9.3 Bus Modernization Program

1) Initial Obstacles

The Bus Modernization Program involves the acquisition and deployment of 1,318 new buses. The buses are meant to be sold to existing operators on a 10-year lease-purchase arrangement with interest to replace old units. To be eligible, small bus operators (mainly cooperatives) were consolidated into bigger and more organized entities.

Implementation started in 2002. Progress has been slow due to the following obstacles:

- The government was unable to close the financing agreement for the entire 1,318 new buses, thus only about 300 were delivered by mid-2003;
- The designated sole manufacturer-supplier suffered some glitches that raised doubts about the quality of the vehicles being delivered;
- The merger of five of the bigger cooperatives into a single transport union faltered on such issues as management form, capitalization, and which among the five shall take the lead;
- Private operators are reluctant to commit resources in view of uncertainties about the quality of the vehicles, stability of subsidies, absence of land for depot or garage for the new fleet, and equality of treatment vis-à-vis the state-owned bus company.

If the foregoing cannot be resolved, the Bus Modernization Project is likely to fizzle out, or end up with the SOE Saigon PTC. Such an eventuality would make it even more difficult, if not impossible, to pursue the long-term development strategy for public transport. Hence, it is important to get the Bus Modernization Project back on track.

2) Addressing Financing Obstacles

The financing obstacle is four-fold: (a) requirements for private bus operators to put up 20% equity, equivalent to a fifth of the price of the buses to be leased; (b) guarantee or assurance to the lending bank in case of nonpayment or default; (c) stability of transport subsidies; and, (d) modification of the subsidy scheme.

It may take HCMC three to six months to overcome the financing hurdles, depending on how quick the decisions can be made.

Equity Issue: It is of course desirable for the lessee of the new bus vehicles to put up the required monies. However, this is unlikely to occur because of the poor viability of bus transport as well as lack of access to capital. A practical compromise is to adopt asset valuation as a means to satisfy the 20% equity rule. This will entail the following time-consuming steps:

- Value the existing (old) but large buses of the participating cooperatives and count the resulting value as part of the minimum 20%;
- Exchange the value of the buses and other assets (like land) for shares in the new stock corporation to be formed;
- Apply the same procedure for Saigon Star, when it is converted into a stock corporation, with the shares of Saigon PTC to be sold (later) at an appropriate time;

- Should the above method still falls short of the 20% rule, lower the hurdle rate to 15% on year 1 and raise it back to 20% after two years.

Assuring Lenders: For the guarantee, the HCMC-PC has to issue a letter of comfort in a form acceptable to the lending bank. In effect, the city will become liable for the payment of the loan in the event that the recipient bus operator is unable to pay, say, after one quarter. The guarantee may also include a right of first call over the monthly subsidies; this means, that the monthly subsidy shall be applied first to the loan repayment to the bank, rather than release to the operators directly. This arrangement has the disadvantage of increasing the contingent liability of the city government. For this reason, it should only be utilized for the 1,318 new buses and should not be repeated in the future.

Successive Reforms on Subsidy Issues: Operators need to be assured that they will be permitted to charge a viable fare, or if short, to be compensated via a clear subsidy scheme. One way to ensure stability is for the HCMC-PC to include in the service contract a commitment that it will pay the bus operator an amount representing the difference between a viable fare level and the approved fare, in case the latter is below the former. In addition, it must commit to an annual review of fare levels; and to adjust the fare to take into account changes in operating costs due to inflation, foreign exchange fluctuation, and fuel prices.

The second action item concerning subsidy is to change the payout method. At present, the amount is administratively determined or budgeted per operator per route by type of vehicle. This method is not efficient.

An alternative method is to allocate subsidies on the basis of passengers, i.e. a fixed amount, say VND 1,000/passenger. This will be uniform across routes and operators instead of varying from route to route and from one operator to another. This method is simpler to administer and is consistent with the underlying philosophy of state subsidy. It has the following advantages:

- It will encourage operators to get more passengers, which is in line with the long-term objective of increasing the modal share of public transport;
- Incentive is for operators to reduce costs and prevent fare evasion, because their profit hinges on actual riders evidenced by ticket sales;
- Encourages operators to shift to bigger-capacity vehicles, which is one of the objectives of the Bus Modernization Project of HCMC.

It is recommended that the shift in payout method be implemented by January 2004.

3) Normalizing the Supply Line

Manufacturing Aspects: The delay in the delivery of buses, unwittingly, helped ease the initial production problem. The huge order placed on the sole designated manufacturer, as expected, swamped Transinco's ability to churn out buses above its previous production levels. If spread over 3.5 years, the demand on the factory floor would be equivalent to one bus/day, instead of seven buses every two days if compressed into one year. Ramping up work schedule of 1 bus/day in year 1, and 1.5 buses/day by year 2, and 2 buses/day by year 3 will take the manufacturer about 2 ½ years to complete the HCMC order.

Another option to ease the production backlog is to tap another supplier. With two factory shops instead of one, the delivery of the 1,318 buses can be completed in 1.5 years. That means by end 2004, all the 1,318 new buses will be operational on the streets. This is the recommended step, as it has the salutary effect of creating competition on the manufacturing side. The long-term consequence is to improve quality and reduce production cost.

Maintenance Aspects: A poorly made vehicle will pose a maintenance headache later on. The close relationship between these two aspects suggests a solution to the issue on who should maintain the buses involved in the bus leasing program. Firstly, the supplier (or two suppliers) should be compelled to provide one-year warranty and long-term maintenance support to the bus operators. The terms and conditions for the maintenance support should be defined and negotiated with the bus operators before the vehicles are delivered and released. This will enable the operators to assess their future viability. The existence of such a maintenance facility will also reduce the burden on the fleet operators. There will be no need for them to invest in expensive heavy maintenance equipment, in storing capital spares, and in recruiting and training mechanics. Conversely, the bus suppliers will also be pressured to improve as they would absorb the extra cost of poorly built buses.

The two basic choices are: (a) centralized under a separate or third party entity, or (b) decentralized and left to respective operators. If centralized, it has to be set up independent of Saigon PTC or any operator for that matter to avoid conflict of interests because of the institutional weakness of bus operators. Allowing them to maintain their respective fleet would be very risky to the lessor (Saigon PTC). Hence, a new maintenance entity or center should be set up by the bus manufacturers/suppliers.

4) Overcoming the Organizational Hurdles

There are 32 bus transport operators in HCMC, only one of which is state-owned. A strategic decision has already been made to maintain multiple operators, rather than a single bus company as in the case of Hanoi. This is a justifiable decision, as it keeps the door open for private sector participation and avoids heavier demands on State resources.

The organizational hurdles are far more formidable than the preceding financial or supply line problems. It will involve the simultaneous buildup of the organizational and human resources of three likely fleet operators: Saigon PTC, Saigon Star, and the fledgling Transport Union.

Challenge for Saigon PTC and Saigon Star: Saigon PTC would have to enlarge its urban bus operating capability by nearly five times. Its scale of operations would jump from 75 buses to about 450. That means organizing a workforce of about 1,350 employees – from the old manning level of about 300 personnel. It has been reported that its depot site could accommodate the larger fleet. In addition, it has to create a new Leasing Office because the PC has assigned it with the task of managing the bus-leasing program.

Similarly, Saigon Star will have to gear up for the larger scale of operations. From a level of 51 buses and 192 employees, it would expand to about 450 buses and 1,350 workforce. Its current site is said to be inadequate, and therefore, would need to acquire additional land for depot. In addition, Saigon Star would have to change the composition of its shareholders and convert itself into a joint-stock corporation.

While Saigon PTC and Saigon Star could dip into its past fleet experience, this could not be said of the transport cooperatives union. This third group would wrestle with the same problems as that of Saigon Star; but in addition, it would have to shift to a different operating mode. Before the proposed "merger", its members are running their buses individually – without joint accounting, joint ticketing, common maintenance, or structured hierarchy. With no strategic investor, it suffers from a lack of bold leadership as well as capital. Without any outside intervention and model to follow, this union is unlikely to become ready to absorb the balance of the 1,318 buses.

Transforming Small Cooperatives to Fleet Operators: However, it has also been recognized that small cooperatives cannot absorb the sudden addition of a fleet of large buses. Thus, it is envisaged that small cooperatives should be merged into fewer but bigger "transport unions". These larger entities can then lease the new buses being delivered in 2003 -2004. However, except for a few (around three), the majority do not possess prior experience or expertise in managing a large fleet. To reduce the risk of failure and assist the emergence of stronger private enterprises, it will be necessary to enhance the capability of these new "transport unions" in operating a large fleet of new buses. Several types of training courses had already been identified (and described) in the TUPWS pre-investment report about the Model Bus Project. These capability-building exercises should be implemented before (and during) the allocation of new buses to new transport unions. This means from the third quarter of 2003 to about the fourth quarter of 2004. One item that needs immediate action is which agency will coordinate and arrange for the training? Logically, this should be assigned to the MOCPT. For practicality and convenience, however, this should also be included as part of the responsibilities of the bus leasing administrator – which would be under Saigon PTC, as mentioned earlier.

Deciding on the Number and Transit Ownership: The merger of smaller transport cooperatives into bigger entities begs the question: how many big-bus operators will then be allowed in HCMC? Corollarily, what should be their management structure? Answers to these two questions should precede the distribution of new buses as well as route assignment. Therefore, this issue should be studied and discussed within 2003. The HOUTRANS' recommendation is to start with three fleet operators (Saigon PTC, Saigon Star, and the Transport Union) to be set up as limited stock companies. The conversion of Saigon PTC into an "equitized" company is consistent with the recent policy of the national government about SOEs and opens the way for its eventual privatization. A privatized Saigon PTC would put it on the same level as the other bus operators and therefore levels the playing field in urban bus passenger business, which is a necessary ingredient for attracting private capital – domestic and foreign.

In the long-term period, the number of large fleet operators should be limited to seven (7) based on the number of transport corridors.

Administration of the Bus Leasing Program: A decision has already been made to channel all the 1,318 buses to be procured under the Model Bus Project through the Saigon PTC, a SOE or more accurately, a city-owned enterprise. As a consequence of this decision, other operators availing of the new buses would have to get the units from Saigon PTC and pay the corresponding monthly leasing charges. Simple as it may seem, this will demand administrative resources from Saigon PTC – for which it is ill prepared.

The biggest danger is for Saigon PTC to lose focus on its core competence – that of providing scheduled bus services. Leasing out buses requires an entirely different orientation. A similar arrangement was tried in Manila in the 1980s and the state-owned bus company at that time suffered heavy losses from leasing operations. This fate might befall Saigon PTC, unless defensive steps are taken.

A small organizational unit within Saigon PTC has to be created as soon as possible. As it is, HCMC has already announced the delivery of another batch of buses before the end of 2004. Thus, the creation of such a unit becomes urgent. This unit should be as lean as possible to minimize cost – possibly staffed by 10 to 15 persons – to perform contracting, billing and collection, record-keeping, liaison with the lending bank, periodic inspection of the physical conditions of the vehicles being leased out, insurance arrangements, and asset disposition (in case of foreclosure or nonpayment). The corresponding budget has to be secured first before the office can be set up and before any staff can be recruited. Presumably, the HCMC government will have to shoulder the administrative expenses involved. It is suggested, however, that a small fee (say, VND 50,000/month) be imposed for every bus unit handled to cover these expenses.

One of the first tasks of the Lease Administrator – before the first contract is signed – is to define the terms and conditions between Lessor (Saigon PTC) and Lessee (bus operator) in such topics as maintenance obligations, manufacturer's warranty, insurance liability, rights of lessor and lessee, dispute resolution, and the like.

5) Promoting Demand Side

It will take great efforts to move commuters away from motorcycles and into buses. People in the study area have grown accustomed to taking motorcycles for every conceivable trip. According to the HIS, about 90% of respondents have no, or little, experience of bus travel. It will, therefore, be an uphill battle to persuade more commuters to shift to bus transport. Improving bus services per se will not be sufficient. Hence, some demand promoting activities would be necessary.

Targeting Students: Two large groups, in particular, should be targeted: students and employees. Students form a controllable group with defined destinations and schedules. They will provide a strong foundation for the future. If they don't get used to riding bus at an early stage, it will be more difficult to alter their riding habits later when they join the workforce. Safety considerations also require that students be given preferential attention. Students can be granted fare discounts via coupons or vouchers, which can be distributed through the schools. The MOCPT has already explored the idea with some schools. It is recommended that this be piloted at several schools – to coincide with the start of the school year in September 2004. To lay the foundation for this school-oriented bus services, the MOCPT should prepare and complete the details of the action plan no later than the second quarter of 2004. The redesign of the bus network described earlier must also consider school locations.

Converting Workers into Regular Bus Users: On the other hand, employees are also suitable targets. Their trip-to-work is more predictable, and it is administratively simple for employers to grant fare coupons as part of the wages or benefits of their employees. Since these can only be used in riding the buses, employees would then find it worthwhile to go to work regularly via buses. A side benefit of this scheme is a reduction of the transport

subsidy budget of the city government. To encourage employers to shoulder this expense, a law may be necessary to deduct this from company expense – that is, deductible for income tax payments. Newspaper reports in HCMC mentioned that bus services to industrial parks are proving to be attractive. Much more needs to be done in 2003 and 2004 for system-wide application and making it an integral element of scheduled bus services – rather than of the shuttle or contracted type – in three years time.

It was reported that that 39% of the 2.4 million workers are employed in the State sector. If all of them are given bus ticket coupons to augment their wages, there would be 1.87 million trips per day. This level is more than five times the current number of riders on buses and lambros. If workers in the private sector are included in the scheme, there would be an additional 2.9 million trips per day.

Clearly, such a shift cannot be accommodated on available buses – even if all the 1,318 new buses have been deployed. Therefore, the granting of bus ticket coupons to workers should be calibrated with the growth in the bus fleet and preferably synchronized with the changes in the mechanics of paying the subsidy. Instead of coursing the subsidy to bus operators, the payment can be given direct to users. Implementation should be timed with a fare adjustment to cover cost. If the fare is set, for example at VND 3,200/trip, the tickets can be sold to workers at VND 2,000 with the difference of VND 1,200 subsidized by the State. Assuming only 25% of workers are covered in the first year of implementation, the required subsidy would amount to VND 185 billion per year. With 50% coverage, the estimated cost of support would be approximately VND 370 billion per year. The amount per worker can be reduced annually depending on the amount of budget support.

Fare coupons as part of workers' compensation has several advantages: (a) it encourages bus operators to entice passengers, (b) it avoids the issue on whether the State can grant subsidy to private or foreign bus operators, since beneficiaries are government workers; (c) it is the most potent instrument to raise the modal share of buses to more than 10%; and, (d) it is the most efficient way of administering transport subsidy. It has two minor disadvantages though both of which can be remedied, viz.: the possibility of fare coupons being falsified or faked, and bus services being not be accessible to all workers.

Major Events and Buses: A third method of marketing the bus is to connect the bus service to "hot" events in the city. The SEA Games held in HCMC (as well as Hanoi) in December 2003 offered such an opportunity. Alternatively, the tickets to mega events can include bus ticket coupons that are usable only on particular bus routes. Advertising for the events can also be associated or carried by the buses, so that both parties – the bus operators and the event sponsors – can mutually benefit.

6) *Clarifying and Updating Regulations*

Last on the short-term action list is a review of existing laws, as well as procedures, governing public transport. Because of the way they were written, some of these regulations may prohibit the emergence of new form of bus services, such as demand-responsive and express services, or constrain traditional modes of transport. For example, Decree No.92A (concerning the business conditions for passenger transport) limits a bus service to a fixed route or to vehicles with 17 seating capacity or more. Theoretically, a mini bus or lambro, with 12 seats or less, would not qualify and therefore cannot operate legally.

It was also reported that there is an existing regulation requiring an operator to own the vehicle used for public transport. If this is the case, the leasing of buses – where the owner may not be the operator – might be proscribed.

Employers will not have the incentive to give out transport coupons to their employees if this cannot be expended or treated as deductible tax. The law on this aspect has to be clarified.

The aforementioned cases are meant only to be illustrative rather than exhaustive. But they point to the need to review the existing laws and regulations as part of the Short-term Action Plan. They lay the basis for the implementation of the medium- and long-term plans.

7) Restructuring Bus Routes

Rationale for Route Redesign: Discussions on reorganizing existing bus routes have been started by the MOCPT in conjunction with the launching of the Model Bus scheme and the fielding of new buses. It is also the view of the Study Team that existing bus routes need to be redesigned to provide existing bus users with better services and to tap potential users. Additionally,

- Responses of bus users and residents obtained from the HOUTRANS surveys put "routing" as the most important aspect that they are looking for in a bus service;
- Analysis of existing bus operations indicated poor load factors, long idle times for vehicles at terminals, and general mismatch between demand and route locations;
- In comparison with cities in other developing countries where public transport exhibit high patronage, the HCMC case lacks route hierarchy, i.e. clearer distinctions between major and feeder services as well as between provincial and intra-urban bus services;
- Service characteristics are more appropriate to provincial (interurban) operations where buses wait for passengers at designated loading points rather than to intra-urban settings where passengers wait for buses at designated bus stops.

Methodology for Bus Route Design: The simplest method is to start with the existing bus routes, followed by an evaluation of rerouting options to improve coverage as well as maximize vehicle productivity. This may be called the "bottom-up" approach to planning. Most literature on bus route design assumes an existing network with sufficient data about transfers, travel times, trip costs, and load profiles by route. Such data, however, are not available for HCMC. Even if such data are assembled, they may have little value because of the current low share of buses in daily trips. In addition, the existing route configuration is only a good starting topology if it resulted from continuous adjustments in response to market demand – which appears to be not the case in HCMC.

A more complicated method is to assume that all trips can be made by buses. Under ideal conditions, a minimum path algorithm can be applied to determine the most appropriate route from origin to destination. When thousands of such "paths" are aggregated to a manageable number of origin-destination (OD) zones, a spider network of "desire lines" will emerge. The desire lines can then be reshaped (and assigned) to the existing road network. These modified desire lines constitute a first approximation of the route network. The resulting number of direct routes, however, will still be too large and many would be impractical for bus services. Where the city has been divided into 200 zones for analytical

purposes, the theoretical number of O-D pairs could reach 40,000! Many of them could be combined for having similar topologies. Pattern recognition programs, however, are not yet available to produce a reduced set of routes with topologies sufficiently differentiated from each other. Another problem is the criterion for minimum paths. It could either be travel time, cost, or some other factor.

The JICA STRADA demand forecasting model used by the HOUTRANS may offer a practical solution to the route design problem. It uses a general utility function – which measures cost as well time – to distribute and assign trips in the road network. By excluding small-volume trips on the network – say, a threshold of 20,000 per day that may be unsuitable for high-occupancy vehicles – a reduced set of candidate routes would emerge. These high-volume corridors are currently served by various transport modes and constitute a viable target for mass transit to reduce traffic congestion. Given the low modal share of public transport in HCMC, as well as the objective of shifting more trips to buses, this "top-down" approach is deemed more appropriate than a "bottom-up" approach. Its main limitation is that it may not yield good results for secondary and feeder routes.

At the individual route level, however, the two approaches should be combined. The final route requires a good analysis of demand and its characteristic, an estimate of needed type and level of service to meet that demand, an evaluation of the physical conditions of roads where the route will move, and a determination of the most suitable vehicle type and size. A route alignment should then be finalized by considering the locations of major schools, markets, employment magnets, and low-income settlements. Once the route alignment is fixed, the corresponding support facilities, like bus stops, waiting sheds, signages, and markings, can be planned. The approach to the planning exercise on bus route design is illustrated in Figure 9.3.1.

Network Topologies: In the attempt to design a suitable future route network for HCMC some general principles can be used as guidelines. It should be noted that the topologies described in the following section are not limited to bus transportation; they are "universal" and should be considered not least in combined systems, e.g. composed of rail and bus.

