

## Appendix D

### Coordination Among Chiang Mai Transport and Traffic Related Agencies

#### D.1 National, Provincial, and Local Transport/Traffic-Related Agencies and Offices

The major traffic/transportation-related agencies involved in Chiang Mai are identified below. Duties and responsibilities of each agency are duly noted.

##### *The Office of the Commission for Management of Land Traffic (OCMLT)*

OCMLT is a national body, directly responsible to the Prime Minister and the Cabinet through the Committee for Management of Land Traffic. OCMLT was set up as a policy and strategic-planning unit. OCMLT objectives include: (i) recommending policies and master plans for nation-wide traffic and transportation management, aiming to achieve an efficient and economical transport system to attract foreign investment and foster social/economic progress; and (ii) approving projects aiming to maintain continuity and consistency, regardless of governmental changes, which solve traffic problems and maximize potential project benefits.

Specific responsibilities include: (i) the study, survey and analysis of land traffic conditions in order to propose sufficient plans, policies and restrictions to the Committee; (ii) analysis of suitable projects according to a broad criteria including technical, economic and environmental aspects; (iii) the data collection to improve general traffic information and ability to forecast trends for future master plans; (iv) the distribution of traffic data to interested government/private sector entities; and (v) the organization of educational and training projects to disseminate knowledge about the land traffic management system.

##### *Department of Highways (DOH)*

The Chiang Mai Department of Highways (DOH) is one of 26 such similar bureaus throughout the country. It is responsible for three different types of roads: (i) special highways; (ii) national highways; and (iii) concessionary highways. Of importance to Chiang Mai, the DOH manages the Inner Ring Road, commonly referred to as the Super Highway.<sup>1</sup> The DOH is currently completing the final stages of the Outer Ring Road. The DOH also is responsible for Canal Road, which was constructed by the DOH with funds from the Sports Authority of Thailand (SAT) in support of the 18<sup>th</sup> SEA Games (ASEAN) held in 1995. Table D-1 shows some of the major highways (or sections of highways) that are under the administration of the Chiang Mai DOH Office. It should be noted that this list does NOT include all highway (or sections of) under DOH jurisdiction.

<sup>1</sup> The Super Highway or Inner Ring Road is actually two separate roadways; it actually constitute a complete ring due to the presence of the International Airport.

**Table D-1 Highways under Management of DOH Chiang Mai Office**

Highway	Designation	Length (km)
Super Highway/Inner Ring Road (NE Segment)	Route 11	10.6
Chiang Mai – Lampang Highway	Route 11	3.6
Chiang Mai – Lamphun Highway	Route 106	N/A
Chiang Mai – Fan Highway	Route 107	N/A
Chiang Mai – Hod	Route 108	N/A
Chiang Mai – Doi Saket	Route 118	N/A
Chiang Mai Outer Ring Road	Route 121	30.6
Chiang Mai – Mae Jo Highway	Route 1001	9.4
Chiang Mai – New Mae Jo Highway	Route 1001	21.4
Chiang Mai – Sankumpeng	Route 1006	N/A
Super Highway/Inner Ring Road (SW Segment)	Route 1141	7.4

Source: Study Team Survey Questionnaire, October 2001.

Responsibilities of DOH include surveying and detailed design work, construction, rehabilitation, widening and maintenance of highways for economic, social, political and military objectives. DOH is also responsible for enforcing rules and regulations on these thoroughfares through the Highway Police Division, which is actually under the jurisdiction of the National Police Department, but receives its annual budget and enforcement directives from the Department of Highways.

#### *Chiang Mai Public Works Department (PWD)*

The Chiang Mai Public Works Department also constructs and manages roadways in the Municipality. In particular, the PWD is responsible for the Middle Ring Road (which should be functional by the end of 2001). The PWD is chiefly responsible for the design and construction of bridges over Mae Ping River.

