvements), in later years renamed 'MITERS' (Minor Improvements Traffic Engineering and Road Safety).

Initially this was not popular with the CRB's Regional DE's as they believed it diverted funds away from their "high demand areas" such as new construction and reconstruction works and in the first year

of ‘TERSIP’ it was difficult to get the DE’s to submit genuine candidate projects for this funding. Many projects submitted by regional DE’s in their applications for funding under this category were just ordinary reconstruction works described in ways to make them look like road safety or traffic management related works. Dr. David Currie was (at that time I think) head of the Works Programming at CRB HQ at the time and he had a lot of difficulty in sorting this problem out before the CRB program was submitted to the Federal Government for approval of the funding. David often consulted with me about individual projects and, as I had many projects in mind for such funding, (projects that the DE’s would not include in their applications), he suggested that Traffic Engineering Division should submit an application to cover them. Of course this was not at all liked by the Regional DE’s who argued that they were the only ones who could submit applications for funding and administer the allocations if they were successful. This was not strictly true as Traffic Engineering Division had always made the necessary applications for funding associated with all roadmarking works and we operated the field crews and plant and equipment that carried out all of the linemarking and road marking works throughout the State.

As a “test case” I therefore submitted an ‘application for funds’ to install RRPM’s (Raised Retro-reflective Pavement Markers) on the Centreline along a section of the Hume Highway between Beveridge and Kilmore (which included the accident prone ‘Pretty Sally’ section. I included data on single vehicle accidents for the section to justify the application. The funding application was subsequently accepted by the board and submitted to the Federal Government who approved and allocated the funds under the ‘TERSIP’ program. In the following financial year when we set about to do the work it was still opposed by the ‘Works Maintenance Engineer’ (David Nicholson), on the grounds that it would become a high cost maintenance problem, and after more argument and reports to the Board it was finally agreed that we would complete the works and evaluate the benefits and ongoing maintenance costs. Immediately after we had completed the work there were reports in the Newspapers that truck operators were saying what a great difference it made to the safety especially when driving in wet or foggy conditions. This was confirmed a year later when we looked at the accident data and compared the ‘before’ and ‘after’ statistics. The Board then had no hesitation in approving our subsequent applications for funding similar works on all of the major highways for a distance of 100km out from Melbourne and within a couple of years the use of RRPM’s was extended to the full length of all Freeways, Highways and many Main Roads including those in the Melbourne metropolitan area.

The Introduction of Roundabouts on Arterial Roads in Victoria

In the late 1970’s, in order to reduce the need for costly traffic signal installations and ongoing maintenance & operation at many intersections consequential to the METCON / STATCON programs, I proposed the widespread introduction of Roundabouts on arterial roads. In 1971 / 72 there were just 17 intersections in Melbourne with a roundabout form of channelisation. One of the most notable was the ‘Haymarket’ roundabout at the top end of Elizabeth St / Royal Pde / Flemington Rd and one of the first to be constructed was at the intersection of Union Rd and Belmore Rd in Nth Box Hill. At that time we followed UK practice where vehicles entering a roundabout were not required to ‘Give Way’ but to “merge and weave with traffic circulating in the roundabout. This generally required large diameter circular roadway and large central islands which permitted higher vehicle operating speed and the merge & weave operation resulted in many crashes. However a new concept of operation at roundabouts was being ‘experimented with’ by the TRRL (Transport and Road Research Laboratory) in the UK where hundreds of these large roundabouts had existed for many years. TRRL looked at various operational arrangements including a new concept with entry vehicles ‘Giving Way’ to circulating traffic and relying on ‘Gap Acceptance’ procedures to enter the flow of circulating traffic. The new ‘gap acceptance’ concept enabled smaller (diameter) roundabouts and lower traffic speed in the circulating roadway. Specific geometric design of the approach and entry roadways was necessary to control the speed of vehicles approaching the roundabout entry. This was achieved generally by

bending the entry roadway. This enabled vehicles to enter the circulating flow on shorter 'gaps' thus greatly increasing capacity and the lower entry speeds reduced crashes and crash severity.

RoSTA and many Councils were generally opposed to roundabouts initially, except on low traffic residential streets, and were reluctant to consider the new operational concept on arterial roads, believing that roundabouts could not match the traffic flow capacity of traffic signals and that the construction of a roundabout would require a large amount of land acquisition. I was confident that this was not the case with the new operational procedure and we had developed a new compact type of geometric design for roundabouts and a methodology for flow capacity analysis based on current research which the CRB had sponsored through the Australian Road Research Board (ARRB).

At about this time, the CRB's Chief Engineer (Dr. Keith Moody) was on an overseas trip (with the Victorian Premier I think) and was in London. He called me on the telephone and asked me if I could use another traffic engineer as he had just interviewed one who was interested in migrating to Australia. Of course I said yes, especially as the person had some experience in the use of roundabouts in the UK. A couple of weeks later Mr. Emmerson Richardson arrived in Melbourne and joined the Traffic Engineering Division and I immediately got him involved in our 'traffic design section' along with Mr. Trevor Miller, developing our roundabout design principles and practices and promoting opportunities to use roundabouts. This resulted in the preparation and publication (within the CRB and Councils) of CRB Technical Bulletin No 30, "Guidelines for the Design and Installation of Roundabouts", dated 13 July 1979. This publication became widely used as roundabouts, based on its design principals, proved very successful and their use gained in popularity. Further research at the ARRB by Rod Troutbeck et al (reported in ARRB AIR393-6, 1984) added to the general understanding of traffic operation at roundabouts in Australia and improved capacity / delay analysis.