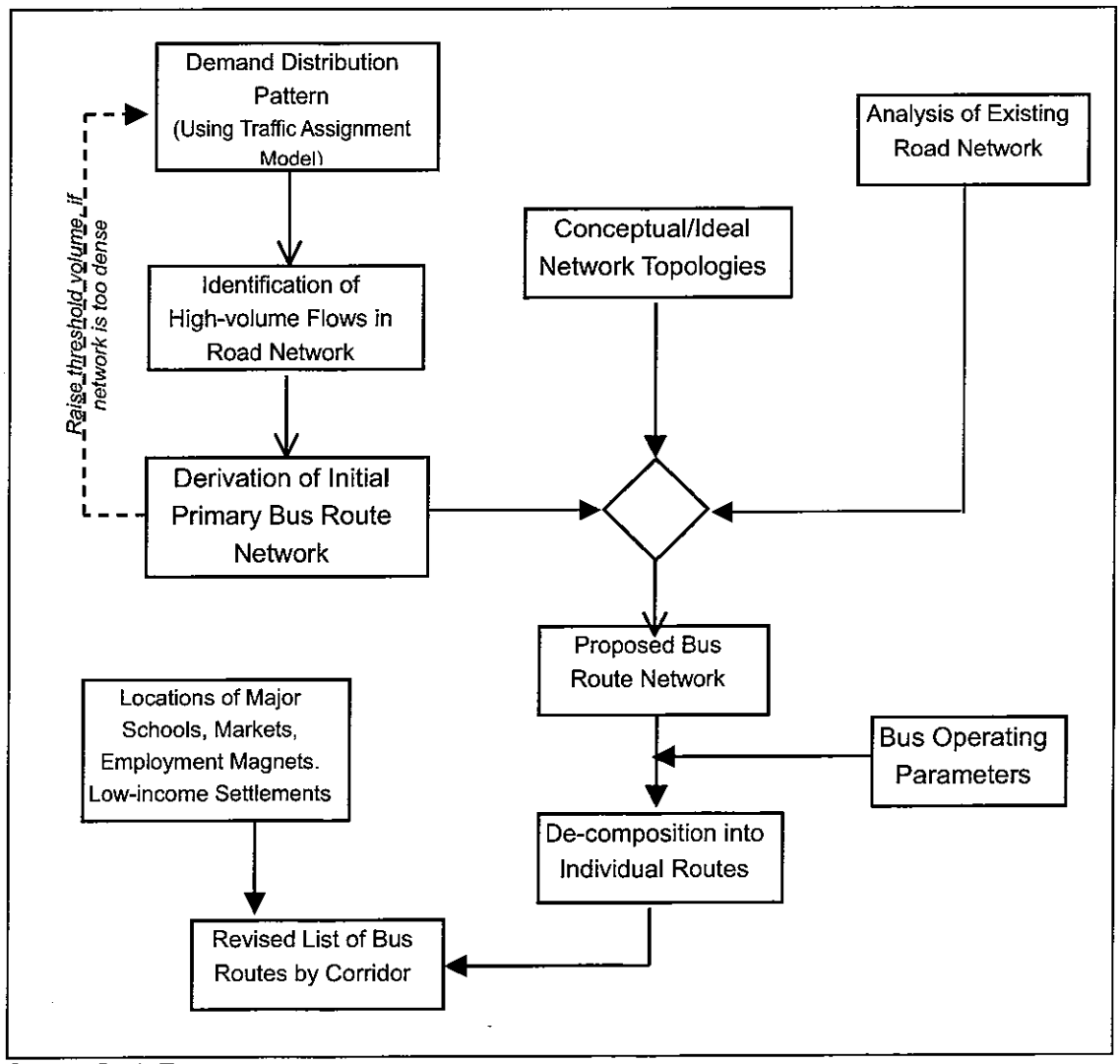
The direct route network: A "direct route" network is illustrated in Figure 9.3.2. It is a pattern common in many developing countries and is particularly suited to a low-density city with a dominant center and no subcenters. Some general characteristics are:

- The network is based on a large number of routes attempting to provide as many direct trips as possible.
- There is no hierarchy among different routes since there is no coordination between them. Therefore, even a heavy rail line if implemented in this structure will operate "on its own".
- Most routes are radial and lead to the central area which is often a dominating trip destination. Tangential or circular route elements are seldom provided. The system thus provides good accessibility to the central area but not between peripheral areas.
- Stops are often lacking, and boarding and alighting occur anywhere along the route. This reduces walking but increases overall travel times.
- Route alignments are not straight and the distances between stops are short which

means good accessibility to the system but limited commercial speed, long trip times, low vehicle performance, and high operational costs.

- The route network is typically operated by a large number of small vehicles, something which tends to create congestion particularly in the city center where they converge.
- The direct route network is least demanding on government resources. It is a natural result of a deregulated environment or ineffectual government institutions. And because they evolve through competition, their prices are quite low but transfers are penalized.

Figure 9.3.1 Approach to Bus Route Network Design



Source: Study Team

In summary, the direct route principle can be described as a demand-following approach where public transport is mainly seen as a business. The system tries to identify and respond to the existing demand of the passengers – and often does so very well – but does not attempt to influence and change travel patterns for the benefit of the city as a whole.

The trunk and feeder line network: The trunk line-feeder line network is common in more mature cities, where several subcenters coexist with a strong center and where a combination of modes (rail and bus, or buses of several sizes) operates. Some of the characteristics of this kind of network are:

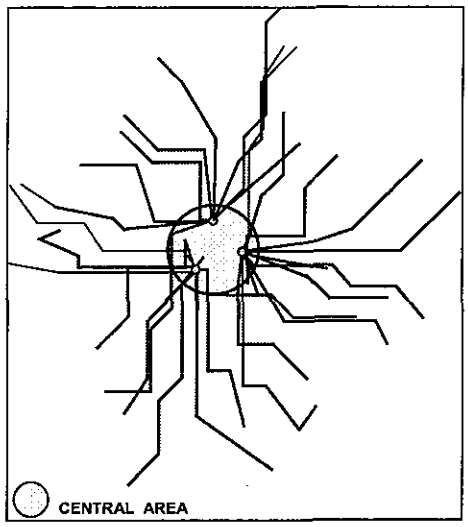
- The route network is hierarchical, where many feeder and secondary routes complement a few trunk lines and each mode operate on a line according to its strengths;
- Fewer but larger vehicles are deployed on the high-capacity trunk lines to provide a good frequency of service.
- Designated stops and stations for boarding and alighting are established, especially along the trunk lines and the points of transfers.
- With a few trunk line corridors, investments are justified for corridor traffic management measures, like separate ROW, grade separation or preferential signal treatment at intersections.
- To minimize transfers, there are a carefully chosen number of well-located and designed passenger interchanges ;
- The fare system is distance-based or zonal, so as not to penalize passengers requiring multiple transfers.

The hierarchical trunk-feeder line structure requires a strong government determined to shape the travel patterns of the inhabitants in a way that is considered rational for the whole city.

The grid network: In some cities with a pronounced grid-type road structure, the public transport network is adapted to that and forms a grid route network. This structure is often introduced in "planned new towns". This network type, used for instance in the central parts of Chicago, and Manhattan island in New York, has the main characteristic of one corridor/street – one bus route. Often, paired streets form a one-way system. The model has the disadvantage of difficulty in maximizing the number of direct trips. On the other hand, it is possible to travel between any two points in the city with only one transfer. Some elements of this principle might be applicable in certain parts of HCMC, where the road network is dense and form parallel pairs.

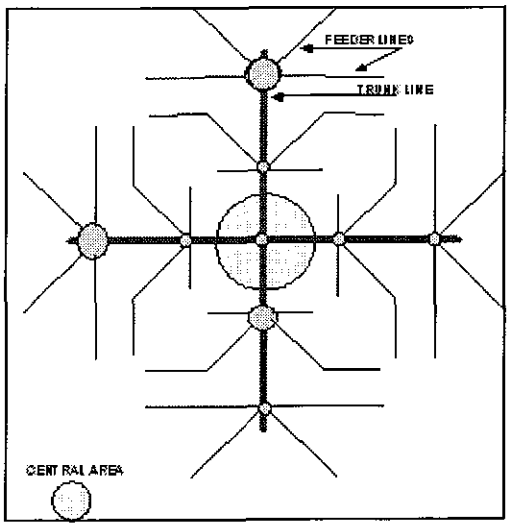
The combination network: A fourth type of network structure could be called a "combination network" which combines several aspects of the preceding three types. What distinguishes it from the trunk-feeder type is the existence of some trunk routes with nearly similar level. However, the different routes are also not individual and self-sufficient as in the direct route network but complement each other in a planned way. Overlapping routes are avoided but all parts of the city are served. As in the trunk route-feeder route network, but to less extent, transfers play a role in providing accessibility to all parts of the system. This is common in cities with extensive rail and bus networks complementing each other.

Figure 9.3.2 Direct Route Network



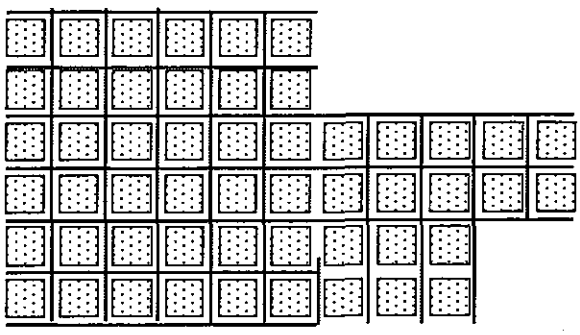
Source: Study Team

Figure 9.3.3 Trunk-Feeder Topology



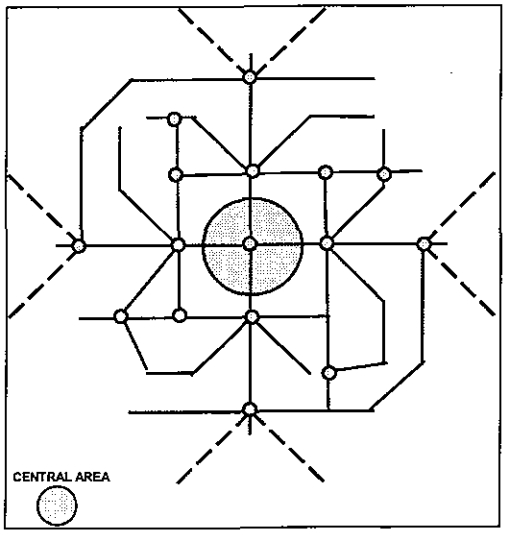
Source: Study Team

Figure 9.3.4 Grid Network



Source: Study Team

Figure 9.3.5 Combination Network

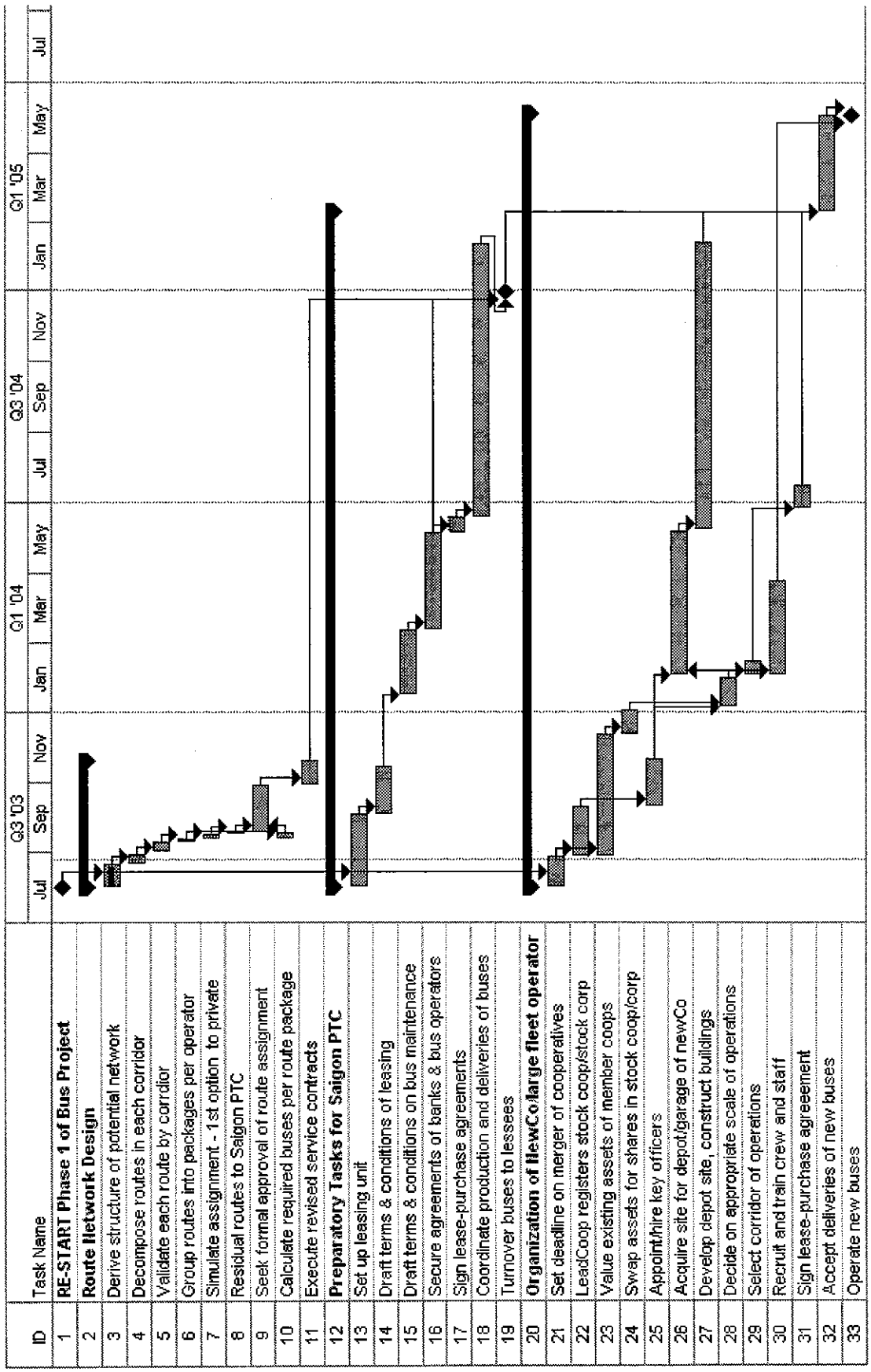


Source: Study Team

8) Implementation Schedule

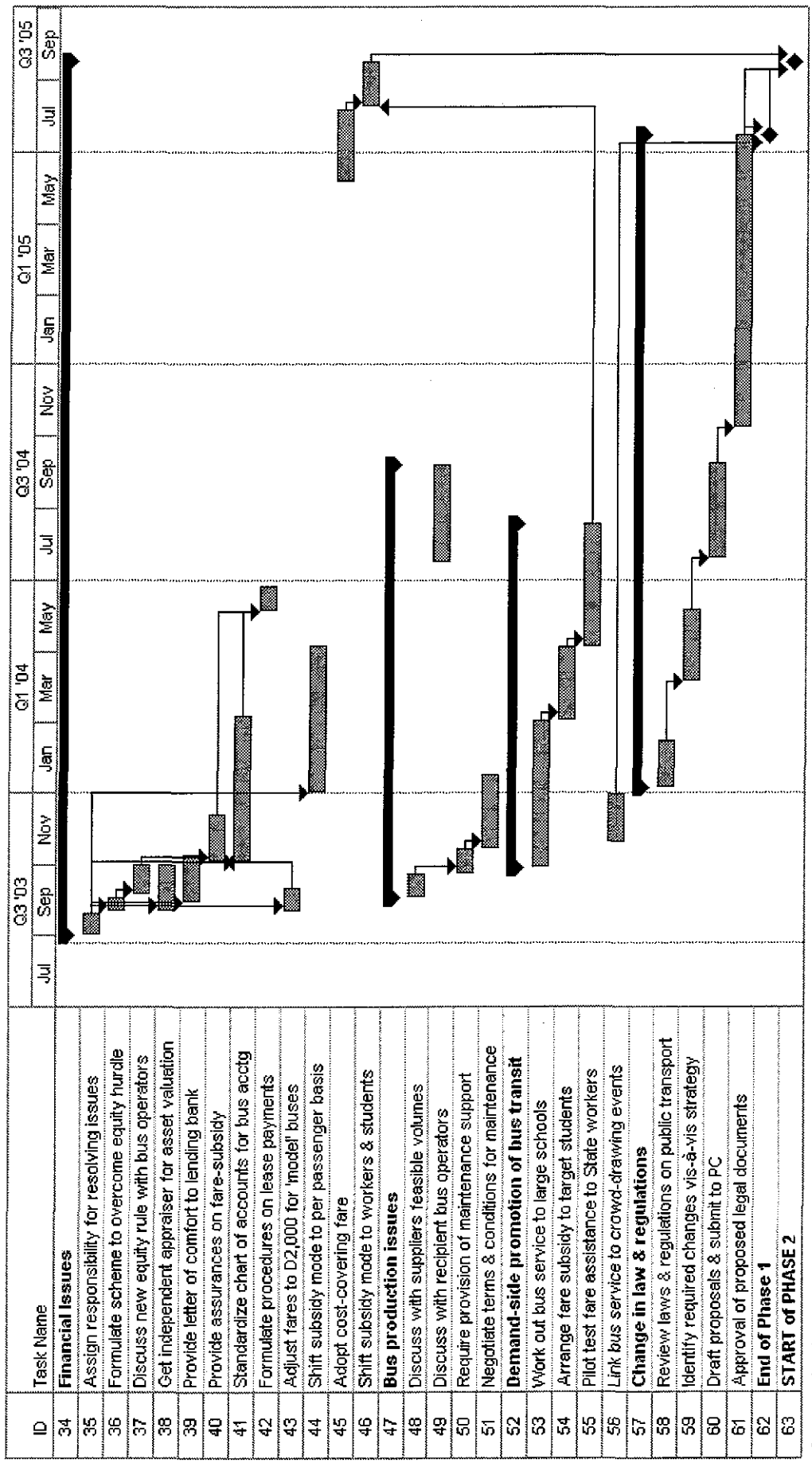
It is expected that the activities revolving around the Bus Modernization Project would extend up to mid-2005. The reorganization of bus operators is on the critical path rather than the manufacture of the buses. Further delays on this aspect will push back realization of the Short-term Action Plan. Figures 9.3.6 and 9.3.7 show the timeline for the Bus Modernization Program.

Figure 9.3.6 Indicative Implementation Schedule for Short-term Action Plan (a)



Source: Study Team

Figure 9.3.7 Indicative Implementation Schedule for Short-Term Action Plan (b)



Source: Study Team

9.4 Bus Corridor Management

1) General

It is of urgency for the city to improve the operating environment of the primary bus corridors and to designate roads where bus transport must be given priority. Prompt actions on these bus corridors will enhance road safety and increase throughput of all traffic types. Most of all, bus corridor improvements demonstrate the political commitment to promote an attractive and reliable bus transport, and allow the public to experience the sweet fruit of success at a much larger scale than the result of the Policy Test Project over a single corridor.

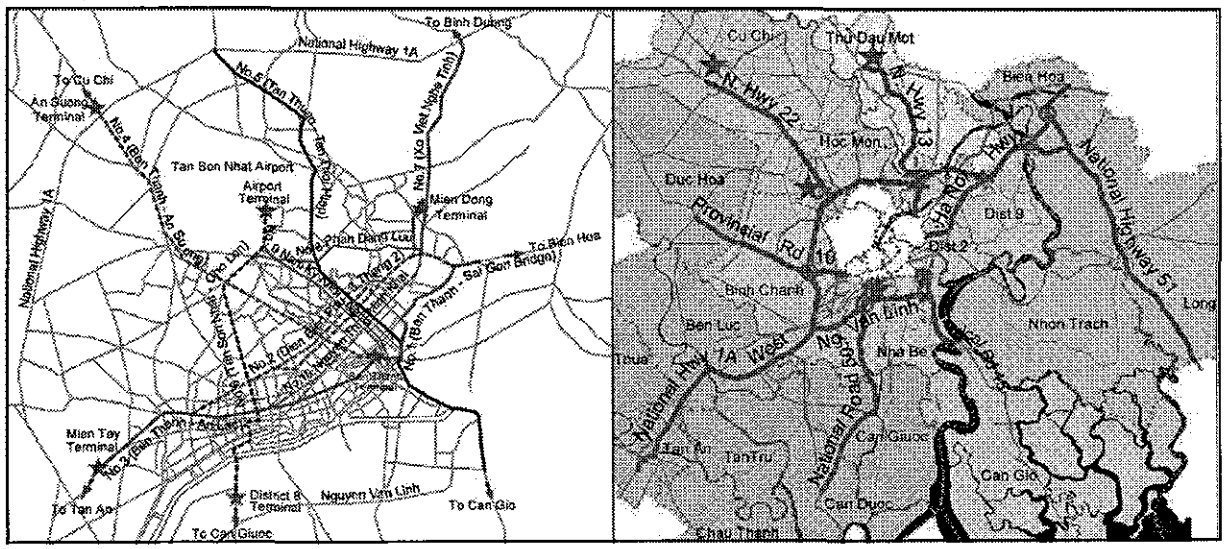
Focus is set on traffic management measures that are practical to implement in the next five years. Many of the bus-friendly traffic flow management schemes, traffic engineering techniques, and maintenance functions are of low budget and do not require dramatic changes to the existing road infrastructure.

The corridors are selected for their significance in the road network and bus service. Major public transport investment envisioned by the Master Plan, inclusive of the URMT and the busways, are located in these bus corridors.