Overall, the PWD has four primary duties as listed below:

- Planning, surveying, design, construction, preservation and maintenance of roads bridges, buildings, dams, banks, piers, and related facilities necessary for water supply, electricity, waste water treatment, flood prevention, garbage disposal, and potable (clean) water systems;
- Enforcement of regulations governing oil and gas storage, including handling, operation, accident prevention etc.;
- Provision of consulting advice/services for construction and other related projects for other divisions; and
- Enforcement and regulation of other works/projects according to specified laws, ministerial regulations, or government edicts.

#### *Chiang Mai Municipality – Traffic Engineering Division*

The Municipality of Chiang Mai, under the Traffic Engineering Division of the Engineering Office, administers all roads within the Municipality except those under jurisdiction of the Department of Highways (DOH) and the Public Works Department. These include all roads within the Inner Ring Road, except Mahidol Road (which is part of Route #1141 under DOH) and Chang Phuek Road (part of Route #107, under DOH).

All other roads however, particularly those within the old city and the Chang Klan Business District are under the Municipality. The Municipality is responsible for maintaining and constructing these roads (as well as bridges and pathways), and placing road and traffic signs in these areas.

The Engineering Office is also responsible for data collection, data analysis, planning, and the design and development of the road network and traffic/transportation systems. Lastly, it is responsible for the promotion of safety and convenience throughout the Municipality.

#### *Chiang Mai Land Transportation Office (LTD)*

The Chiang Mai Land Transportation Office is responsible for controlling, managing and organizing transit networks in Chiang Mai as specified under the Land Transportation Act, 1979 (B.E. 2522).<sup>2</sup> Other responsibilities include: (i) transportation operation/management; (ii) surveying; (iii) statistics collection/data analysis; (iv) transportation planning; (v) law enforcement; (vi) improving transportation safety; (vii) operation of bus terminals; and (viii) auditing of private car verification service centers, driving schools, and private transportation operators. The office is also in charge of issuing licenses, as required by the Land Transport Act, the Car Act and the Mobile Vehicle Act respectively.

The Office is divided into six departments as follows: (i) General Administration; (ii) Information/Research; (iii) Registration Division; (iv) License Issuing Division; (v) Bus Station Terminal 1; and (vi) Bus Station Terminal 2. The Chiang Mai Office is further divided into three branches by district: (i) Fang District; (ii) Chomthong District; and (iii) Mae Tang District.

#### *Chiang Mai Town and Country Planning Office*

The Chiang Mai Town Planning Office, under the Department of Town and Country Office Planning, is in charge of formulating city plans, forecasting/analyzing impacts, coordinating with academic institutions, encouraging public participation within the planning process, disseminating information and promoting public awareness of such activities, as well as collaborating with governmental organizations to outline the provincial development plans.

#### *Chiang Mai Police Department – Traffic Enforcement*

The Chiang Mai Traffic Police, Region 5, Royal Thai Police, is responsible for organizing/controlling the traffic system, enforcing traffic regulations, preventing accidents and managing/planning traffic within the municipal area. The Traffic Police is also in charge of organizing services for VIP's as well as community promotion of pedestrian/rider safety issues such as helmet wearing and accident prevention awareness. Jurisdiction covers some 225 police stations, divided into 2 vice-districts and 12 sub-districts.

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<sup>2</sup> The official acronym for the Land Transportation Office is LTO, however locally, it is referred to as LTD.

### *Northern Technical Center for Traffic System Management at Chiang Mai University (NTCT)*

The Northern Technical Center for Traffic System Management is a technology center and laboratory for traffic/transportation studies run by OCMLT at Chiang Mai University. Main duties of the Technical Center include: (i) advising OCMLT on specific topics; (ii) making suggestions and raising interesting transportation questions to the Chiang Mai Sub-Committee of Land Traffic System Management; and (iii) conducting informational sessions about traffic control and management for traffic police training courses.<sup>3</sup>

Some of the important contributions that the Northern Technical Center have made within Chiang Mai include: (i) a management study project for red *songtaews*; (ii) an accident study project; (iii) an automated (computerized) traffic control (ATC) informational database; (iv) a parking space study plan; and (v) a network traffic system suitability study.

## **D.2 Multi-Agency Committees**

This section describes important committees with broad-based representation from several transport/traffic-related agencies in the Municipality.