Trial Roundabout at Clarendon St – Normanby Rd- Yarra Bank Rd

Prior to the opening of the West Gate Bridge in 1978, as part of the traffic management arrangements for the new bridge, TE Division put to the Board a proposal to the trial of a roundabout treatment at the complex intersection of Clarendon St - Normanby Rd – Yarra Bank Rd. in South Melbourne (immediately south of the Spencer St Bridge). This was approved by the Board and subsequently by the Victorian Government. This intersection had been too difficult to signalise because of the number legs to it, the heavy right turn truck movements at it (to and from the Melbourne Ports South Wharf) and the Tramway operations along Spencer St – Clarendon St. It was heavily congested on weekdays and required control by at least two Policemen for most of the working day. This location was critical in the routing of traffic from the Melbourne CBD to and from the (then) soon to be opened West Gate Bridge and the 'Charles Grimes Bridge' then being constructed by the MMBW as part of the Footscray Rd to Johnson St link. The trial roundabout installation was implemented over a weekend by Metropolitan Division using sand bags to form the roundabout islands. There was some initial problems on the first day due to trucks (wanting to right turn) approaching the intersection in the left lane (under police direction) rather than the right lane, immediately fixed by appropriate lane-use signing on the rail bridge over Spencer St, the roundabout operated very successfully without any further police involvement. This trial proved the performance of roundabouts even in the most difficult conditions. Within a few years thereafter roundabouts were widely accepted and constructed at many arterial road intersections as well as hundreds of local street intersections because of their superior safety performance. It is of interest to note that the 1984 Edition 15 of the Melway Street Directory showed a total of around 423 roundabouts in the area covered by the Directory (i.e. Melbourne, Geelong and the Bellarine and Mornington Peninsulas). This included both arterial and local roads.

Over the years since their introduction, it was not uncommon for intersections controlled by traffic signals to be reconstructed as roundabouts both to reduce traffic crashes and to reduce the costs of

operation and maintenance. In more recent times there has been some roundabouts removed from intersections on arterial roads and replaced with traffic signals especially where the locations could operate more effectively under the SCATS coordinated traffic signal system. Also there were several roundabout sites operating with traffic signal metering. This type of operation was first devised in the mid 1980's with the first such location being at the roundabout on Mickleham Rd – Johnstone St where 'unbalanced peak hour traffic flows' (e.g. on the northern Mickleham Rd leg) caused major delays to the Johnstone St (east) leg. A set of pedestrian crossing signals was installed just upstream (north) of the roundabout in Mickleham Rd. which was activated by queue detectors placed in the pavement of Johnstone St at an appropriate distance upstream (east) of the roundabout. When the queue from the roundabout entry reached the detector, the pedestrian signal would operate (as though a pedestrian had pushed the button) and a relatively short 'Red' time to Mickleham Rd would allow greater flow of vehicles to enter from Johnstone St. This was initially set up as a trial and was particularly successful and the treatment is then widely used where this problem occurred at other arterial road roundabouts.

The development of Traffic Signal Coordination:

With the large increase in the number of traffic signal installations in the Melbourne metropolitan area in the late 1970'sas part of the METCON program, the question of introducing some form of signal coordination to reduce the number of 'stops and starts' suffered by vehicles became an issue. At that time there were a number of proprietary signal coordination systems being used overseas and proposed in Melbourne by the Melbourne City Council and by RoSTA. These were small isolated systems using 'fixed time plan' signal operation and incapable of integration into an overall metropolitan wide system. With my representation on the NAASRA (later AustRoads) Traffic Engineering Committee (TEC) I developed contacts with traffic engineers in other States, (especially NSW). I thus became familiar with the new system of traffic signal control and coordination called SCATS (Sydney Coordinated Adaptive Traffic System). This system was developed by engineers in the NSW Department of Main Roads (DMR), mostly by Mr. Arthur Simms, and it offered much greater operational flexibility than any of the proprietary systems available at the time. DMR NSW was a world leader in traffic signal technology at that time and in fact was the first organisation in the world to use micro-processor computer based traffic signal controllers. Their SCATS system used normal telephone lines rather than dedicated cables for communications between local 'intersection controllers' and Regional Computers and also to connect to a Central Master Computer. This had a big advantage over other systems both overseas and in Australia, as it was capable of 'fully adaptive' operation to respond to constantly changing traffic flows. Other systems at that time operated on 'fixed time plans' designed on historical traffic flow data at specific times of the day. The 'adaptive operation' is able to sense changing traffic conditions minute by minute and change the mode of operation to suit the situation. Discussions with my counterpart in DMR NSW resulted in their agreement to assist us in adapting their system to Melbourne and I proposed this to the (CRB) Board for adoption in Melbourne. The CRB obtained Government approval for an initial trial of the system which was carried out along the heavily trafficked Maroondah Highway through the Ringwood shopping precinct in Melbourne's East. This trial proved very successful and the system was then adopted exclusively for Metropolitan Melbourne and subsequently for other major cities throughout the State. Ultimately all States throughout Australia (except for Qld) adopted the SCATS system. The system in Victoria / Melbourne now controls more than 3200 sets of traffic signals and 'SCATS' is still recognised as one of the two best signal coordination systems in the world.

It was in 1976, as part of staff movements within the CRB, I was finally appointed to the position of Principal Traffic Engineer. This did not result in any significant change to my work apart from adding staff management responsibilities