The bus corridors can be grouped into two categories in relation to the location of Ring Road No. 2 (RR2), which will be formed on the existing NH1A loop and Nguyen Van Linh. For the area inside RR2 (commonly referred to as the city center), a core urban bus network comprising 10 main routes was selected, including roads where four UMRT lines are proposed. Outside RR2, 10 radial and circumferential corridors were identified. Eight corridors connect provincial centers with the city at the junctions of NH1A and Nguyen Van Linh, sites of the planned RR2. A busway is on the blueprint for three corridors, namely Hanoi Highway, NH1A (west) and NH22, which will be capable of transporting passengers to and from major provincial centers at a large capacity yet low cost in comparison with the UMRT.

Figure 9.4.1 Location of Proposed Bus Corridors

Within RR2 Outside RR2



Source: Study Team

2) Approach to Bus Corridor Management

Traffic management and bus promotion are the two core themes of bus corridor management. They are equally important and mutually supportive.

Road management schemes need to be suitable for primary roads.

By definition majority of the bus corridors are primary arterials on the road hierarchy, some of which have regional significance for the metropolitan area and even for the southern Vietnam. Improvements and modifications ought to be compatible with road functions and traffic features classified for such primary roads and ought to be holistic covering road infrastructure, traffic operation and control, bus operations, and community characteristics. It should also be understood that there will always be differences among the corridors, reflecting variations in urban forms and travel patterns.

There is trade-off between bus promotion and general traffic.

The short-term actions do not consider road widening unless proven critical. Therefore, promoting bus operation on these corridors would inevitably incur tradeoffs under a constrained road space, in particular in urban areas where roads are narrow. The type of tradeoff and degree of transit promotion vary from corridor to corridor pending each individual road's infrastructure and operation features.

Bus priority should be promoted for bus corridors inside city center.

Personal vehicles in the forms of motorcycles and cars are the predominant traffic on the central city roads. Under the target of 50% public transport mode share, users of such modes are the potential patrons of public transport. Bus transit priority would edge out the convenience of personal vehicles and create appeals for bus transit with fast and reliable services.

Improvement of bus facilities and limited introduction of bus priority are appropriate for corridors outside city center (outside RR2).

Within the short term, the operating frequency and passenger demand of bus services in these corridors generally will not be compatible with those of the central city bus corridors. In the meantime, these corridors will continue to function as economic arteries for the provinces into the metropolitan area. Freight movements and road safety are deemed of high priority.

3) Assessment of Existing Corridor Management

Within RR2, each bus corridor consists of a number of primary and secondary roads. Motorcycles constitute over 80% of the traffic in urban bus corridors. In the peak hours, mid-blocks and intersections are occupied by motorcycles and they tend to form latitudinal congestion in comparison to longitudinal queues of car traffic. Road pavement is usually in fair condition and basic traffic management schemes have been applied. There are some street amenities, though not always consistent and continuous, inclusive of street trees, sidewalks, street lights, and bus stop signs and markings.

For the corridors outside RR2, they mainly serve suburban communities of the city, stretches of rural areas, and spots of urban centers in the surrounding provinces. Linear low-density development is typical, with a mix of residential, industrial, and market in local

centers. Among them, Hanoi Highway, NH1A, 13 and 22 are the metropolitan's prime truck routes. Majority of the corridors have carriageways of 4-6 lanes and fair pavement conditions (except for PR10 and NH50 where pavement overlay is overdue). While traffic volume at present can be accommodated on most roads, congestions occur from section to section. Current practices in corridor management have not effectively utilized existing roadway space and have not kept up with traffic growth. Common issues are summarized below in five areas.

Undesirable bus operating environment: In urban corridors, bus operation is hampered by streams of motorcycles and bicycles. Altogether with the frequent stop-and-go on short city blocks, actual bus operating speed is much lower than that of motor vehicles. As for those in the outlying areas, little stop facility is provided with stops often located in the unpaved roadside.

Inadequate traffic engineering: This is observed throughout the corridors including those recently constructed. Inadequate and inconsistent applications of traffic engineering measures undermine road capacity and safety.

Separation of corridor management from road development: Other than pavement, supporting facilities and traffic control measures are missing from section to section on newly constructed corridors that are open to traffic.

Lax road maintenance: A noticeable portion of pavement marking is overdue for maintenance across corridors. Maintenance condition also varies by jurisdiction where road section passes, implying unclearly defined maintenance requirements and responsibilities.

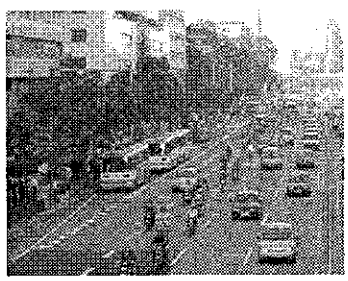
Insufficient provision of road amenities: Encroachment of narrow sidewalk by shops and parking is common along urban bus corridors. Outside RR2, lack of sidewalk, lighting, and signage in community centers and negligence of road littering and dust are shared by corridors narrow and wide, old and new.

4) Measures for Bus Corridors

(1) Separation of Vehicle Modes through Lane Designation

For better traffic capacity, road safety, and bus operation, it is a must to segregate slow-moving vehicles from fast-moving ones on the primary corridors. On urban roads, motorcycles are capable of speeds comparable with cars. On long stretches of interprovincial corridors, there is an observed difference in speeds among vehicles. Segregation of vehicle type is appropriate where multiple lanes are available, with slow-moving vehicles on the right (outer lane) and fast-moving ones on the left (inner lane). Scheme of improvement differentiates by width of road, the most critical factor for short-term actions.

Figure 9.4.2 Measures in Guangzhou, China



Guangzhou (China) has a population of 7 million and had undergone substantial increases of motorcycle numbers in the 1990s, which still remain above 50% in the traffic. Vehicle separation is carried out on major arterials:

- Motorcycles are combined with trucks in the motorcycle-truck lane as the city center is under strict truck ban at daytime;
- Buses operate in the outer lane shared with turning vehicles;
- Light-duty 4-wheeled vehicles use the inner lanes; and,
- Bicycles are prohibited from accessing such roads.

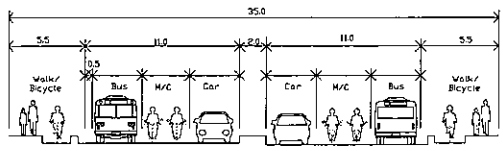
Surveillance cameras, strict violation fines, clear lane markings, and signages also assist in effectively implementing vehicle separation.

Source: Study Team

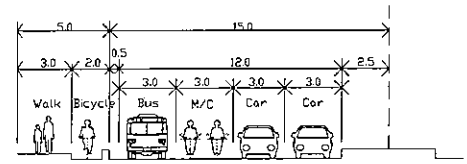
Although drivers in HCMC follow the general rule of vehicle separation, few bus corridors have a lane designation that is clearly defined and marked. Such lane designation is the basic step towards an organized traffic flow in the urban area.

Roads of 6 lanes and wider: Designation of four-wheeled and motorcycle lanes has been introduced on some corridors. Such vehicle separation is usually observed by motorists.

The challenge encountered on these urban corridors is from bicycles. There are two typical approaches to bicycle traffic. One is to provide bike path on roads where exclusive bike lanes exist or where the roadway is wide enough to accommodate an exclusive bike path. The other is to prohibit bicycle access onto bus corridors and divert bike traffic to roads in proximity.



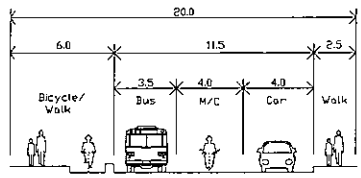
Lane Designation on Section 4
Tan Son Nhat – Cho Lon Corridor



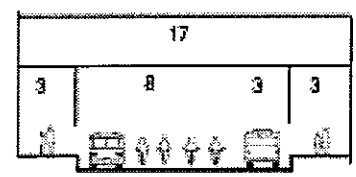
Lane Designation on Section 6
Ben Thanh - An Lac Corridor

Roads of 2-4 lanes: Tradeoffs will have to be made on cars and two-wheels in support of bus operation on the narrow bus corridors. A scheme to limit access for certain modes and divert them to parallel roads is practical only in areas where a grid road network prevails. The advantage of a grid system in the city core offers flexibility for traffic flow reorganization.

Several forms of vehicle flow separation are applied to the narrow urban corridors: conversion from two-way to one-way to open up roadway space, establishment of bus priority and exclusive lanes, prohibition of car access on narrow two-way traffic roads where buses operate, and strict control of bicycle traffic through the designation of a bike path on 1-way roads or prohibition of bicycle access.



Lane Designation on Section 3, 4, 5
Dien Bien Phu-3 Thang 2 Corridor
(One-way traffic)



Lane Designation on Section 4
Tran Hung Dao Corridor
(Prohibition of car access)

Bus corridors outside city center (outside RR2)

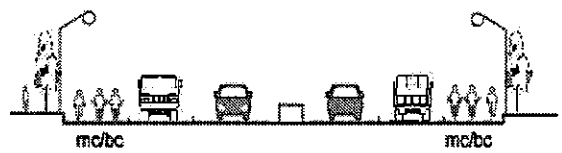
The separation of vehicle modes on these corridors is different from that of urban bus corridors due to the significance of goods movement. Within the short term, the crucial action is to ensure a smooth segregation of trucks, cars, and motorcycles. Buses should retain maneuverability in the outer lanes. Priority lanes can be introduced carefully in densely developed urban sections.

Corridors of 6 lanes and wider: The imperative action is to separate four-wheeled and two-wheeled vehicles on six-lane roads, following the rule of cars in the inner lane, trucks in the middle lane, and motorcycles in the outer lane. Such designation has been applied on Hanoi Highway and NH13 sections.

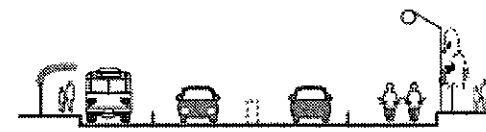
For local bicycle traffic, the designation of a separate bike path using the shoulder space is a feasible approach as there is no alternative road in the near future for limited bicycle traffic. Such bicycle space has been done on NH22 and 51.

Corridors of 2-4 lanes: The four-lane bus corridors can be categorized into two types. One type has the ROW to accommodate six lanes. On such roads, the marked edge space of 2 meters in each direction should be expanded into a 3-meter lane, allowing the designation of a motorcycle-bicycle lane in the outermost lane. Applicable roads include NH1A loop in the city, NH1A west of the city, and middle sections of NH22.

The other type of four-lane road is confined by the dense abutting development, i.e. PR15. In this case, buses share the outer lane of travel direction with motorcycles.



Section 2, NH22
(Road widening to designate mc/bc lane)



PR15
(Continuing existing rule of traffic flow)

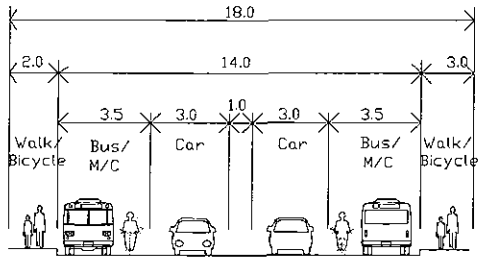
For two-lane sections on PR15 and NH50, the solution is to widen to four lanes in the mid-term. The widening of NH50 is already a committed project by HCMC. Prior to the occurrence of such widening, efforts should be on traffic control and engineering measures, which are detailed in the section on traffic engineering measures.

(2) Bus Priority and Facilities

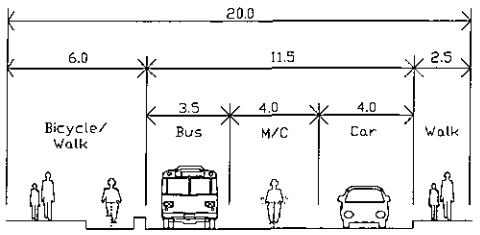
All urban bus corridors are targeted to eventually establish bus priority lanes or exclusive lanes. Exclusive lanes, by definition, do not permit other traffic entering the bus lanes except for emergency vehicles, offering higher priority to bus operation but has bigger impact on traffic flow. Priority lanes allow other specified vehicle traffic to travel in the bus lane as long as they do not disturb bus operation. It compromises bus operation with vehicular traffic, especially motorcycles and right-turning vehicles, and has considerable applicability in HCMC.

Urban bus corridors (within RR2)

Generally, bus exclusive lanes could be initiated on wide six-lane roads as well as the 3+ lane urban roads suitable for conversion to one-way traffic. Bus priority lanes fit the narrow six- and four-lane roads where two-way traffic has to be maintained. Motorcycles are allowed to operate on the bus priority lanes.



Bus Priority Lane on 4-lane Road



Bus Exclusive Lane on 1-way Road

As the level of bus services will increase much in the urban bus corridors, the growing number of transit users would desire a convenient access to bus stops and comfortable waiting at stops. Improvement of sidewalks and provision of stop amenities throughout the corridors should be the target within the short term, even prior to the implementation of priority lanes.

Bus corridors outside city center (outside RR2)

The bus priority lane is introduced in the District 2 section of Hanoi Highway up to the toll plaza. This section carries frequent city bus services with closely spaced bus stops. Most importantly, it has a wide carriageway with exclusive two-wheeled lanes. The bus priority lane would allow right-turning vehicles in the lane. Prohibiting two-wheels into the bus lane and improving stop amenities would complement the bus priority scheme. As the priority lane is built upon the existing infrastructure, it would bring in short-term benefits without interfering with the future plans for the UMRT or the busway.

Bus Priority w/ Right–turning Vehicles
Section 1, Hanoi Highway

Bus service and demand on other sections and corridors are yet to mature in the short term to be considered for bus priority treatment. However, the undesirable conditions of bus stops and pedestrian environment call for immediate actions by the city and the provinces.

(3) Traffic Engineering Measures

Traffic engineering for bus corridors is essential to accomplish effective bus priority operation as well as improve overall corridor performance without incurring large investments. In addition, measures could be designed to target location-specific operational issues, particularly at bottlenecks and accident-prone spots.

Key to the success of traffic engineering is to devise location-suited applications through the modification and combination of common measures. Measures for individual corridors are proposed in detail in subsequent pages. Typical measures suitable for bus corridors are described below.

a) Mid- block

Traffic engineering measures are most effective when applied in the same format along the same bus corridor so that road users attain a clear understanding of traffic rules.

Pavement markings: Pavement markings, such as center lines, lane lines, edge lines, and arrows, are in need of standardization and regular maintenance in HCMC. On the roads where bus priority lanes are designated, solid lane lines shall be marked to reinforce the separation of buses from the general traffic. An illustrative bus lane logo in combination with color pavement painted over the bus lane would be most effective in keeping out other vehicles.

Median dividers: Continuous median dividers for multilane roads (2+ lanes in one direction) should be installed to prevent vehicles from encroaching into the opposite direction. In doing so, openings should be spaced to facilitate U-turns and pedestrian crossing.

Signs: In corridors with bus priority and exclusive lanes, signs for lane designation including bus lane shall be present and visible throughout. In the bus corridors capable of fast speed (outside RR2), speed limit signs and signs warning pedestrian walking at junctions and openings are critical. At unsignalized approaches to bus corridors, the installation of a stop or yield sign would reduce disruption to through traffic.

Delineators: Delineator studs should be used when designating bus exclusive lanes. Outside RR2, they shall be used at edges of lane, altogether with pavement markings, to enhance night safety especially on poorly lit provincial road sections.

b) Intersection

Most delays on bus corridors occur at intersections. Intersection management relies heavily on traffic engineering measures.

Geometric improvement: Many intersections along both urban and interprovincial bus corridors have inadequate, inefficient or excessive geometry, which impedes safe turning movements. General approaches consist of adjusting corner radius to fit the trajectory of vehicles, removing excessive islands on the approaches of intersecting roads, using median to prevent left turners from cutting corner, channelizing at roundabouts, and adding left-turn pocket to minimize delay to through traffic from upstream.

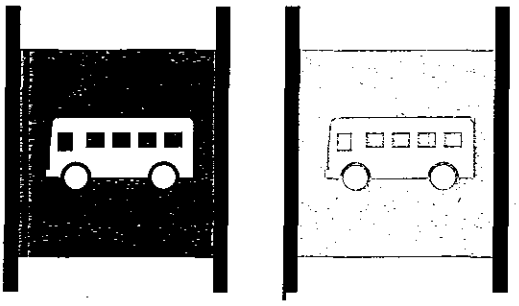
Pavement markings: Intersection markings include stop lines, pedestrian crossing, center lines, lane lines, edge lines, directional arrows, centerpoint markings, and other auxiliary symbols. Consistent marking application reduces the occurrence of vehicle intruding into intersections in red phase and protects crossing passengers to access bus stops.

Traffic signal: For bus corridors, priority is given to the left-turn phase where turning movement is warranted and to adjust lantern configuration and timing plan to fit traffic pattern at location. Replacement of outdated signals with signals of clear visibility is costly and shall begin with critical bus corridors, i.e. NH1A and Hanoi Highway.

c) Bus lane and stop

Bus lane marking: To raise road user attention to bus operation and to limit encroachment into the bus lane, the bus corridor management opts for two types of colored bus lane symbols as shown below. Bus priority lane is proposed to be painted in green and bus exclusive lane in red for a number of meters. Bus logo would be painted over the colored section.

Figure 9.4.3 Proposed Bus Lane Markings

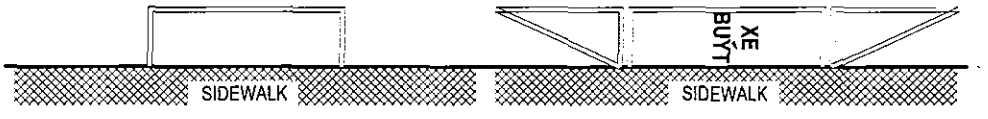


Bus Exclusive Lane Bus Priority Lane

Source: Study Team

Bus stop markings: The existing bus stop marking is a yellow rectangular box of bus size. If a car parks just before or after the yellow box, the bus cannot access the bus stop and has to load and unload passengers in the middle of the road. Although parking must be prohibited along the primary bus routes during bus operating hours, it is still effective to show the location of the bus stop in case vehicles illegally park on the road. A new design *with a triangle marking for bus access path is proposed.*

Figure 9.4.4 Bus Stop Marking



a) EXISTING BUS STOP MARKING b) PROPOSED BUS STOP MARKING

Source: Study Team

Bus priority signal: Bus priority signal is a signal function that offers preferential treatment to bus approaching the intersection. It detects an approaching bus through a bus detector installed at a suitable location upstream of the intersection and extends the green if the bus approaches the intersection at the end of a green phase, or shortens the red phase if the signal is already red. The system assumes a fixed travel time between the bus detection point and the intersection. For this reason, it works better with exclusive bus lanes and less effective with bus priority lanes. Bus stops must be set up after the intersection for the same reason.

Because bus priority signals require add-on function to signal the controller and the bus detection mechanism, the existing signal controllers would have to be replaced with new ones equipped with bus priority function. On-board unit would be installed as well.

Bus location system: The bus location system monitors the location of bus on the route.

It transmits real-time bus information to facilitate operational management and provides bus users the waiting time they would expect at stops.

The conceptual configuration of bus location system includes on-board GPS (Global Positioning System) unit and communication unit. The on-board GPS unit determines the real-time bus location and sends the information to the operation center via wireless communication system. The bus location is then displayed on the monitor screens in the control center and at bus stops, indicating the location of the arriving bus and its expected arrival time. Internet and cell phone are the other channels to use this information. These systems are already in use for years on the bus systems in both developed and developing cities and equipment is readily available.

(4) Other Management Measures

Review of traffic regulation and enforcement: Various traffic regulations required for bus corridor management, such as segregation of two- and four-wheeled vehicles, one-way system, left-turn ban, and curbside parking ban, have been done in a number of bus corridors on an ad hoc basis. A consistent approach is required when developing bus corridors by unifying and standardizing traffic regulations. Among them, it is vital to stipulate policies to ban curbside parking along priority and exclusive lanes. Strict enforcement also assists bus operation on narrow bus corridors.

Provision of road amenities: While bus corridors inside RR2 tend to have good amenities, keeping sidewalk open to pedestrians and transit users is a challenge. Outside RR2, establishing gateway image should be recognized as part of corridor management, such as road cleaning, water spraying, tree planting, lighting and rest area provision. Bus stop amenities and sidewalks are important for local community centers.

Improvement of corridor maintenance: Repair of traffic signals and routine repainting of pavement markings need to be emphasized. Clarification of maintenance requirements and responsibilities among SOE road maintenance companies and jurisdictions also ensures good pavement condition.

Integration into road development: By defining bus corridors, the city now has the opportunity to plan bus priority treatments and apply corridor management measures in the planning and design process of road widening projects and corridor land-use redevelopment. Such integration allows the built road infrastructure ready for bus priority and safe traffic operation, reducing cost and time otherwise required for separate implementation after road construction.

5) Target Improvements for Individual Corridors

A detailed description of the existing conditions and proposed improvements for individual corridors is presented in Table 9.4.1 - Table 9.4.5 and Figure 9.4.5 - Figure 9.4.34. Key improvements of each corridor are summarized below.