### *Chiang Mai Board of Traffic and Land Transportation Control*

The Board of Traffic and Land Transportation Control is one of the most powerful regional public transportation oversight entities in Chiang Mai. The Board of Traffic and Land Transportation Control was appointed according to the Land Transportation Act B.E. 2522, and consists of top provincial officials such as the governor (acting as the chairman), the public prosecutor, provincial superintendent as well as up to five other members, including the municipal mayor. The head of the provincial transportation office is appointed as the secretary of the board.

Responsibilities of the Board include: (i) specifying bus routes, route numbers and fleetsizes for public bus service operators; (ii) specifying the number of bus operators and fleetsizes for non-fixed route transport service; (iii) specifying routes, numbers and fleetsizes for minibus operators; and (iv) determining transport fares as well as any other related services.<sup>4</sup> The Board also has the responsibility to follow other tasks according to this Act and according to the agreement of the Land Transportation Policy Committee and the central Board of Traffic and Land Transportation Control.

There are also two sub-committees under the Board. The Bus Station Service Committee is responsible for specifying bus stop location. The Road and Traffic Sign Committee is responsible for specifying road and traffic sign location/orientation.

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<sup>3</sup> The Chiang Mai Sub-Committee of Land Traffic System Management is discussed in the next section.

<sup>4</sup> These items must be approved by the Central Land Transport Control Board.

*Chiang Mai Committee of Land Traffic Management*

The Committee of Land Traffic Management is organized as follows in Table D-2. It is responsible for traffic management issues including the signal system, road planning, road construction, traffic regulation, as well as the budget, etc. The Committee meets about four times per year.

**Table D-2 Outline of Provincial Committee for Land Traffic Management**

Member Institutions	Major Traffic Management Issues Handled
- Governor of Chiang Mai Province (Chairman)	- Traffic Management including Signal System
- Traffic Police	- Road Planning
- Department of Highways	- Road Construction
- Chiang Mai Municipality	- Traffic Regulation
- Public Works	- Budget
- OCMLT	- Others
- Commercial Office	
- Provincial Office	
- President Office Provincial	
- Industrial Congress	
- Electric Authority	
- Telephone Authority	
- Water Supply Authority	
- Technology Arts	

Source: Study Team Survey Questionnaire, October 2001.

*Chiang Mai Sub-Committee of Land Traffic System Management*

According to the Land Transport Act, 1979 (B.E. 2535), the Chiang Mai Committee of Land Traffic Management appoints the Chiang Mai Sub-Committee of Land Traffic System Management (SLTM). The Sub-Committee is responsible for: (i) preparing annual master plans concerning land traffic management in the province (including annual workshops); (ii) defining traffic measures to solve traffic problems in the province; (iii) monitoring related works from other agencies; (iv) coordinating with other agencies in accordance with specific measures/plans; (v) promoting/initiating public relations work regarding traffic measures in the province; (vi) assessing project performance according to plans and measures; (vii) establishing ad hoc committees to serve the needs of the Sub-Committee; (viii) following the assignments of the Board of Traffic and Land Transportation Control; and (ix) reporting results to OCMLT.

Table D-3 shows the organizations and individuals involved with the Sub-Committee, as well as their respective roles.

**Table D-3 Composition of Sub-Committee of Land Traffic System Management**

<b>Members of Sub-Committee</b>	<b>Role in Sub-Committee</b>
Governor of Chiang Mai Province	Chairman
Mayor of Chiang Mai Municipality	Vice-Chairman
Chairman of the Provincial Council	Member
Chairman of the Chiang Mai Commercial Council	Member
Coordinator of State/Private Sector	Member
Head of Chiang Mai Transportation Office	Member
Director of Provincial Civil Engineering Office	Member
Head of Provincial Office	Member
Director of Highway Office (1 <sup>st</sup> Branch)	Member
Head of Town Planning Office	Member
Dean of the Faculty of Engineering, Chiang Mai University	Member
Provincial Superintendent	Secretary/Member
Director of Chiang Mai Municipality, Technical Department	Assistant Secretary/Member
Chiang Mai Municipal Officer, Technical Department	Assistant Secretary/Member

Source: Study Team Survey Questionnaire, October 2001.