(1) Bus Corridors Inside RR2

No.1 Ben Thanh - Saigon Bridge Corridor: Peak-hour bus exclusive lane on the six-lane carriageway with motorcycle-bicycle lane on the service road; bus priority on the other roads; installation of traffic control devices at terminals and intersections.

No.2 Dien Bien Phu - 3 Thang 2 Corridor: Conversion to one-way system in historical urban areas (districts 1&10) to accommodate bus lane, motorcycle lane, and car lane; bus exclusive lane on eight-lane road; mixed bus and motorcycle operation in the outer lane of four-lane sections; improvement of signal system including roundabout signalization.

No.3 Ben Thanh - An Lac Corridor: Bus priority lane and control of nonmotorized vehicles on four-lane roads; improvement of sidewalk environment for pedestrians; contra-flow bus lane on converted one-way section from Nguyen Van Cu to Nguyen Tri Phuong.

No.4 Ben Thanh - An Suong Corridor: Mainly traffic control measures to eliminate through traffic from CMT8 Street; road widening to be integrated into urban redevelopment; bus and motorcycle share outer lanes on the four-lane corridor; improvement of road network in the area.

No.5 Tan Thuan - Tan Thoi Hiep Corridor: Conversion to one-way on Hai Ba Trung paired with Nam Ky Khoi Nghia and bus priority measures; road improvements of northern section including carriageway and sidewalk.

No.6 Tan Son Nhat - Cho Lon Corridor: Improvement to narrow carriageways and sidewalks in District 5; strict enforcement to minimize conflicts from roadside activities and parking; bus/motorcycle lane on the relatively wide sections.

No.7 Xo Viet Nghe Tinh Corridor: Improvements on carriageway and sidewalk in the old town of Binh Thanh; provision of one-way system; road markings and signages for bus, car, and motorcycle lanes; incorporation of bus priority measures in ongoing road construction.

No.8 Phan Dang Luu - Bach Dang Corridor: Adjustment of wide travel lanes in the corridor to provide efficient use of road space; designation of bus exclusive lane in the eastbound direction; clearing up of sidewalks on Bach Dang; signalization and addition of left-turn phase at intersections.

No.9 Nam Ky Khoi Nghia - Airport Corridor: Utilization of one-way system on Pasteur and NKKN; bus exclusive lane for travel into the city (southbound) north of Cong Ly Bridge and two-directional bus exclusive lanes on the six-lane road to the airport; provision of convenient transfers at airport terminal.

No.10 Nguyen Thi Minh Khai Corridor: Contra-flow bus exclusive lane for travel direction into the city center with motorcycle and car traffic using Vo Van Tan; exclusive lanes on one-way roads of Hung Vuong and Tran Phu; bus priority on the other sections; clearing up of narrow sidewalk east of Phung Khac Khoan; signalization of roundabouts.

(2) Bus Corridors Outside RR2

No.1 Hanoi Highway: Bus priority using outer lane of six-lane section in District 2 shared with right-turning vehicles; separation of two-wheels through enforcing present lane designation and widening within existing ROW for motorcycle lane; construction of a northbound and a southbound bus passenger transfer and bus interlining facilities at current locations.

No.2 Nguyen Van Linh Corridor: Inclusion of corridor management into road development;

conservation of land for future transit pedestrian and bicycling facilities through development permits; introduction of bus priority and frequent bus service as Nam Saigon realizes large-scale development.

No.3 PR10: Road pavement improvement to provide basic operating environment for buses and general traffic on the two-lane road; mid-term target of road widening for the east-west connector; reorganization of roadside markets in city districts.

No.4 PR15: Congestion mitigation of the northern section through traffic engineering and enforcement; buses sharing with motorcycle traffic in the outer lane. This is a continuation of an inner-suburban transit and pedestrian-friendly corridor.

No.5 NH1A (city loop): Integration of standard corridor management as part of road construction; management of flyover junctions to facilitate safe and organized traffic movements; designation of two-wheels in the outer lane throughout the corridor; immediate provision of basic bus stop amenities with signs and paved pads.

No.6 NH1A (west): Lane designation for motorcycles, cars, and trucks on this major truck corridor; bus operation in outer lanes, shared by motorcycle traffic; provision of basic transit amenities inclusive of pads, stop signs, and shelters at local centers.

No.7 NH13: Application of good corridor management on north sections to the road section south of NH1; improvement of bus operating environment in urban areas south of NH1; establishment of bus priority when widening the section south of NH1A to 6 lanes.

No.8 NH22: Clear lane markings and sidewalk provision in Hoc Mon District to better utilize its wide carriageway; improvement of access to inter-city bus terminals; widening within ROW in mid sections to establish motorcycle-bicycle lane.

No.9 NH50: Enforcement of traffic regulation within the city at present; road widening to 4 lanes; Incorporation of bus-friendly operating measures during road widening.

No.10 NH51: Improvements of poor corridor conditions on the new PR 51 in Bien Hoa; provision of amenities in urban segments, including sidewalk, lighting, marking, and bus stop.

Table 9.4.1 Current Performance of Bus Corridors (Within Ring Road No.2)

Corridor		Corridor Profile			Overall Assessment[1]			
		Typical Section	Land Use	Traffic Mix[2]	Vehicle Travel Condition	Traffic Management	Bus Facility	Road Amenity
No.1. Ben Thanh – Saigon Bridge Corridor (34km)								
Section 1	Ham Nghi	6 lane	Commercial	Pax vehicle	Very good	Good	Good	Very good
Section 2	Ton Duc Thang	4-6 lane	Commercial	Pax veh, truck	Fair-Poor	Fair	Good	Very good
Section 3-4	Ton Duc Thang-Saigon Br.	4-6 lane	Mid-density resi mix	Pax vehicle	Good	Good	Fair	Good
No.2. Dien Bien Phu - 3 Thang 2 Corridor (15km)								
Section 1	Nguyen Huu Canh-Thi Nghe Br.	8 lane	Commercial	Pax veh	Very good	Good	Poor	Good
Section 2-7	Thi Nghe Br. - Cay Go	3 lane(1-wy), 6 lane	High-density resi mix	Pax veh	Fair	Good	Fair	Good
No.3. Ben Thanh - An Lac Corridor (11km)								
Section 1	Quach Thi Trang - Tran Hung Dao	6 lane	Commercial	Pax veh	Good	Very good	Very good	Very good
Section 2-3	Tran Hung Dao - Nguyen Tri Phuong	2 lane	Commercial	Pax veh	Fair	Fair	Fair	Fair
Section 4-6	Nguyen Tri Phuong-An Lac Terminal	6 lane	High-density mix	Pax veh, truck	Good	Good	Fair	Good
No.4. Ben Thanh - An Suong Corridor (13km)								
Section 1	Quach Thi Trang - 3 Thang 2	4 lane	Commercial	Pax veh	Fair	Fair	Fair	Fair
Section 2-4	3 thang2 - NH1A	4 lane	Mid-density resi mix	Pax veh	Very poor	Very poor	Fair-Poor	Fair
No.5. Tan Thuan - Tan Thoi Hiep Corridor (15km)								
Section 1	Cau Tan Thuan - Cau Khanh Hoi	4 lane	Commercial	Pax veh, truck	Fair	Good	Fair	Fair
Section 2	Ton Duc Thang - Vo Thi Sau	4 lane	Commercial	Pax veh	Fair	Good	Good	Good
Section 3-6	Vo Thi Sau - NH1A	2-4 lane	Mid-density resi mix	Pax veh, truck	Poor	Poor	Poor	Poor
No.6. Tan Son Nhat – Cho Lon Corridor (8km)								
Section 1	Cau Nhi Thien Duong - Hung Vuong	2 lane	High com/resi mix	Pax veh	Very poor	Poor	Poor	Poor
Section 2-4	Hung Vuong – Lang Cha Ca	4-6 lane	Commercial	Pax veh	Good	Good	Fair	Fair
No.7. Xo Viet Nghe Tinh Corridor (9km)								
Section 1-5	Dien Bien Phu – Binh Trieu Br.	3 lane(1-wy)	Mid density resi mix	Pax veh, truck	Fair	Fair	Fair	Poor
No.8. Phan Dang Luu – Bach Dang Corridor (6km)								
Section 1	Lang Cha Ca – Nguyen Van Troi	3 lane(1-wy)	Park/resi	Pax veh	Very good	Fair	Good	Very good
Section 2	NguyenVan Troi – Phan Dinh Phung	4 lane	High com/resi mix	Pax veh	Fair	Fair	Fair	Fair
Section 3-4	Phan Dinh Phung – Xo Viet Tinh	4 lane	Commercial	Pax veh	Poor	Poor	Fair	Poor
No.9. Nam Ky Khoi Nghia – Airport Corridor (9km)								
Section 1-3	Pasteure /NKKN from Ham Nghi - Vo Thi Sau	2 lane(1-wy)	Commercial	Pax veh	Fair	Good	Fair	Good
Section 4-5	Vo Thi Sau – Hoang Van Thu	4 lane	Commercial	Pax veh	Fair	Fair	Fair	Fair
Section 6	Hoang Van Thu – Airport	6 lane	Commercial	Pax veh	Good	Good	Fair	Good
No.10. Nguyen Thi Minh Khai Corridor (10km)								
Section 1-2	Dien Bien Phu – Phung Khai Khoan	4 lane	Mid density com/resi mix	Pax veh	Fair	Poor	Good	Poor
Section 3-4	Phung Khai Khoan - Ly Thai To	3-4 lane	High density mix	Pax veh	Poor	Fair	Good	Fair
Section 5-6	Ly Thai To – Hong Bang	3 lane(1-wy)	Mid density mix	Pax veh	Good	Fair	Fair	Good

Source: Study Team

Note: 1) Assessment rating: Very Good, Good, Fair, Poor, and Very Poor.

2) Traffic mix identifies vehicle modes of significance measured by volume and modal share
Pax veh (passenger vehicles) consist of motorcycle, car, and bus.

Table 9.4.2 Current Performance of Bus Corridors (Outside Ring Road No.2)

Corridor		Corridor Profile			Overall Assessment			
		Typical Section	Land Use	Traffic Mix	Vehicle Travel Condition	Traffic Management	Bus Facility	Road Amenity
No.1. Ha Noi Highway (31km)								
Section 1	Saing Br. - An Binh, Dist 2	6 lane	Suburban resi/indus mix	Pax veh, truck	Fair	Fair	Fair	Poor
Section 2	An Binh - Dong Nai Br.	4 lane	Suburban resi/indus mix	Pax veh, truck	Fair	Poor	Poor	Poor
Section 3	Dong Nai Br. - Bien Hoa Ctr	4 lane	Suburban com/indus mix	Pax veh, truck	Fair-Poor	Fair	Poor	Poor
No. 2. Nguyen Van Linh (18km)								
Section 1	Natl Hwy 1A-Ong Lon River	4 lane	Planned indus/edu use	Pax veh	Good	Poor	Very poor	Fair
Section 2	Ong Lon River - Provicial Rd.15	4-6 lane	Mid-density resi mix	Pax veh	Very good	Very good	Poor	Very good
No.3. Provincial Road 10 (21km)								
Section 1	Hung Vuong - An Duong Vuong	2 lane	High-density res/market mix	Pax veh,	Poor	Fair	Fair	Fair
Section 2	An Duong Vuong - City boundary	2 lane	Mid-density resi/mkt mix	Pax veh, truck	Very poor	Very poor	Very poor	Very poor
Section 3	City boundary - Duc Hoa Ctr	4 lane	Rural; Indus mix in Duc Hoa Ctr	Pax veh	Good	Good	Poor	Fair
No.4. Provincial Road 13 (12km)								
Section 1	Tan Thuan Br. - Phy Xuan Br.	4 lane	Urban high-density com/resi mix	Pax veh, truck	Fair-Poor	Good	Good	Good
Section 2	Phu Xua Br . - Ferry Terminal	4 lane	Suburban mid-density resi mix	Pax vehicle	Good	Good	Good	Good
No.5. National Highway 1A_City (33km)								
Section 1	Ha Noi Hwy - Hwy 22	6 lane	Suburban low density mixed use	Pax veh, truck	Good	Fair-Poor	Very poor	Fair
Section 2	Hwy 22 - An Lac	6 lane (construction)	Mid-density mixed use	Pax veh, truck	(under construction)		Very poor	Poor
No.6. National Highway 1A_West (34km)								
Section 1	An Lac - City Boundary	4 lane	Suburban mid-density mix	Pax veh, truck	Fair	Fair	Fair	Poor
Section 2	City boundary - Tan An boundary	4lane	Rural w/indus mix	Pax veh, truck	Fair	Fair	Very poor	Very poor
Section 3	Tan An boundary - Tan An ctr	4 lane, 2 lane(bypass)	Urban mid-density mixed use	Pax veh, truck	Fair	Fair	Good	Fair
No.7. National Highway 13 (24km)								
Section 1	Binh Trieu Br.- Hwy 1A	4 lane	Suburban mid-density mixed use	Pax veh, truck	Poor	Poor	Poor	Poor
Section 2	Hwy 1A - Thu Dau Mot Boundary	6 lane	Low density w/ indus mix	Pax veh, truck	Good	Good	Good	Good
Section 3	Boundary - TDM Bus Terminal	6 lane	Urban mid-density mix	Pax veh, truck	Very good	Very good	Very good	Very good
No.8. National Highway 22 (21km)								
Section 1	Natl Hwy 1A - Dist Rd No. 6	6 lane	Suburban com/resi mix	Pax veh, truck	Good	Fair	Poor	Fair
Section 2	Dist Rd 6 - Cu Chi Bus Terminal	4 lane	Suburban low density mix	Pax veh, truck	Very good	Fair	Poor	Fair
No.9. National Highway 50 (31km)								
Section 1	Nhi Thien Duong Br. - City boundary	2 lane	Urban high-density resi mix	Pax veh	Very poor	Very poor	Fair	Poor
Section 2	City Boundary - Can Duoc Ctr	2 lane	Rural; Mixed use in local ctr	Pax veh	Fair	Poor	Poor	Poor
No.10. National Highway 51 (40km)								
Section 1	Ha Noi Hwy - Bien Hoa Boundary	4 lane	Provincial ctr resi/mkt/indus mix	Pax veh, truck	Poor (new 51), Good (old 51)		Poor	Poor
Section 2	Boundary- An Phuoc	4 lane	Rural; Mixed use in local ctr	Pax veh	Very good	Good	n.a.	Fair
Section 3	An Phuoc - Phuoc Thai	4 lane	Rural; Mixed use in local ctr	Pax veh	Very good	Good	n.a.	Fair

Source: Study Team

Table 9.4.3 Required Improvements for Bus Corridors (Within Ring Road No.2)

Corridor		Infrastructure			Traffic Management					Bus & Street Amenities		Cost Est. (US$ 000)
		Widening	Pave-ment	Signal-ization	Traffic Reorganizing	Bus* Priority	Mid-block	Inter-section	Curb-side Control	Bus Stop Facility	Bike Lane/ Sidewalk	
No.1. Ben Thanh - Saigon Bridge Corridor												**1,158**
Section1	Quach Thi Trang - Ton Duc Thang					E		x			x	
Section2	Ton Duc Thang			x	x	P	x	x	x		x	
Section3	Ton Duc Thang - Thi Nghe Br			x		P	x	x		x	x	
Section4	Thi Nghe Br - Saigon Br			x		E		x		x	x	
No.2. Dien Bien Phu – 3 Thang 2 Corridor												**1,830**
Section1	Nguyen Huu Canh- Rach Thi Nghe					E		x		x	x	
Section2	Rach Thi Nghe - Dinh Tien Hoang			x		E		x	x	x	x	
Section3	Dinh Tien Hoang - Cong Truong Dan Chu (CTDC)			x	x	E	x	x	x	x	x	
Section4	CTDC - Nguyen Tri Phuong			x		E	x	x	x	x	x	
Section5	Dinh Tien Hoang – CMTT			x	x	E	x	x	x	x	x	
Section6	CMTT - Nguyen Tri Phuong			x		E	x	x	x	x	x	
Section7	Nguyen Tri Phuong - Cay Go				x	P	x	x	x	x	x	
No.3. Ben Thanh - An Lac Corridor												**3,003**
Section1	Quach Thi Trang - Tran Hung Dao			x		E		x	x		x	
Section2	Tran Hung Dao - Nguyen Van Cu	x	x	x	x	P	x	x	x	x	x	
Section3	Nguyen Van Cu - Nguyen Tri Phuong (NTP)			x	x	P	x	x	x	x	x	
Section4	NTP - Chau Van Liem			x		P	x	x	x	x	x	
Section5	Chau Van Liem - 3 Thang 2			x		E	x	x	x	x	x	
Section6	3 Thang 2 - An Luc Bus Terminal					E		x		x	x	
No.4. Ben Thanh - An Suong Corridor												**4,642**
Section1	Quach Thi Trang - 3 Thang 2				x	P	x	x	x	x	x	
Section2	3 Thang 2 - Nga Tu Bay Hien	x	x	x	x	P	x	x	x	x	x	
Section3	Nga Tu BayHien- Nga Ba Queo			x	x	P	x	x	x	x	x	
Section4	Nga Ba Queo - NH1A	x	x	x	x	P	x	x	x	x	x	
No.5. Tan Thuan - Tan Thoi Hiep Corridor												**5,528**
Section1	Cau Tan Thuan - Cau Khanh Hoi					P	x	x	x	x		
Section2	Ton Duc Thang - Vo Thi Sau		x		x	P	x	x	x		x	
Section3	Vo Thi Sau – Nga Tu Phu Nhuan	x	x	x	x	P	x	x	x	x	x	
Section4	NgaTuPhuNhuan – NgaSauGoVap	x	x	x	x	P	x	x	x	x	x	
Section5	Nga Sau Go Vap - Le Duc Tho	x	x	x	x	P	x	x	x	x	x	
Section6	Le Duc Tho – NH1A	x	x	x	x	P	x	x	x	x	x	

(Continuation of Table 9.4.3)

Corridor		Infrastructure			Traffic Management					Bus & Street Amenities		Cost Est. (US$ 000)
		Widening	Pave-ment	Signal-ization	Traffic Reorganizing	Bus* Priority	Mid-block	Inter-section	Curb-side Control	Bus Stop Facility	Bike Lane/ Sidewalk	
No.6. Tan Son Nhat - Cho Lon Corridor												**2,415**
Section1	CauNhiThienDuong – Hung Vuong	x	x		x	P			x	x	x	
Section2	Hung Vuong - 3 Thang 2	x	x	x	x	P		x	x	x	x	
Section3	3 Thang 2 - Nga Tu Bay Hien			x		P			x	x		
Section4	Nga Tu Bay Hien – Lang Cha Ca			x		P			x	x		
Section5	Lang Cha Ca - Nga Tu Phu Nhuan			x		P			x	x		
No.7. Xo Viet Nghe Tinh Corridor												**3,004**
Section1	Dien Bien Phu - Back Dang		x	x	x	E	x		x	x	x	
Section2	Back Dang - Xo Viet Nghe Tinh	x	x	x	x	E	x		x	x	x	
Section3	XoViet Nghe Tinh - Xau Binh Trieu				x	E	x		x	x	x	
Section4	Xo Viet Nghe Tinh - Back Dang			x	x	P	x		x	x	x	
Section5	Back Dang – Dinh Bo Linh			x		E			x	x		
Section6	Dinh Bo Linh - Nga Tu Binh Trieu			x		P			x	x		
No.8. Phan Dang Luu Corridor												**900**
Section1	Lang Cha Ca – Nguyen Van Troi			x	x	E		x		x	x	
Section2	Nguyen Van Troi – Phan Dinh Phung			x	x	E & P		x	x	x	x	
Section3	Phan Dinh Phung – Le Quang Dinh			x	x	E & P	x	x	x	x	x	
Section4	Le Quang Dinh – Xo Viet Tinh			x	x	E & P	x	x	x	x	x	
No.9. Nam Ky Khoi Nghia - Airport Corridor												**1,150**
Section1	Pasteur (Ham Nghi – Ly Tu Trong)				x	P				x	x	
Section2	Pasteur (Ly Tu Trong–Vo Thi Sau)					P				x	x	
Section3	NKKN (Ham Nhgi – Vo Thi Sau)					P				x	x	
Section4	Vo Thi Sau – Cong Ly Bridge			x		P	x	x	x	x	x	
Section5	Cong Ly Bridge – Hoang Van Thu				x	E & P	x	x	x	x	x	
Section6	Hoang Van Thu – Airport					E	x			x	x	
No.10. Nguyen Thi Minh Khai Corridor												**1,600**
Section1	Bach Dang – Thi Nghe Bridge			x		P	x	x	x	x	x	
Section2	Thi Nghe Bridge – Phung Khac Khoan			x		P	x	x	x	x	x	
Section3	Phung Khac Khoan – Ba Huyen Thanh Quan				x	E & P	x	x	x	x	x	
Section4	Ba Huyen Thanh Quan – Ly Thai To			x		P	x	x	x	x	x	
Section5	Hung Vuong (LTT – Hong Bang)				x	E		x		x	x	
Section6	An Duong Vuong&Tran Phu (Hong Bang – Ly Thai To				x	E		x	x	x	x	

Source: Study Team
Note: E: Bus exclusive lane; P: Bus priority lane (mainly mix with M/C)
E&P: Bus exclusive lane Inbound (towards city center), bus priority lane outbound (away from city center)

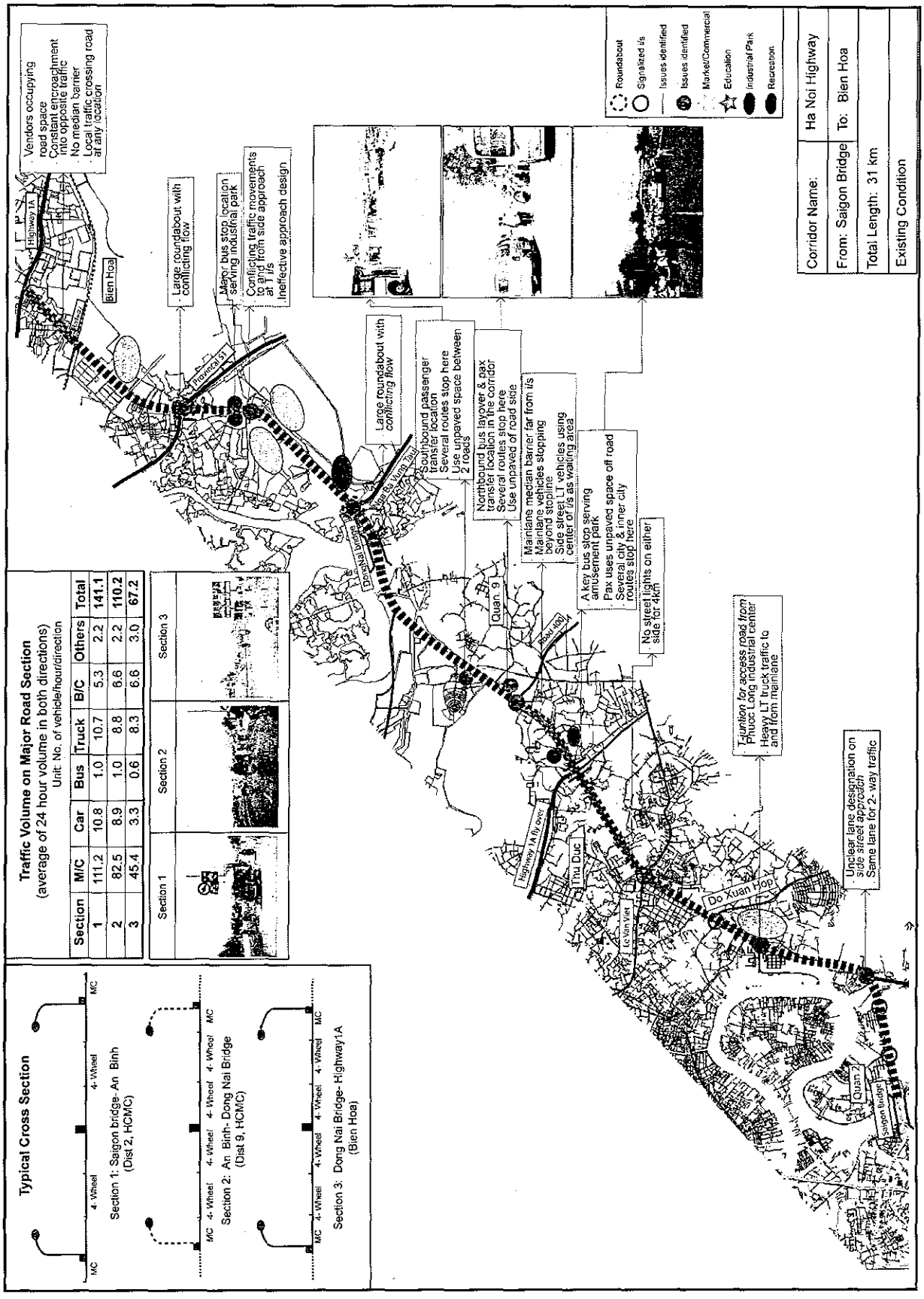
Table 9.4.4 Required Improvements for Bus Corridors (Outside Ring Road No.2)

Corridor		Infrastructure			Traffic Management				Bus Facilities			Amenities			Cost Est. (US$ 000)
		Widening	Pave-ment	Signal-ization	Lane Designation	Add'l Signal Phase	Marking /Sign / Median Barrier	Geom. Modification	Stop Sign & Pad	Shelter / Busbay at Key Stop	Transfer Node/ Terminal	Side-walk	Street Light	Land-scape/ Cleaning	
No.1. Ha Noi Highway															**3,200**
Section 1	Saigon Br. - An Binh				x				x	x		x		x	
Section 2	An Binh - Dong Nai Br.	x		x	x	x	x	x	x	x	x	x	x	x	
Section 3	Dong Nai Br. - Bien Hoa Ctr			x	x		x	x	x	x		x		x	
No. 2. Nguyen Van Linh															**700**
Section 1	Natl Hwy 1A-Ong Lon River			x	x	x	x	x	x	x		x			
Section 2	Ong Lon River-Prov Rd.15				x		x		x	x		x			
No.3. Provincial Road 10															**2,100**
Section 1	Hung Vuong - An Duong Vuong						x	x	x	x		x			
Section 2	An Duong Vuong - City boundary	x	x			X	x	x	x	x		x	x	x	
Section 3	City boundary- Duc Hoa Ctr	x					x	x	x	x	x				
No.4. Provincial Road 15															**300**
Section 1	TanThuan Br . - PhuXuan Br.						x			x		x			
Section 2	PhuXuanBr.- Ferry Terminal						x	x	x	x	x				
No.5. National Highway 1A_City															**1,100**
Section 1	Ha Noi Hwy - Hwy 22				x	x	x	x	x	x	x	x		x	
Section 2	Hwy 22 - An Lac	Under construction			x	x	x		x			x		x	
No.6. National Highway 1A_West															**3,000**
Section 1	An Lac - City Boundary	x		x	x	x	x	x	x	x		x		x	
Section 2	City boundary - Tan An boundary			x	x	x	x		x	x		x	x	x	
Section 3	Tan An Ctr			x	x	x	x	x	x	x		x	x	x	
No.7. National Highway 13															**800**
Section 1	Binh Trieu Br.- Hwy 1A	x			x		x		x			x		x	
Section 2	Hwy 1A - Thu Dau Mot Boundary			x	x		x		x	x		x	x	x	
Section 3	Boundary - TDM Bus Terminal				x		x		x	x					
No.8. National Highway 22															**1,900**
Section 1	Natl Hwy 1A - Dist Rd No.6			x	x	x	x	x	x	x	x	x		x	
Section 2	Dist Rd 6 - Cu Chi Bus Terminal	x		x	x		x		x	x	x	x			
No.9. National Highway 50															**1,100**
Section 1	Nhi Thien Duong Br. – City boundary	x	x		x		x		x	x	x	x		x	
Section 2	City Boundary - Can Duoc Ctr				x		x	x	x	x	x	x		x	
No.10. National Highway 51															**1,300**
Section 1	Ha Noi Hwy - Bien Hoa Boundary				x		x		x	x		x		x	
Section 2	Bien Hoa boundary- An Phuoc			x	x		x		x	x		x		x	
Section 3	An Phuoc - Phuoc Thai				x		x		x	x		x		x	

Source: Study Team

Figure 9.4.5 Existing Condition of Bus Corridor (Outside Ring Road No.2)

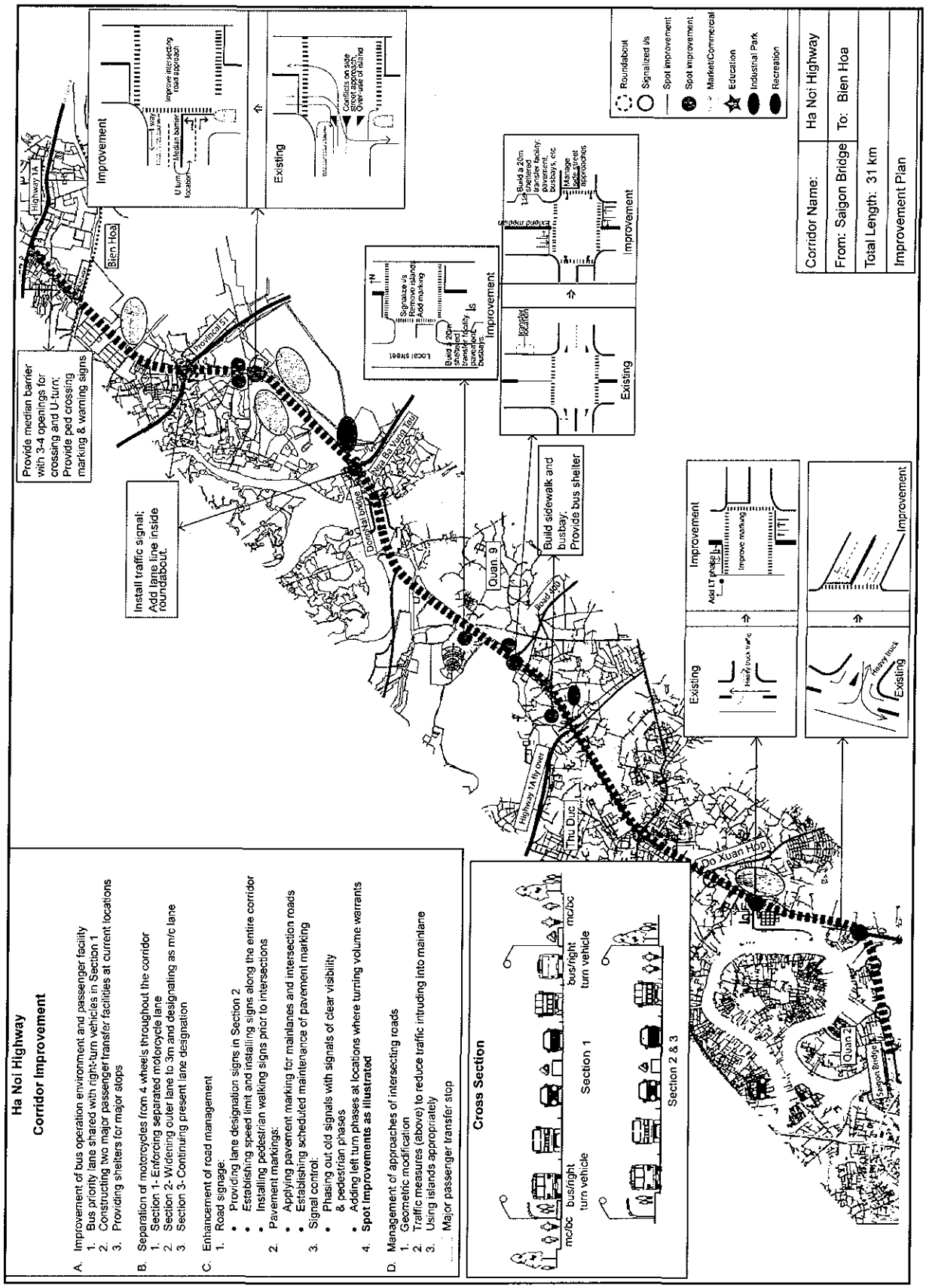
No.1. Ha Noi Highway (Sai Gon Bridge – Bien Hoa)



Source: Study Team

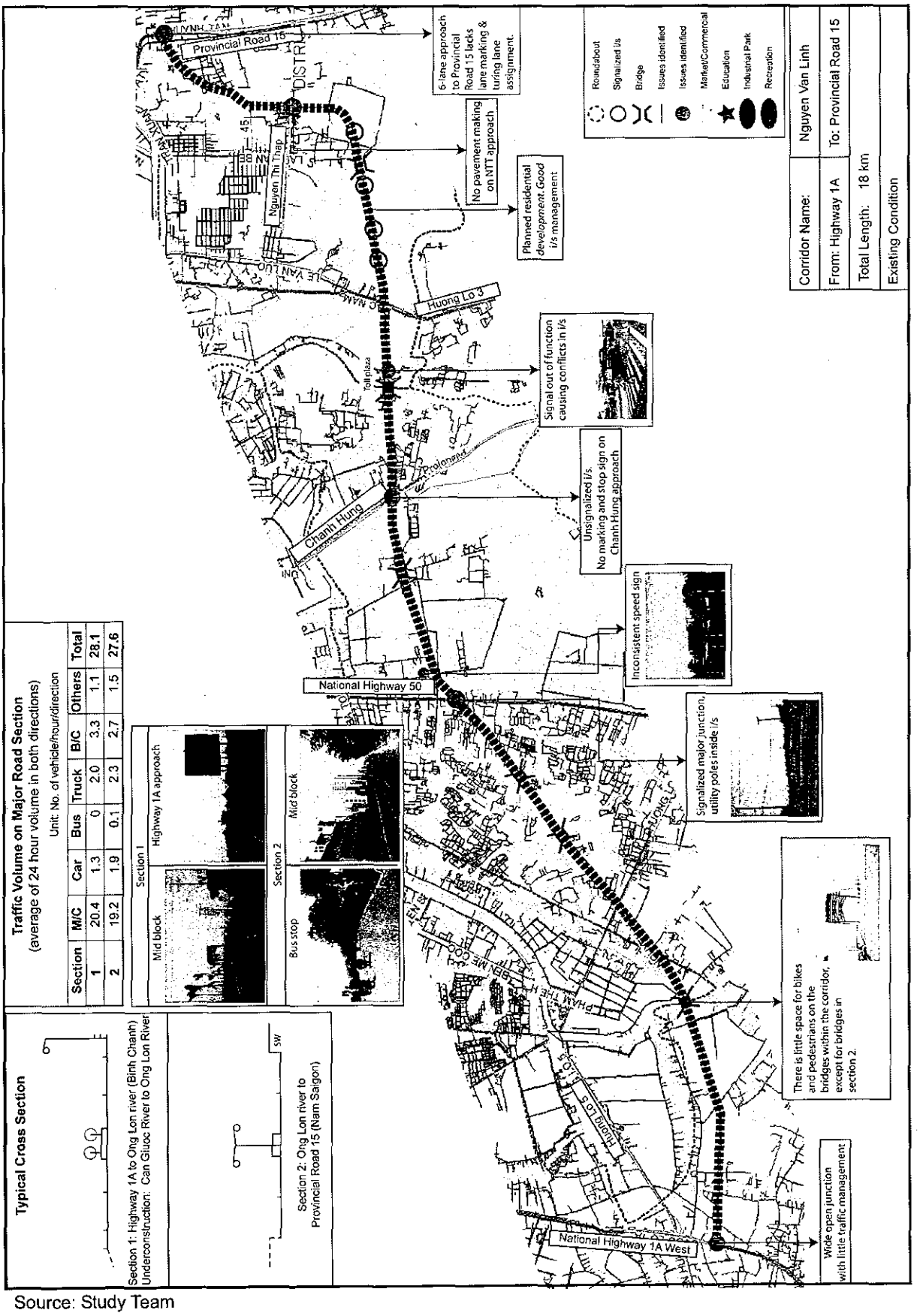
Figure 9.4.6 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

No.1. Ha Noi Highway (Sai Gon Bridge – Bien Hoa)



Source: Study Team

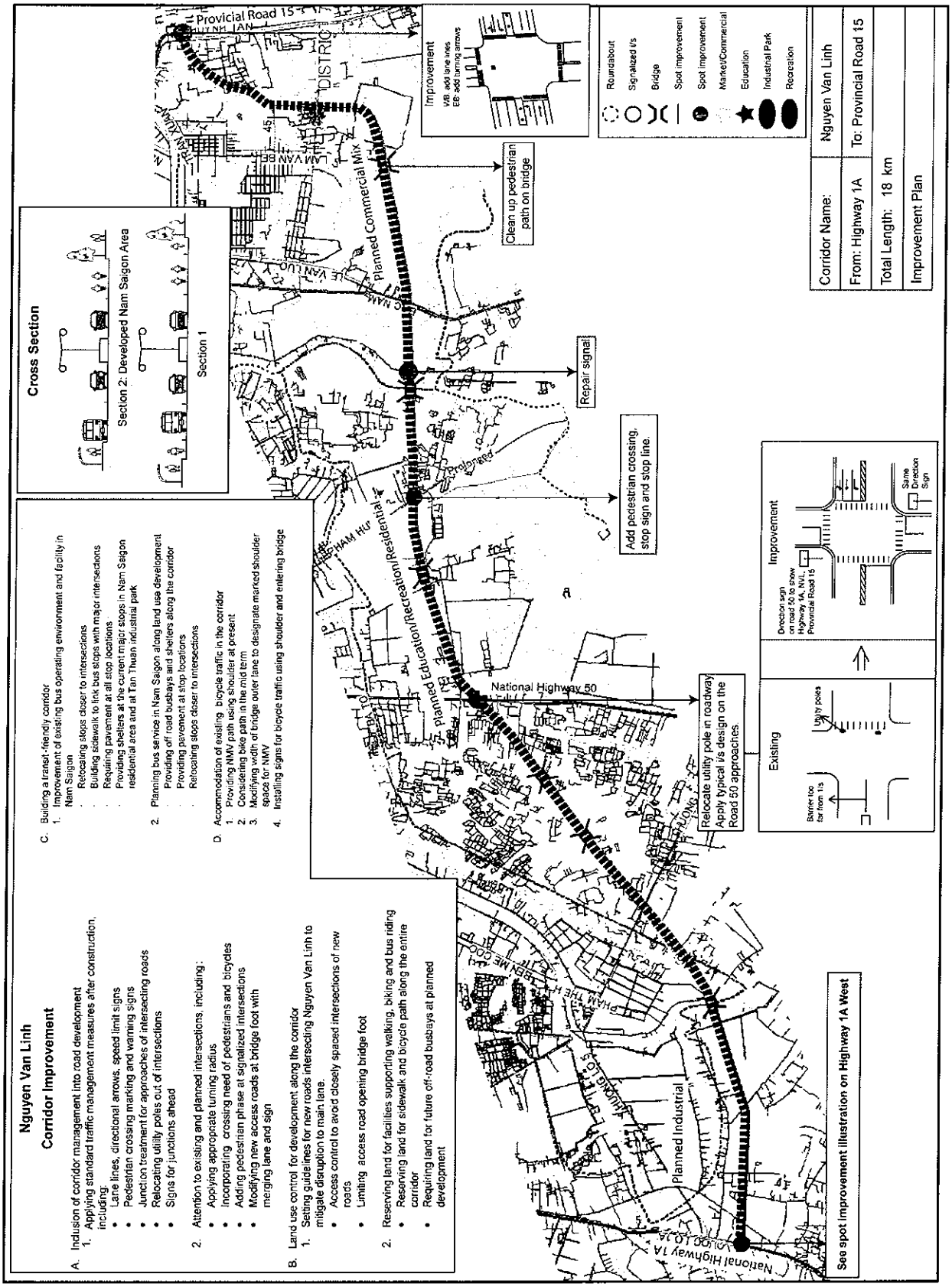
Figure 9.4.7 Existing Condition of Bus Corridor (Outside Ring Road No.2)
No.2. Nguyen Van Linh (PR15 – NH1A)



Section	M/C	Car	Bus	Truck	B/C	Others	Total
1	20.4	1.3	0	2.0	3.3	1.1	28.1
2	19.2	1.9	0.1	2.3	2.7	1.5	27.6