The Sub-Committee of Chiang Mai Land Traffic System Management is appointed to support the operations of two other sub-committees, namely the Chiang Mai Traffic Planning Team (by order No. 2909/2535) and the Chiang Mai Traffic Information Division.

#### *Traffic Safety Committee*

The Traffic Safety Committee is responsible for traffic accident prevention and other related issues. There are 15 members of this committee, including representatives from the Chiang Mai Municipality, the Department of Highways, and the Public Works Department. Table D-4 shows the composition of the Traffic Safety Committee and the major activities/roles it participates in. It is also the main entity coordinating traffic safety measures among agencies.

**Table D-4 Traffic Safety Committee**

<b>Members</b>	<b>Main Activities/Roles</b>
- Provincial Police	- Traffic safety improvement
- Provincial Government	- Traffic regulation
- Provincial Transportation	- Traffic accident prevention
- Chiang Mai Municipality	- Accident Prevention Plan during Song Kran Festival
- Provincial Public Health Bureau	- Traffic congestion solving measures
- Department of Highways	- Coordination between agencies
- Public Works Department	- Other related issues (organization, budget, procedures etc.)
- Other Related Agencies	

Source: Study Team Survey Questionnaire, October 2001.

### D.3 Coordination Issues in Traffic/Transportation Activities

Most traffic/transportation related agencies have authority within their province, under the jurisdiction of the central government. While each agency has its own responsibilities and commitments under similar laws, responsibilities sometimes become unclear and overlapping. Furthermore, some traffic-related responsibilities have no direct authority. The following sub-sections identify issues or examples of well-coordinated traffic activities/projects that took place within Chiang Mai, as well as examples of poorly-coordinated efforts. Lastly, recommendations to improve the level and degree of coordination within related traffic/transportation agencies in Chiang Mai are suggested.<sup>5</sup>

#### *Issues/Examples of Well-Coordinated Activities*

Some issues/examples of well-coordinated traffic/transportation activities between agencies/bureaus in Chiang Mai.

- The Automatic Traffic Control (ATC) System, operating 24-hours per day at 38 intersections, is a cooperative effort between among others, the Traffic Police, the Municipality, the regional electric authority, the telephone authority, and the Northern Technical Center for Traffic System Management. It was considered a success because the head of each agency took a vested interest in such a system, which was enthusiastically encouraged and promoted by the Provincial Governor, the Mayor of the Municipality, as well as the Deputy Superintendent of the Traffic Police. Another reason for the ATC success was that participating agencies were not required to allocate separate budgets for the project themselves, as funding was from the Municipality.
- The “Drink Not Drive Project” is a cooperative effort between the Municipality and the Traffic Police to educate and train the public about the dangers of drunk driving using signs and billboards, placed at key intersections and important locations. The Traffic Police produced the initial proposals, and the Municipality designed, provided, and installed the signs. The project continues to be a success as drunk driving has decreased significantly. It is likely that the clear delineation of responsibilities between the two entities as well as the clear objective and purpose of the project served to foster a close, symbiotic relationship between the Municipality and the Traffic Police
- The “Drug and Alcohol Testing Project”, initiated by the Chiang Mai Land Transportation Office, intended to reduce drug/alcohol consumption during working hours. Agencies involved in this project included the Chiang Mai Provincial Police Department, the Chiang Mai Public Health Office as well as the Narcotics Control Board Office among others. The project established driver checkpoints along major roadways in Chiang Mai and at bus stations. Besides reducing the incidence of drug/alcohol consumption while driving, the program sought to raise public awareness of the dangers of such activities.

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<sup>5</sup> The issues and examples as well as recommendations found in this section have been collected via interviews with all traffic/transport-related entities identified in prior sections.