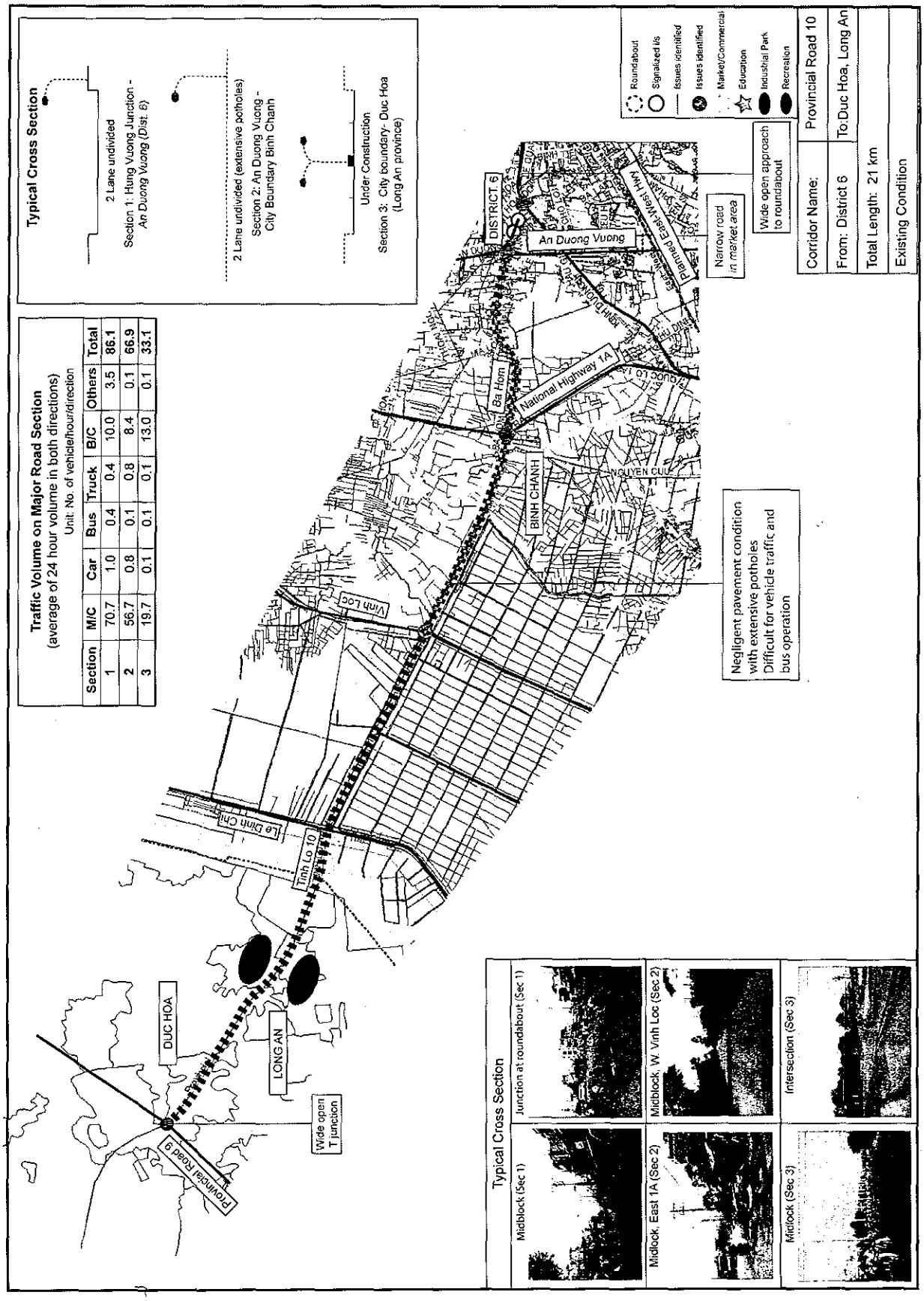
Source: Study Team

Figure 9.4.8 Proposed Measures for Bus Corridor (Outside Ring Road No.2)
No.2. Nguyen Van Linh (PR15 – NH1A)



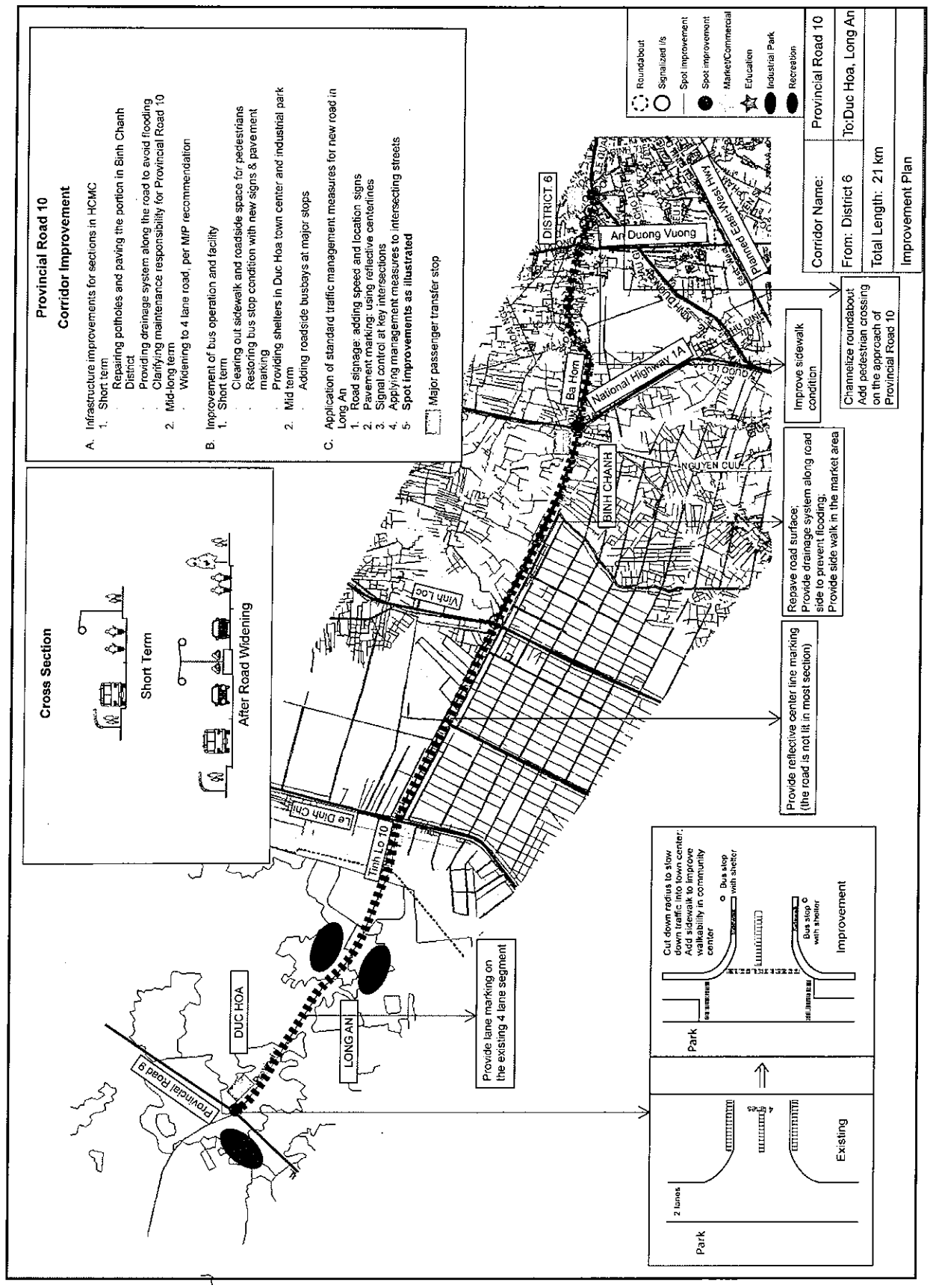
Source: Study Team

Figure 9.4.9 Existing Condition of Bus Corridor (Outside Ring Road No.2)
No.3. Provincial Road 10 (District 6 – Duc Hoa)



Source: Study Team

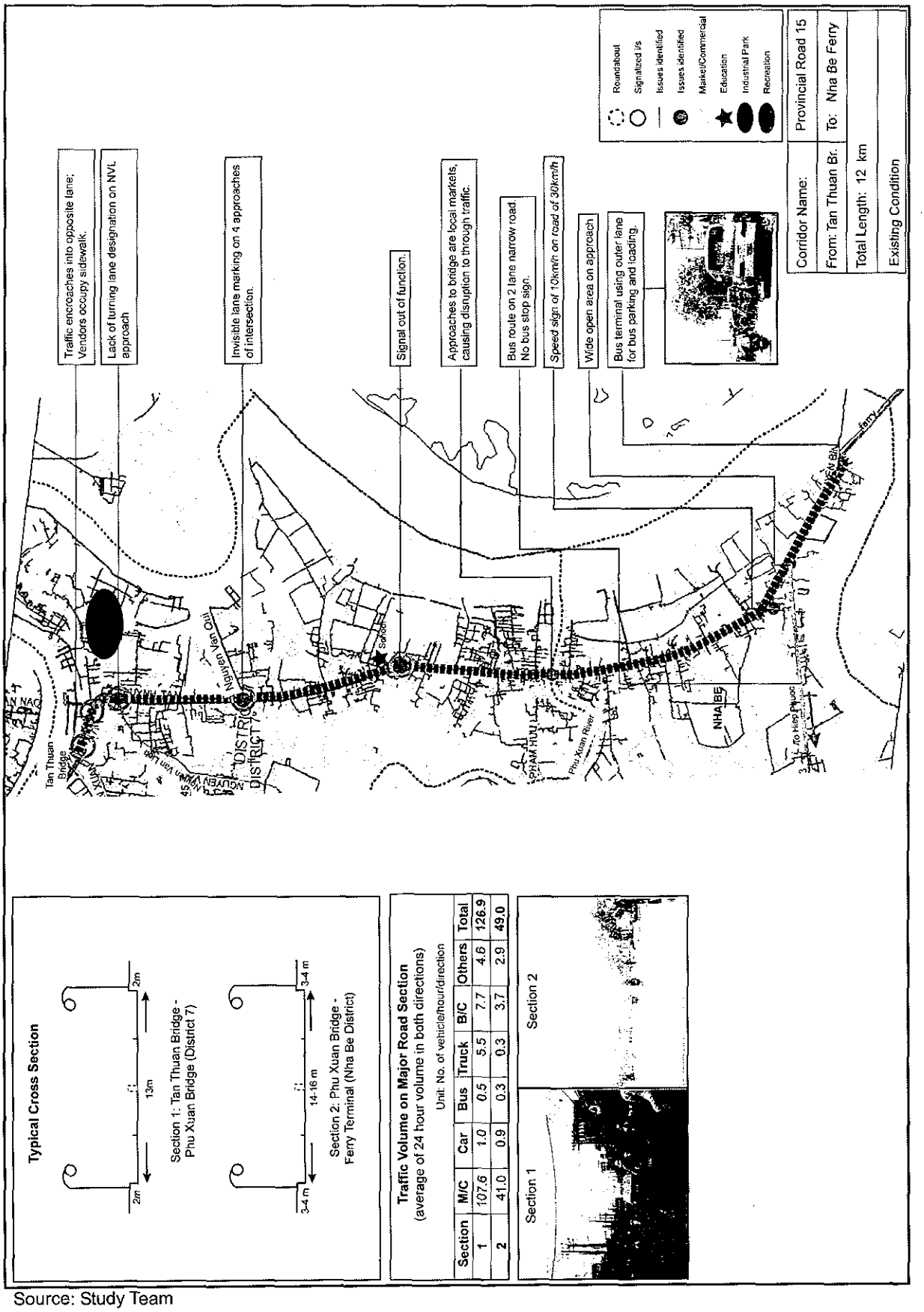
Figure 9.4.10 Proposed Measures for Bus Corridor (Outside Ring Road No.2)
No.3. Provincial Road 10 (District 6 – Duc Hoa)



Source: Study Team

Figure 9.4.11 Existing Condition of Bus Corridor (Outside Ring Road No.2)

No.4. Provincial Road 15 (Tan Thuan Bridge – Nha Be Ferry)

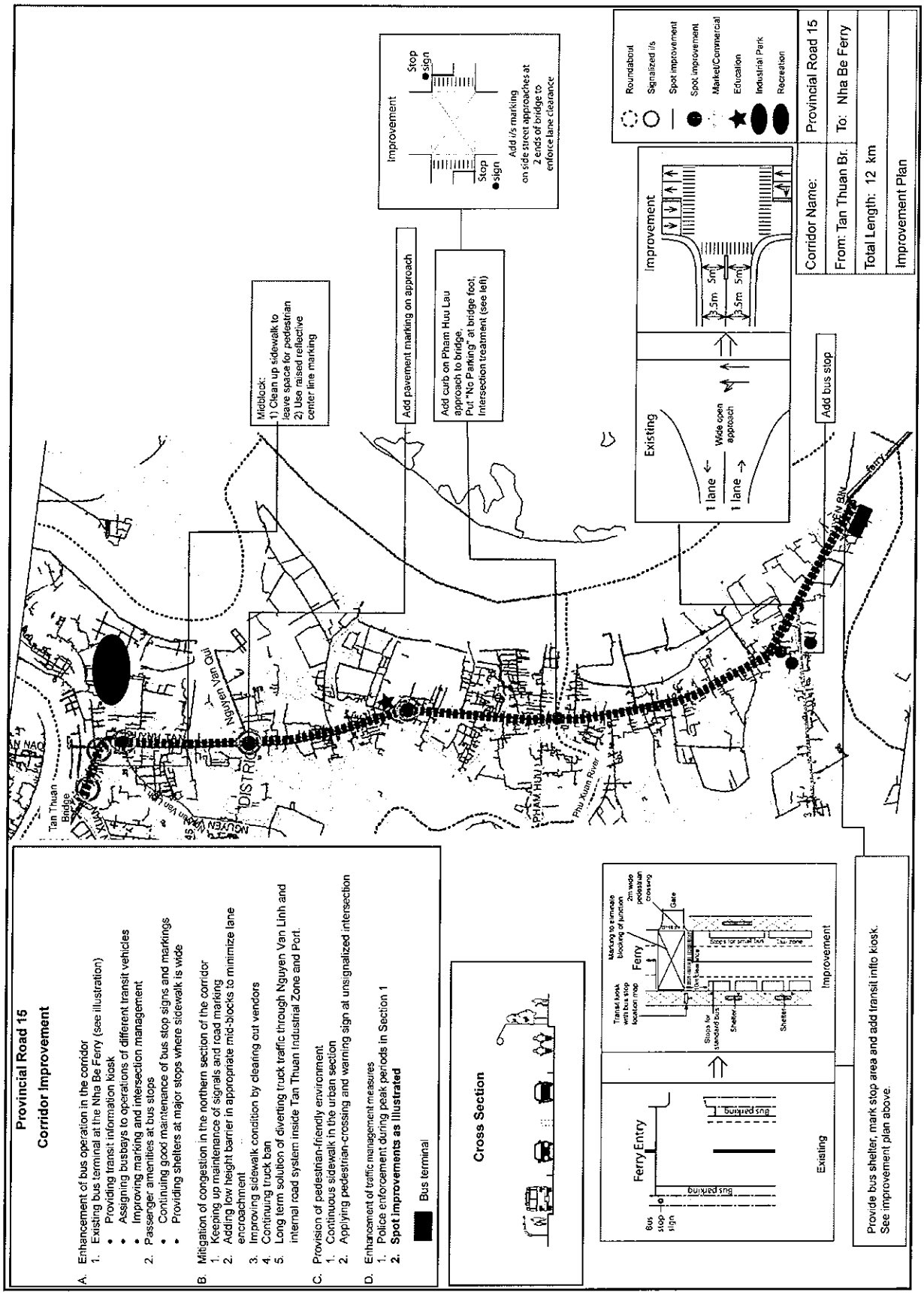


Section	M/C	Car	Bus	Truck	B/C	Others	Total
1	107.6	1.0	0.5	5.5	7.7	4.6	126.9
2	41.0	0.9	0.3	0.3	3.7	2.9	49.0

Source: Study Team

Figure 9.4.12 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

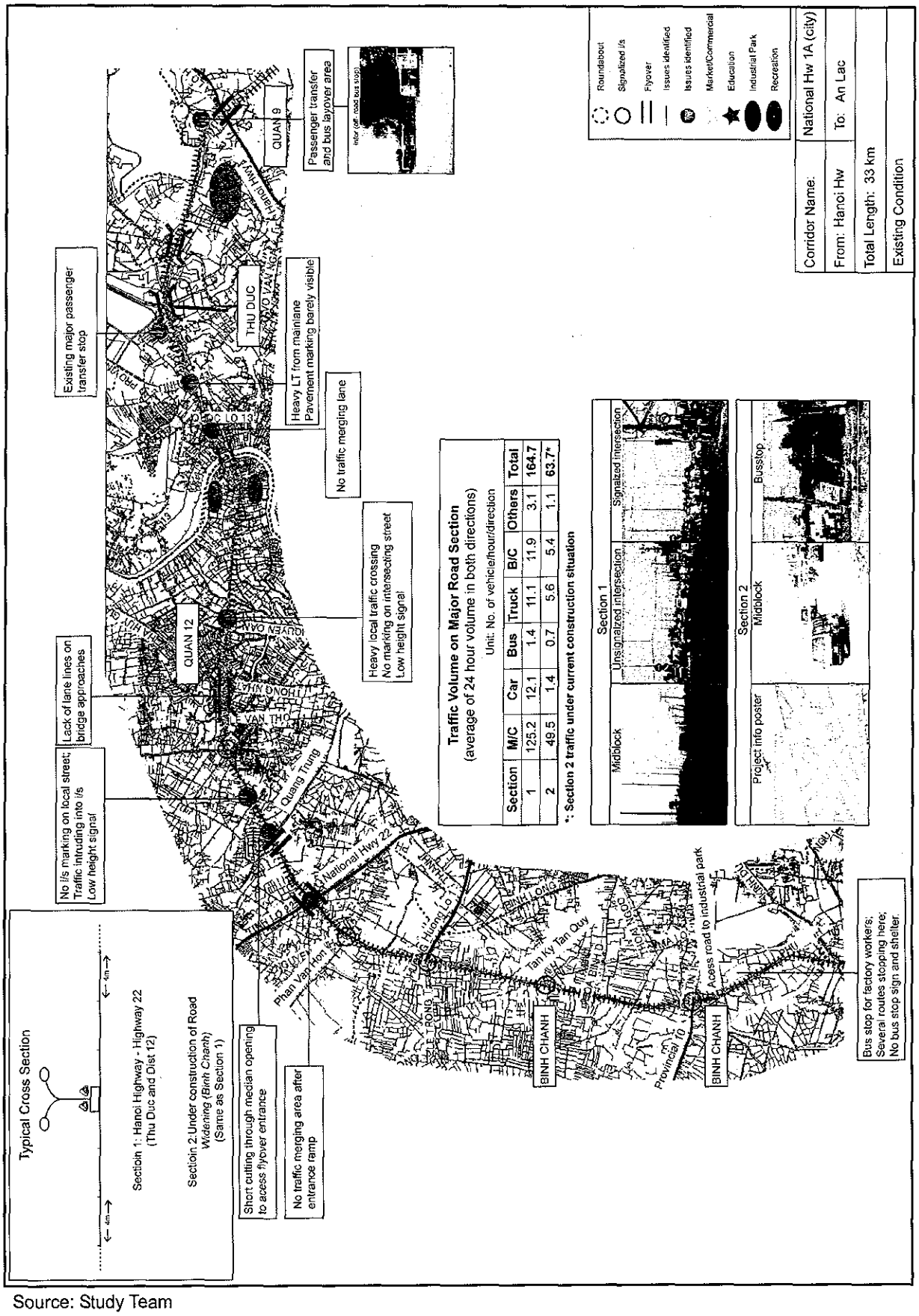
No.4. Provincial Road 15 (Tan Thuan Bridge – Nha Be Ferry)



Source: Study Team

Figure 9.4.13 Existing Condition of Bus Corridor (Outside Ring Road No.2)

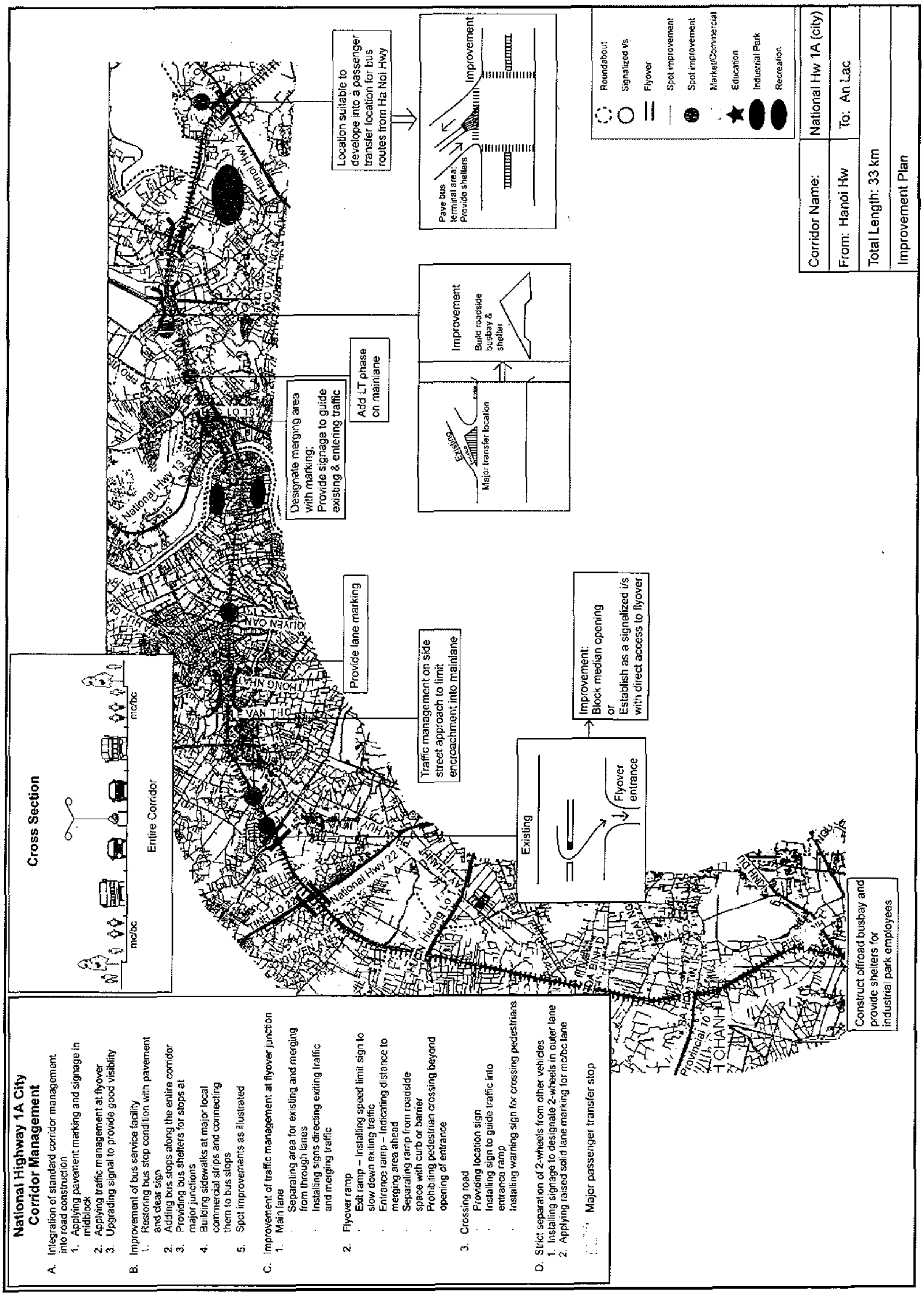
No.5. National Highway 1A _City (Thu Duc – An Lac)



Source: Study Team

Figure 9.4.14 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

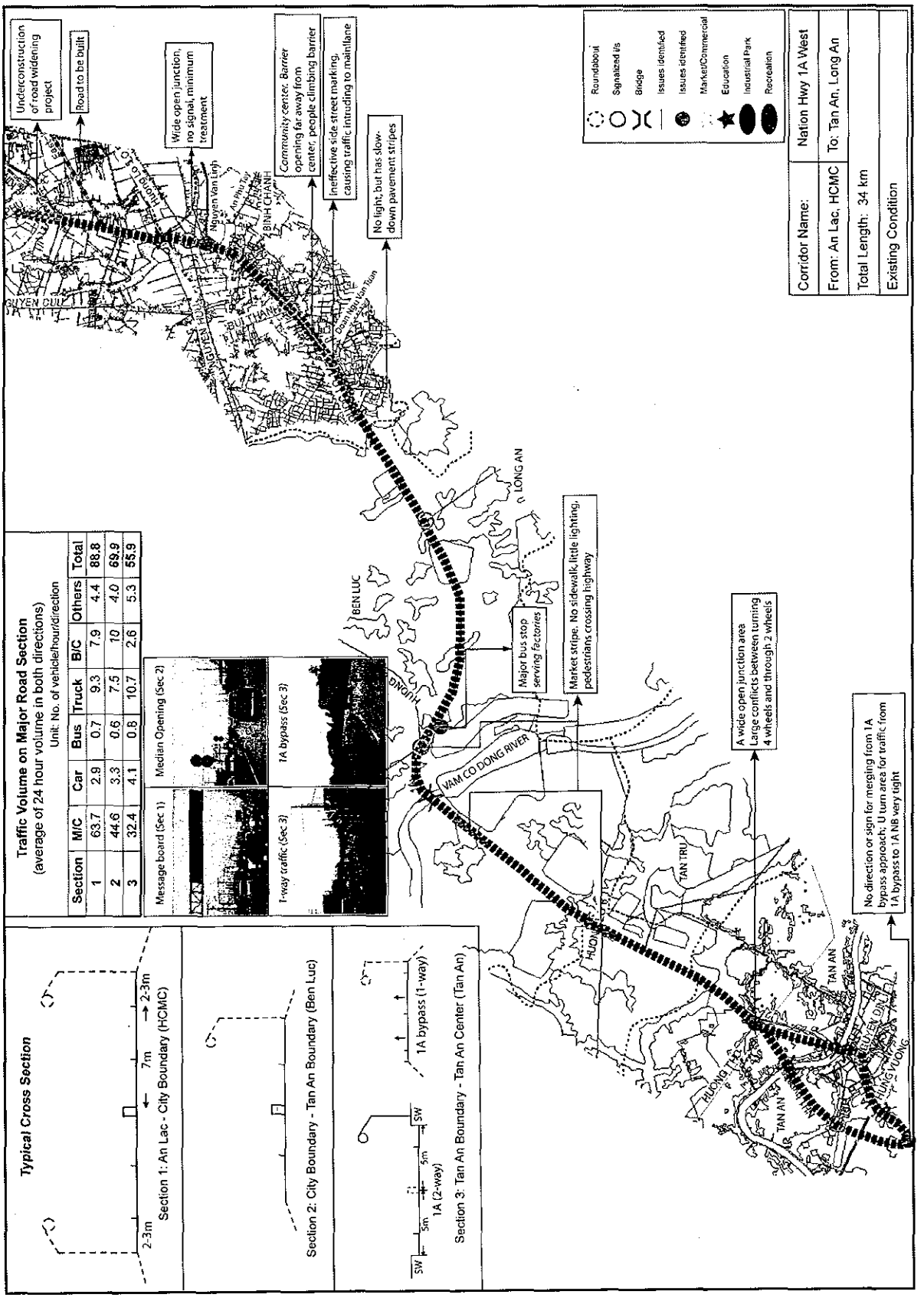
No.5. National Highway 1A _City (Thu Duc – An Lac)



Source: Study Team

Figure 9.4.15 Existing Condition of Bus Corridor (Outside Ring Road No.2)

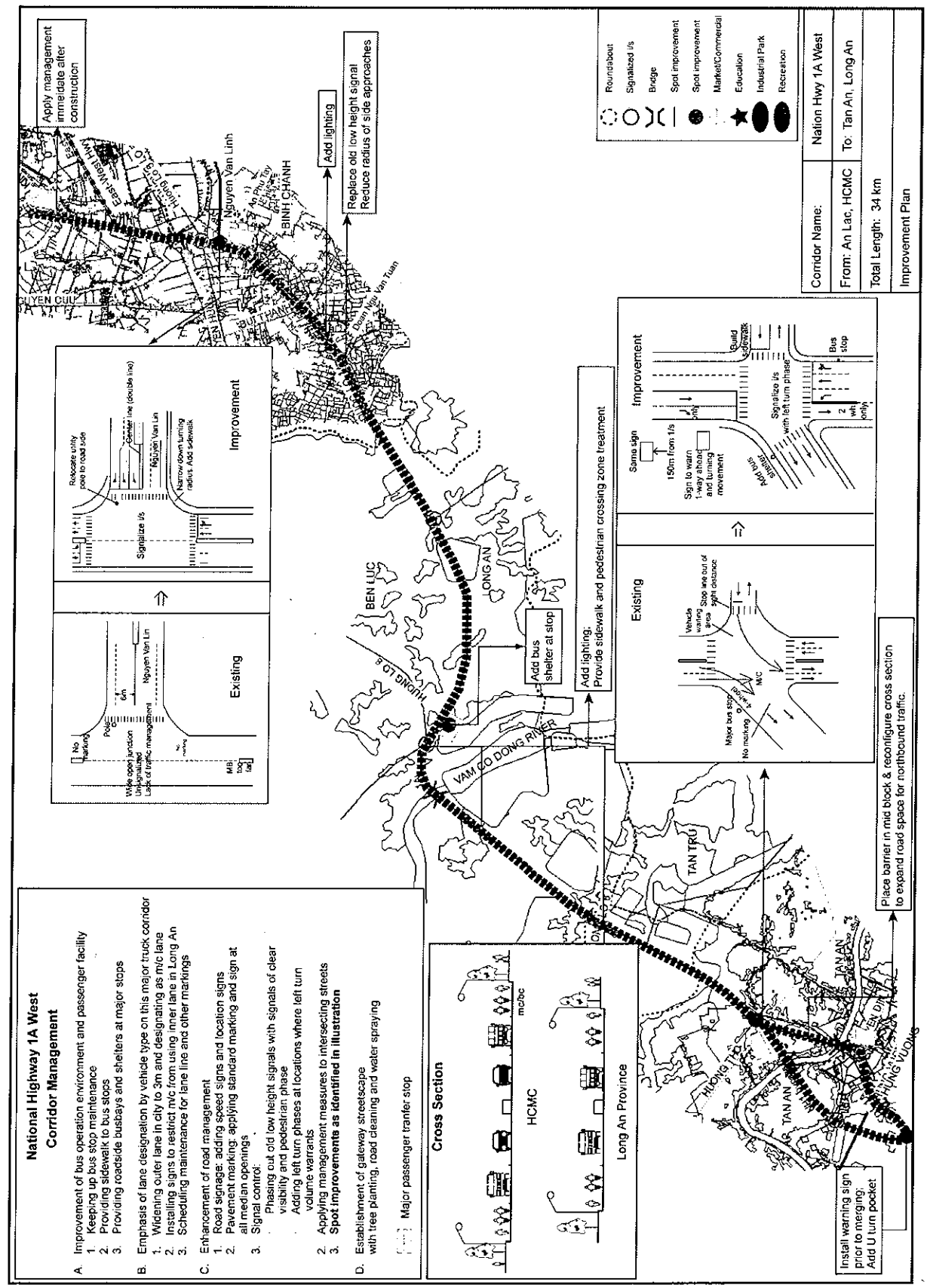
No.6. National Highway 1A_West (An Lac – Tan An)



Source: Study Team

Figure 9.5.16 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

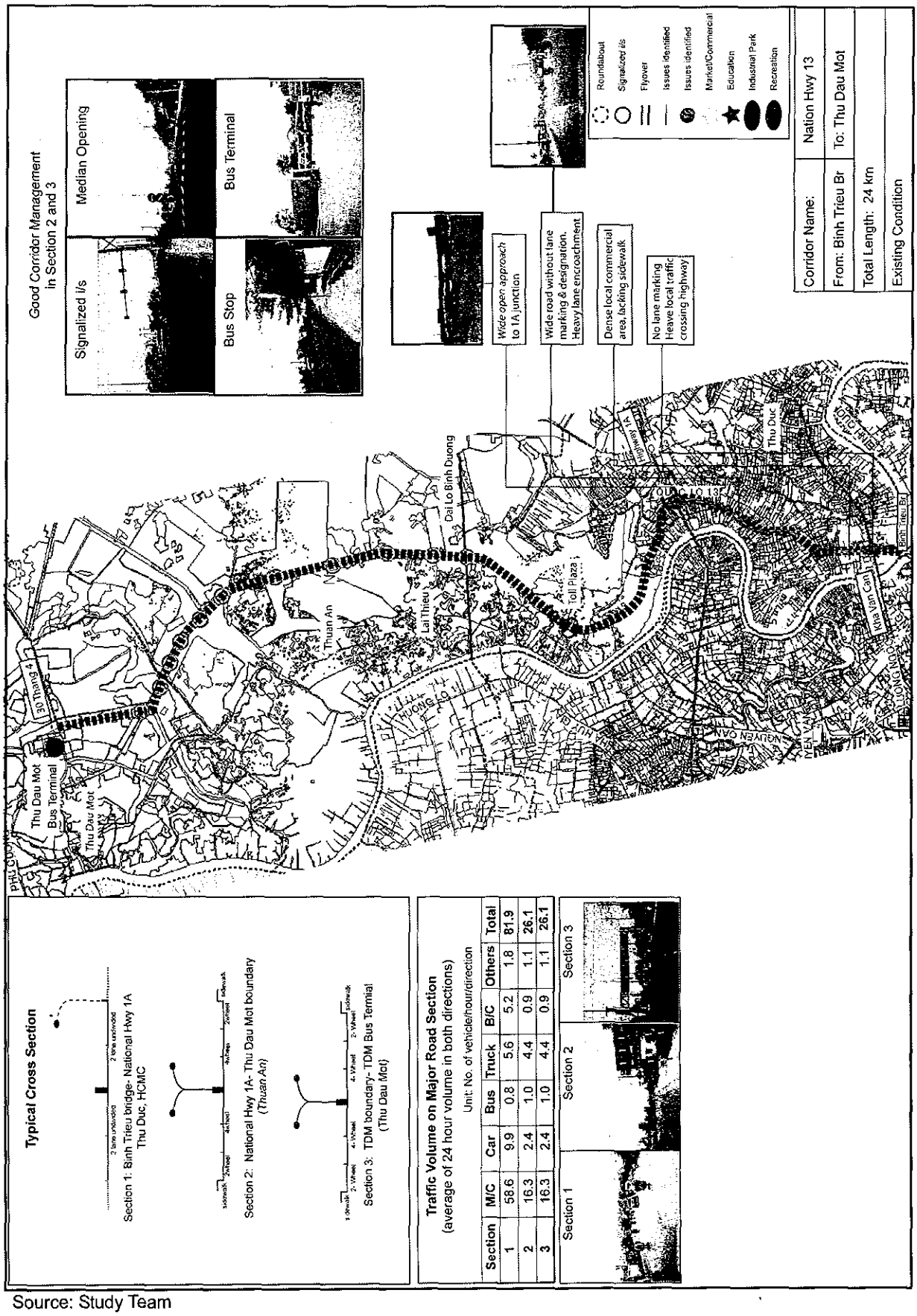
No.6. National Highway 1A_West (An Lac – Tan An)



Source: Study Team

Figure 9.4.17 Existing Condition of Bus Corridor (Outside Ring Road No.2)

No.7. National Highway 13 (Binh Trieu Bridge – Thu Dau Mot)

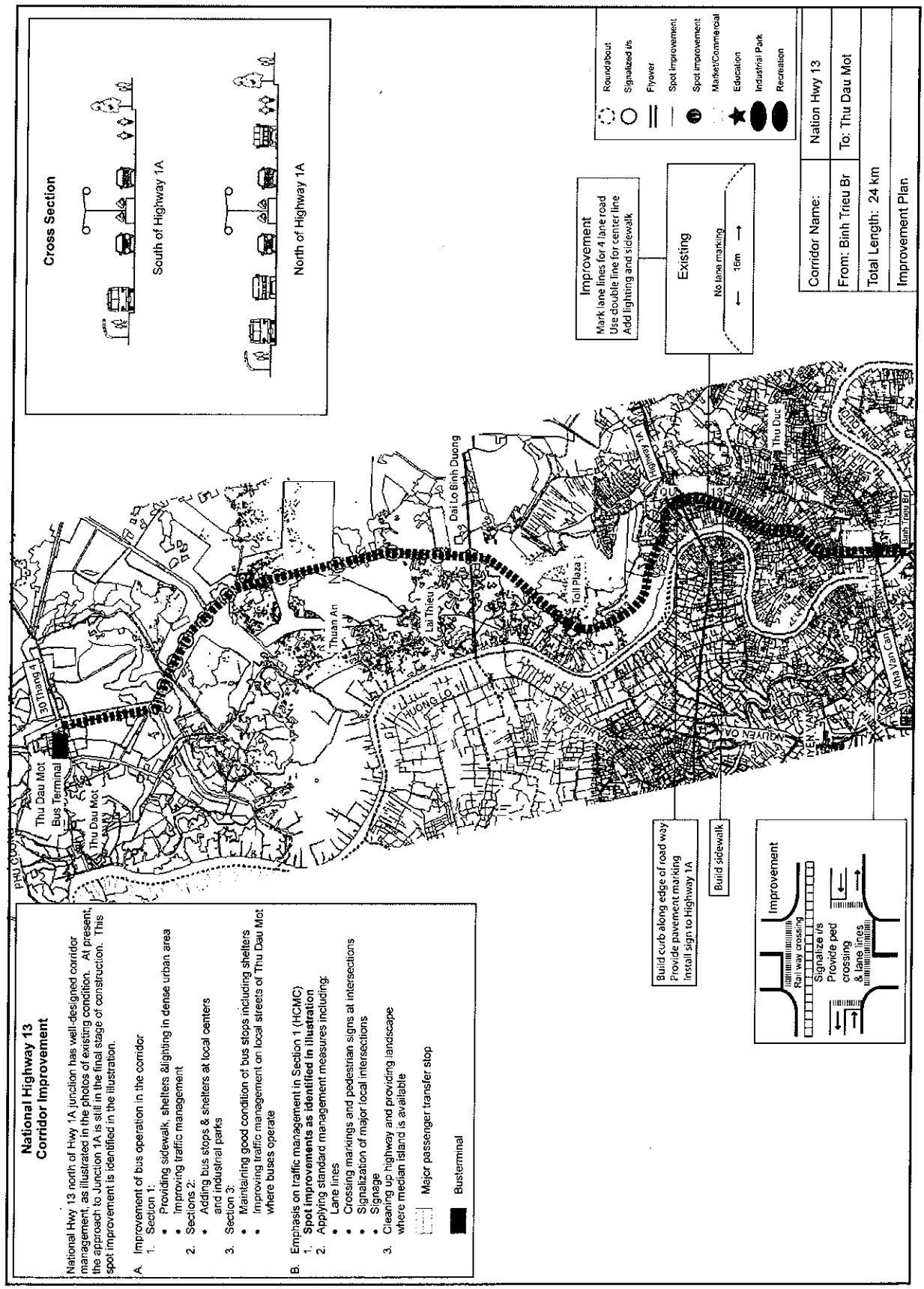


Section	M/C	Car	Bus	Truck	B/C	Others	Total
1	58.6	9.9	0.8	5.6	5.2	1.8	81.9
2	16.3	2.4	1.0	4.4	0.9	1.1	26.1
3	16.3	2.4	1.0	4.4	0.9	1.1	26.1

Source: Study Team

Figure 9.4.18 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

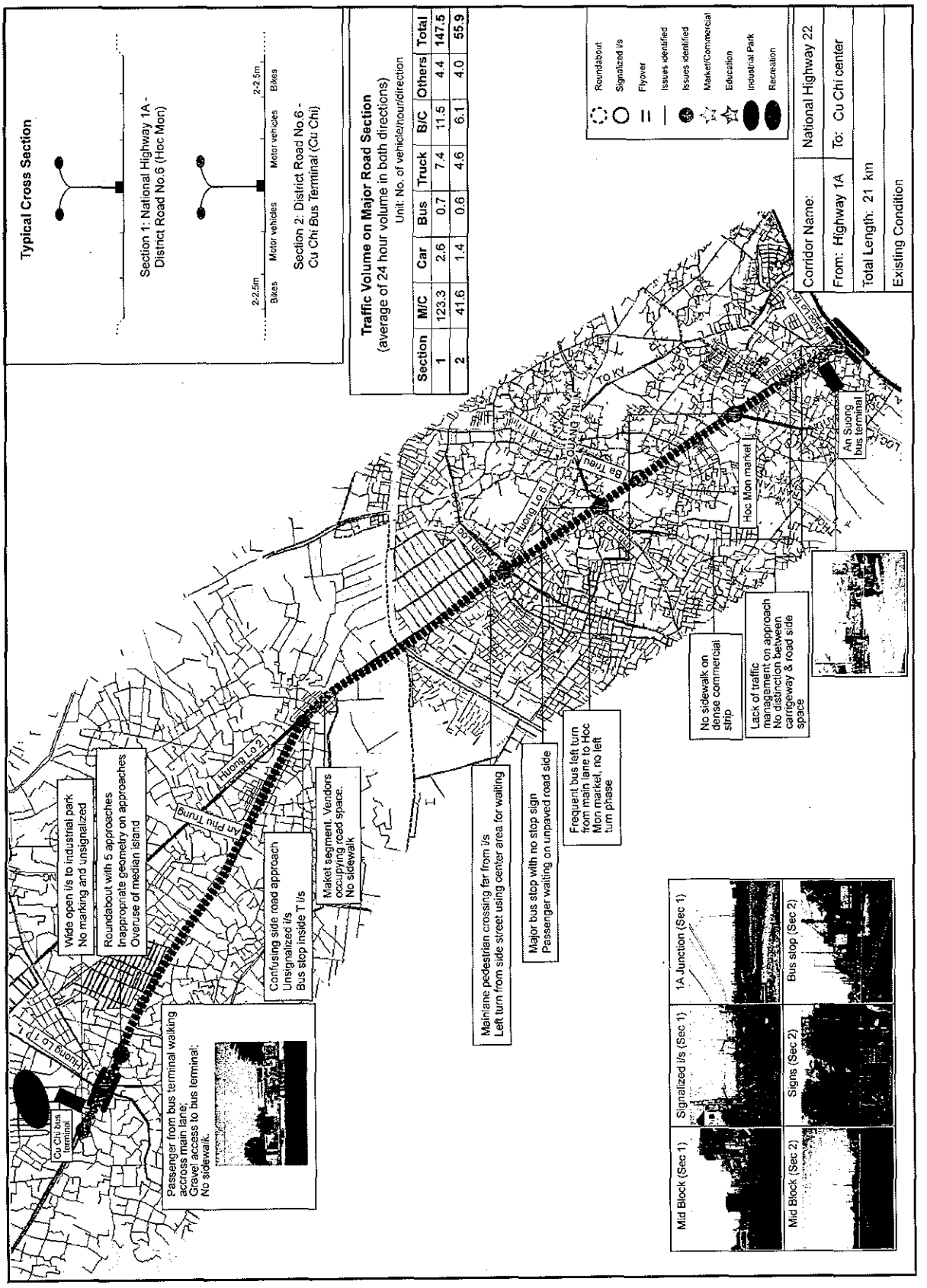
No.7. National Highway 13 (Binh Trieu Bridge – Thu Dau Mot)