- The so-called “Black Smoke Checking Project”, is a collaborative effort between the Traffic Police and the Chiang Mai Land Transportation Office, to check and find vehicles emitting high amounts of pollutants. The LTD is to supply specialists and monitoring equipment, while the Traffic Police is to enforce the law and catch violating vehicles. This project has been deemed a success, due to the clear responsibilities given to each entity and the clear and obvious benefits produced from such a project.
- The Chiang Mai Land Transportation Office, in cooperation with the Chiang Mai Department of Town and Country Planning, have collaborated to establish a monitoring station to support the operations of a Truck Management System. Suitable sites were recommended, which were adherent and congruent to town planning needs and requirements of the province. The Land Transportation Office worked closely with the Chiang Mai Sub-Committee of Land Traffic System Management (SLTM) to integrate the goods transportation system plans with the traffic/transportation plans of Chiang Mai Province, so as not to adversely affect intended plans or traffic mitigation efforts.
- The planning of Chiang Mai’s road network system, specifically the Middle Ring Road and the Outer Ring Road, has been a success in terms of inter-agency cooperation, among the Chiang Mai Public Works Department, the Provincial Highway District, and the Municipality. Related agencies were especially cooperative in terms of information sharing including traffic volume data, commuting trip data in each area, and land characteristics. There was some confusion however, as the Municipality was aware that certain types of information existed, but did not know where it was located, indicating the need to improve data inventory capabilities among agencies.

#### *Issues/Examples of Poorly-Coordinated Activities*

Some issues/examples of poorly-coordination traffic/transportation activities in Chiang Mai are identified below.

- As noted, roads in Chiang Mai come under the responsibility of three entities, the Chiang Mai Municipality (Engineering Office), the Department of Highways, and the Public Works Department as noted earlier. While it is true that all or most of these organizations are represented on committees such as the Traffic Safety Committee and the Sub-Committee of Land Traffic System Management, they have their own respective plans and programs. While each agency is generally aware of the plans/programs of the other agencies, coordination remains poor as each agency maintains its own jurisdictional areas. For instance, the DOH has constructed national highways and roadways according to highway traffic safety standards, which safely accommodate high driving speeds. At intersections with local and minor roadways however (under the jurisdiction of either the PWD or the Municipality), roadway safety standards do not meet the specifications used on other areas of the highways.
- The Sub-Committee of the Chiang Mai Land Traffic System Management is a broad-based entity primarily responsible for upcoming master plans as well as

coordinating projects between various agencies and bureaus. It is composed of representatives from the major traffic/transportation institutions. However the size of the body makes it difficult to arrive at a consensus on many issues. The perception is that each constituent department has its own master plans and operational objectives, making it difficult to merge these goals (potentially divergent as well) into a single, cohesive plan for Chiang Mai.

Difficulties were particularly noted between the construction and repair division, as well as between the public utility and the traffic management division. Furthermore, it was perceived that certain provincial-level organizations are ineffective and fail to strictly adhere to policy/planning measures. Since some departments do not come under the jurisdiction of the Chiang Mai Governor, coordination and collaboration for budget allocation was difficult.

- The Northern Technical Center for Traffic System Management has found it difficult to support OCMLT in some instances, due to the lack of information sharing (presumably other agencies/bureaus have this information, but do not readily make it available to the Center) and from unreasonable time deadlines (presumably arising from the lack of notice given to the Center and the poor communication between the involved agencies), which serves to undermine the potential usefulness of the Center.
- The Land Transport Act of 1979 (B.E. 2522) stipulates that the Red *Songtaew* Cooperative operate on a fixed route basis. For the last two decades, the Cooperative has flouted this stipulation, while the Chiang Mai Land Transportation Office, the body responsible for public transportation management, has failed to enforce the Act due to lack of administrative continuity and lack of cooperation with the Traffic Police. Currently, the Land Transportation Office has only three officers assigned to handle enforcement duties due to budget constraints. The LTD requested assistance from the Traffic Police to enforce the operating regulations. The Traffic Police however, did not enforce the laws in a concerted manner, only doing so when prompted by the complaints of other cooperatives. The Traffic Police may view such affairs as under the jurisdiction of the Land Transportation Office and does not want to interfere. The previous administration was keen on enforcing the Act, whereas the current one is less inclined to do so. Thus, a rededicated effort by upper management is required of both agencies to improve coordination and correspondingly the enforcement situation.
- The Municipality, in an effort to develop fixed route transport services, experimented on a trial basis, with electric vehicles. These operations did not receive permission from the Land Transport Department, which made such activities illegal. Failing to cooperate with the Municipality in this novel experiment, the LTD essentially killed the project in its infancy stages, despite the fact that such fixed route networks would improve transport services within the Municipality and were only run on a trial basis. It was thought that the powerful lobby force of the Red *Songtaew* Cooperative was able to convince the LTD to deny these trial requests. In the future, the Municipality must make a concerted effort to convince the LTD to cooperate with such ventures and overcome political pressure from outside influences, otherwise they will turn out to be a waste of time, resources, and manpower as the electric shuttle experiment was.