Source: Study Team

Figure 9.4.19 Existing Condition of Bus Corridor (Outside Ring Road No.2)

No.8. National Highway 22 (NH1A – Cu Chi)

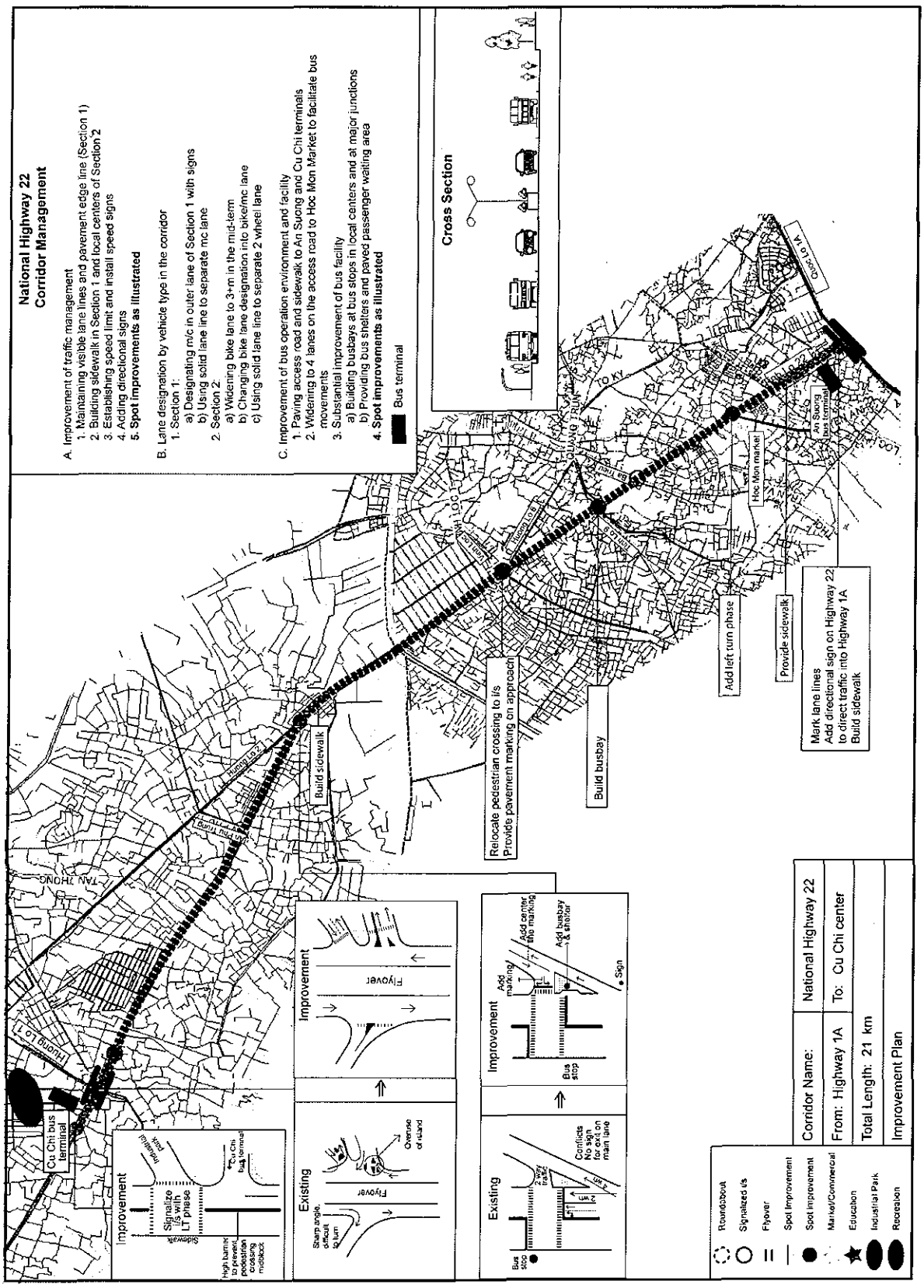


Section	M/C	Car	Bus	Truck	B/C	Others	Total
1	123.3	2.6	0.7	7.4	11.5	4.4	147.5
2	41.6	1.4	0.6	4.6	6.1	4.0	55.9

Source: Study Team

Figure 9.4.20 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

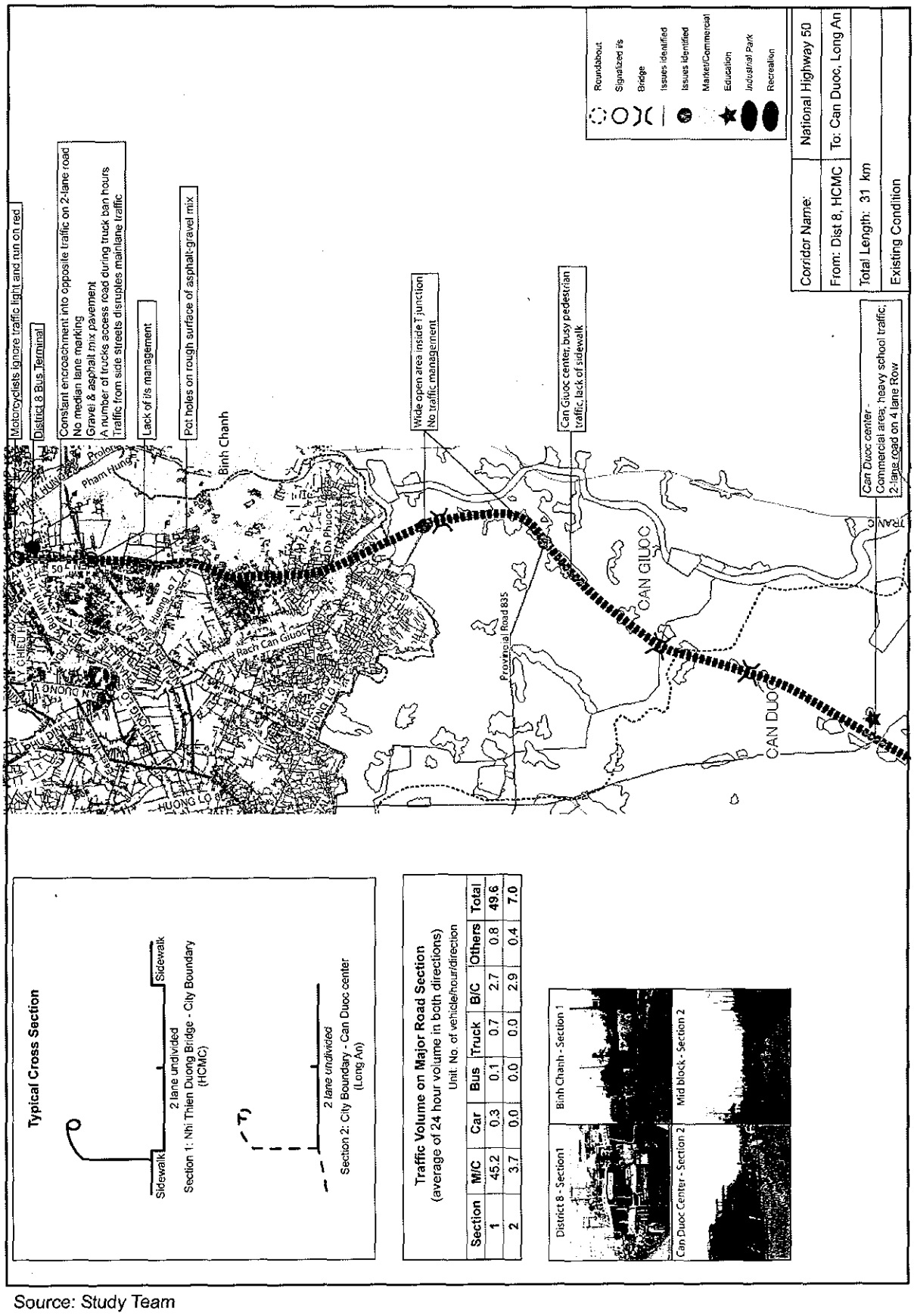
No.8. National Highway 22 (NH1A – Cu Chi)



Source: Study Team

Figure 9.4.21 Existing Condition of Bus Corridor (Outside Ring Road No.2)

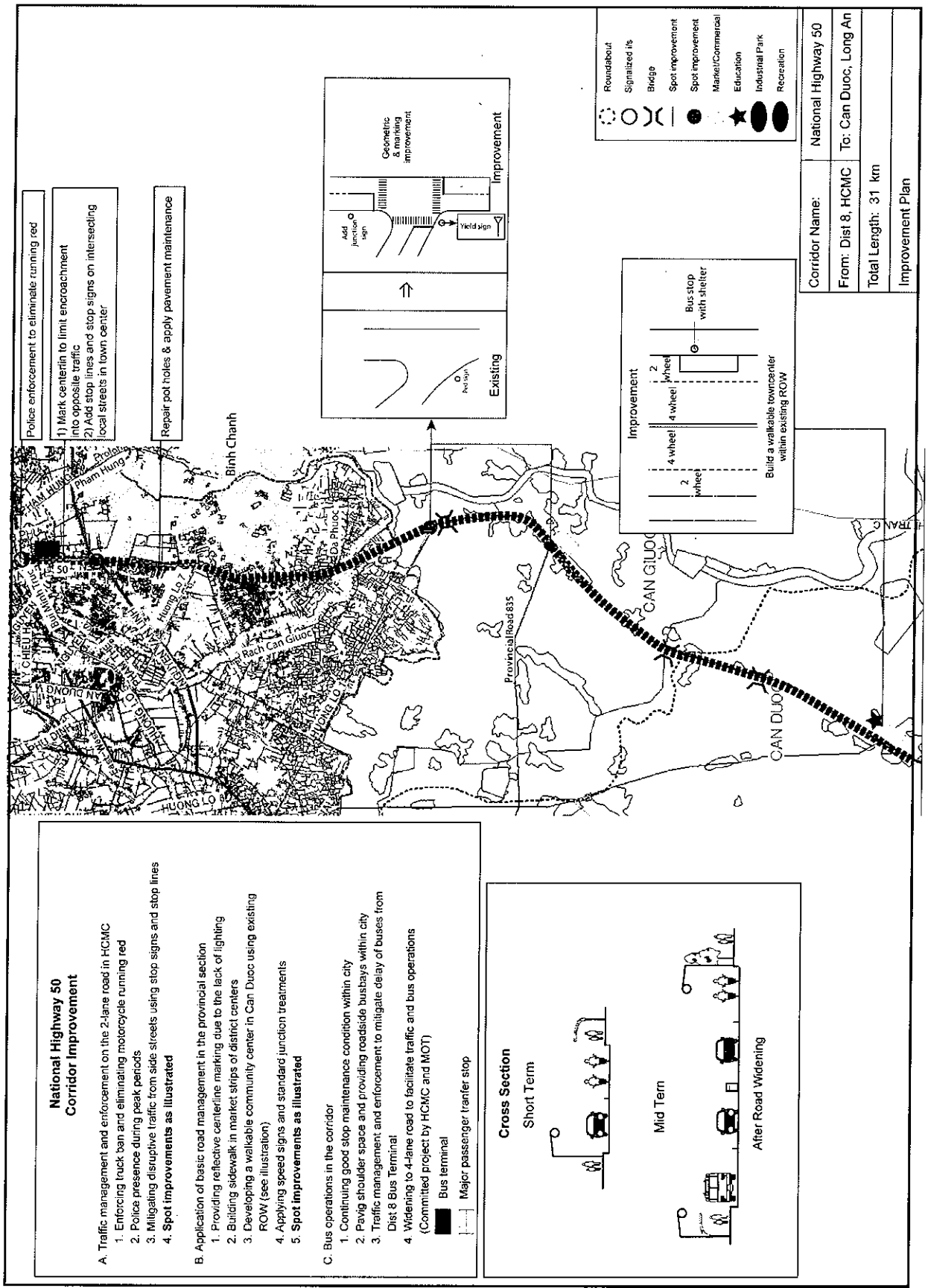
No.9. National Highway 50 (District 8 – Can Duoc)



Source: Study Team

Figure 9.4.22 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

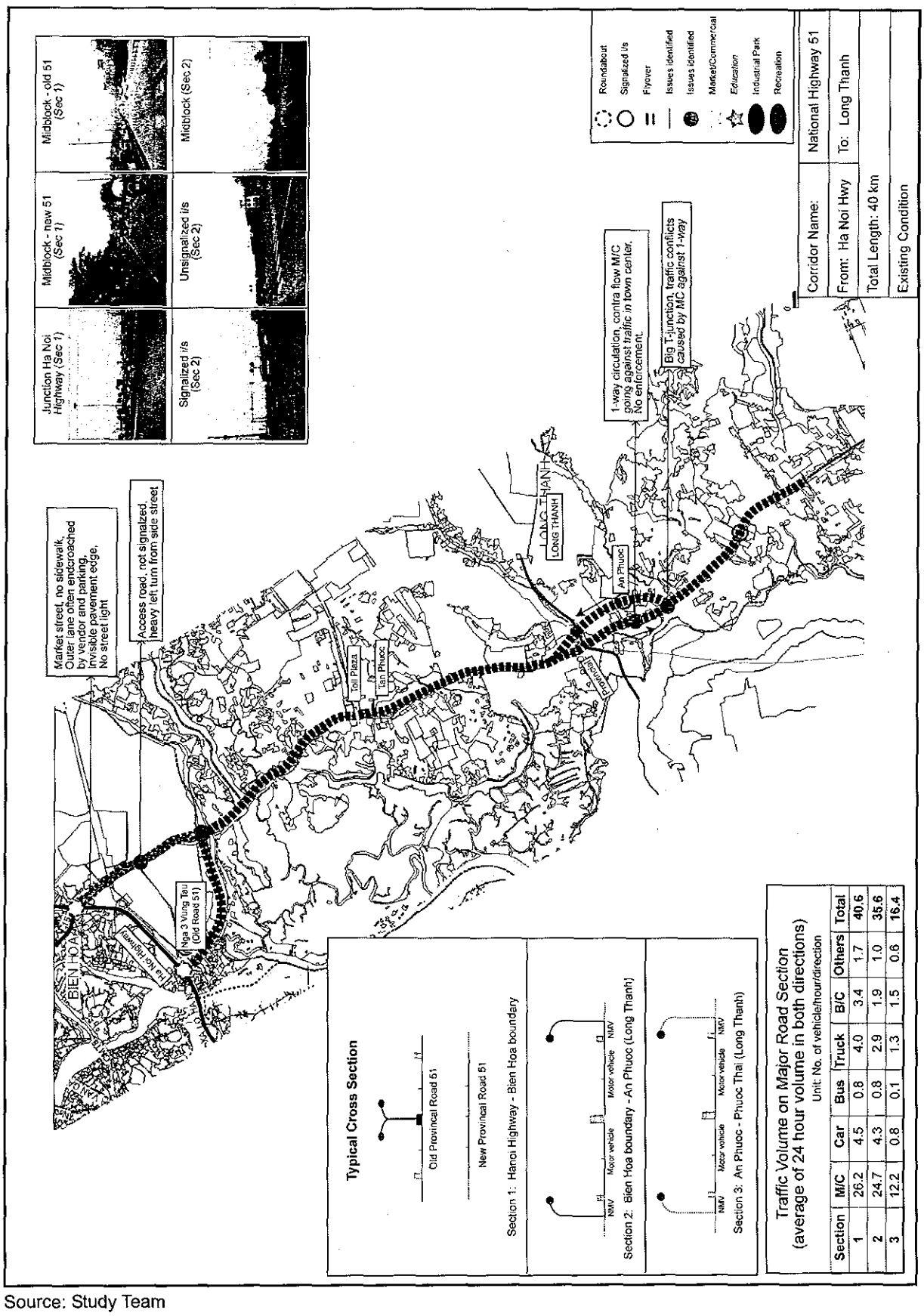
No.9. National Highway 50 (District 8 – Can Duoc)



Source: Study Team

Figure 9.4.23 Existing Condition of Bus Corridor (Outside Ring Road No.2)

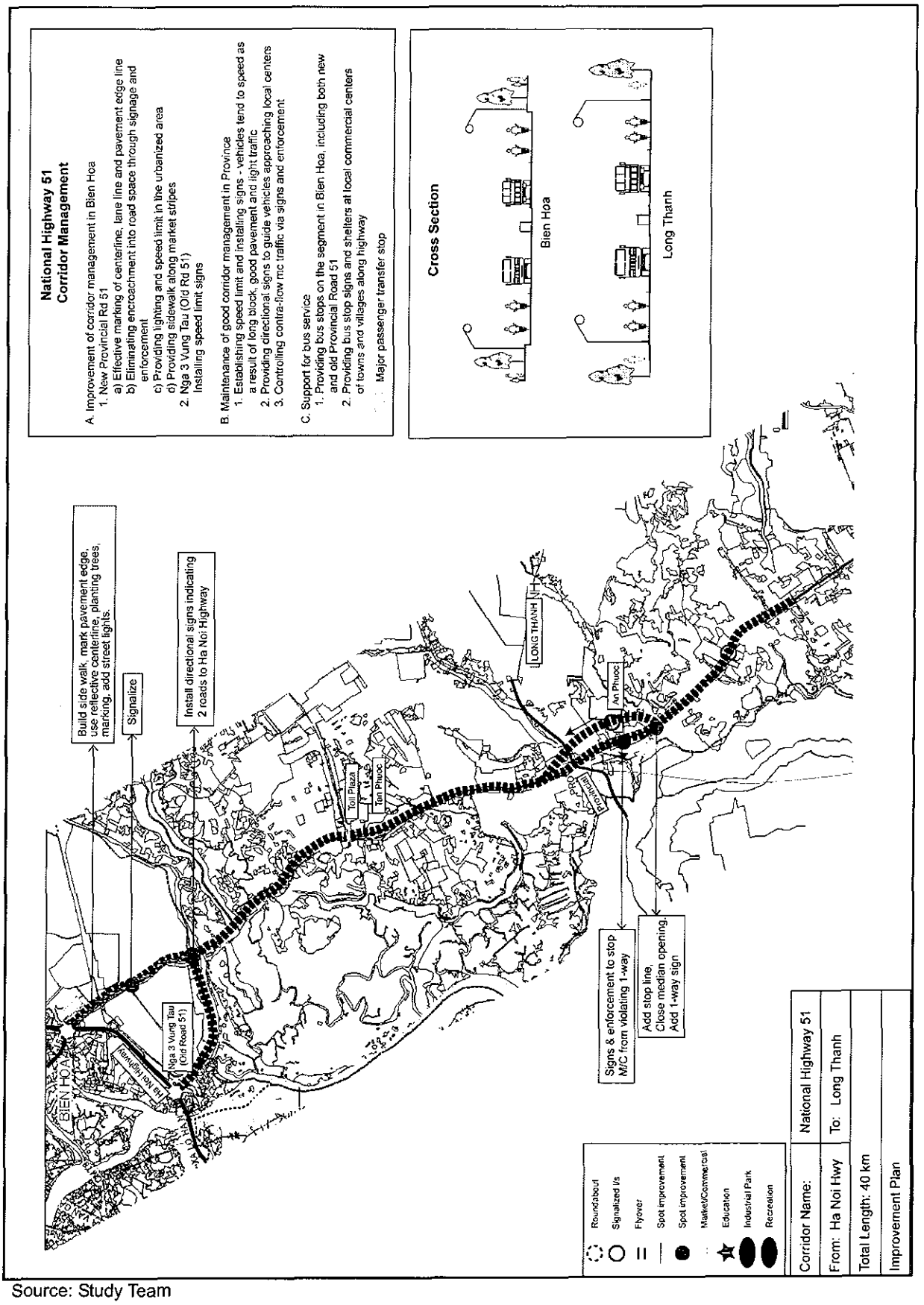
No.10. National Highway 51 (Ha Noi Highway – Long Thanh)



Source: Study Team

Figure 9.4.24 Proposed Measures for Bus Corridor (Outside Ring Road No.2)

No.10. National Highway 51 (Ha Noi Highway – Long Thanh)



Source: Study Team