- It was found that DOH roadway designers did not utilize information from the Town Planning Office to incorporate rainfall drainage concerns. Furthermore, some designers do not make site visits to assess actual conditions. This lack of coordination in the design of roadways may be potentially dangerous (resulting in landslides, increased occurrence of accidents) and costly (road maintenance and repair) as well. Despite the persistent concerns of the Town Planning Office, this coordination problem remains.
- Some agencies also felt that coordination is poor between agencies in Chiang Mai as most of the offices have their head offices and administrative bodies in Bangkok. The only local agency, the Municipality, is relatively small in terms of budget and political power.

#### **D.4 Recommendations for Improved Coordination in Chiang Mai**

Some recommendations suggested by relevant traffic/transport agencies in Chiang Mai to improve overall transport coordination are mentioned below.

- It was noted that the Chiang Mai Sub-Committee for Land Transportation Management (SLTM) is mainly responsible for the planning stages, rather than the actual operating stage. The sub-committee should be streamlined to include fewer organizations, while retaining the most important ones, making it easier for the Sub-Committee to assign specific tasks to certain organizations.
- The number of committees should be reduced and the responsibilities of each fully clarified.
- The provincial-level traffic organizations should be improved and made more efficient. Appropriate officials/specialist should undergo additional training to improve overall management/performance of projects and activities.
- Particular changes should be made to certain sections of the law, to give the Provincial Governor the authority to assign and initiate projects on his own, without having to consult with the Sub-Committee of Land Transport System Management.
- National agencies should increasingly take a leadership role in traffic/transport-related projects, as many local agencies lack the resources to successfully complete a project.
- The Chiang Mai Municipality should be transformed into a larger and more powerful institution, akin to the Bangkok Municipality, which is responsible by law for a number of traffic/transportation issues.
- The Traffic Police should be placed under authority of the Municipality.
- Managers in positions of authority in related agencies should periodically meet to discuss potential ideas and share opinions. Any ideas or proposals that arise can be

put forth to these members, who can decide if they are feasible or not, given the responsibilities of their agencies.

- Laws should be changed so responsible agencies have their own budgets and do not need to rely upon the budget allocated by the Municipality. Furthermore, the planning and budget allocation process should be jointly developed for each agency.

In summary, it is apparent that in order to control and combat the worsening traffic situation throughout the Municipality, agencies and committees need to do their utmost to coordinate between themselves to initiate traffic mitigation efforts. The previous sections examined the level and degree of coordination between agencies, as well as fielding recommended suggestions to improve the existing situation. Some general conclusions can now be drawn.

Projects with well-coordinated activities, generally succeeded due to: (i) involved agencies being delegated specific responsibilities, which were clearly defined and unambiguous; (ii) a budget allocated from a central source, instead of one funded separately by each participating agency; (iii) a clear social benefit (not necessarily economic) was obvious for all parties involved; (iv) the maintenance of upper management continuity of participating agencies, promoting stability and assured that a uniform and consistent operating philosophy was espoused; and (v) a fully-supportive upper management.

Projects with poorly-coordination activities generally failed due to: (i) a reluctance of some agencies to share or assist others to obtain information; (ii) the lack of clearly, defined roles for participants; (iii) project financing coming from several different participating agencies; (iv) shortage of budgetary funds; and (v) the political influence of outsiders.

Overwhelming, certain measures were suggested to improve the level of coordination between agencies including: (i) giving the Provincial Governor and the Municipality greater authority in transport projects; (ii) reducing the number and the size of committees; (iii) clarifying project roles and responsibilities; and (iv) allocating separate budgets for each agency.

## **Appendix E**

### **Summary of Intersection Study**

The results of Intersection Study are summarized in this appendix.

Table E-1 Summary Table on Problems at Selected Study Intersections

No.	Name of Intersecting Streets		Type of Junction	Signalization	Conditions based on Site Observations				Overall Assessment
					Geometric	Markings	Signs	Pedestrian Crossings	
J-1	Ninman hemin Road	Huay Kaew Road	Cross – intersection (Inner Ring Road with radial road)	Signalized	Inconsistent approach lane numbers (Ninmanhemim –4, Superhighway –8) creates traffic bottleneck.	Satisfactory	Satisfactory	Crossing is not provided on Ninmanhemim Road.	A major intersection in the western part of city. Major traffic bottleneck. Delay significant during peak hours. Geometric improvement is necessary to upgrade its efficiency.
J-2	Super Highway	Soi Wat Chet Yod	T – JTN (A high grade arterial with a minor collector)	Not Signalized	Obliged angle and upslope approach of minor road retards start speed, opening at median allows U-turn traffic in conflict with right turning traffic.	Poor markings on minor road.	No proper signs installed on minor road	No crossing facility	Extremely dangerous intersection due to many conflicting movements and high M/C traffic from minor road (college) and high speed of traffic on highway. No proper channelization of traffic from minor road. Signalization and geometric improvements are urgently needed.
J-3	Canal Road	Soi Chet Yod Khlan	Cross Junction (High grade arterial with a minor collector)	Not Signalized	Canal road being divided by the canal with a narrow bridge as crossing section. Sharp curve section from the south with poor visibility.	Poor markings on minor road.	Insufficient warning signs on Canal roads of crossing traffic ahead.	No crossing facility	Canal road is going to be a very important link when middle ring and outer ring are completed. High traffic is expected. Signalization and geometric improvements are necessary.
J-4	Hadsadhi Sawee Road	Chang Phuak Soi 4	Cross Junction (a collector with another collector)	Not Signalized	Soi 4 is a very narrow road and slight off-set at the intersection.	Very poor markings, faded stop-lines and lane markings	Signs are not installed or poorly located. No stop signs	No pedestrian crossing markings or signals	Although traffic speed is not very high, capacity is further reduced by vendors in the evening. Left turn from Soi 4 and right turn from Hadsadhi Road does not stop before the turning. Signalization and geometric improvements are needed.
J-5	Mahidol Road	Haiya Road	T-Junction (a high grade arterial with a minor collector)	Not Signalized	Median opening with RT lanes on major road. Right turn storage lane is provided but short.	Markings on minor road are fading	Signs are adequate on major road but inadequate on minor road	Pedestrian overhead bridge on Mahidol rd. No crossing facility on minor road	Very high speed traffic on Mahidol and poor visibility from minor rd – an accident hazardous location. Signalization is necessary.

Table E-1 Summary Table on Problems at Selected Study Intersections (Continued)

No.	Name of Intersecting Streets		Type of Junction	Signalization	Conditions based on Site Observations				Overall Assessment
					Geometric	Markings	Signs	Pedestrian Crossings	
J-6	Thipapnet Road	Wualai Road	Y-Junction (An arterial with another arterial)	Not signalized	A Y-junction, close to a signalized intersection in the south. No clear indication of rights of way	No markings visible. Rights of way of traffic streams is confusing	Inadequate signage	No pedestrian crossing facility	Ambiguous intersection, confusing to drivers, no clear priority movement Traffic is moderately high. Signalization (linked to the adjacent signal necessary) and geometric improvements are needed.
J-7	Chiang Mai Land Road	Super Highway (Aom Muang Rd)	T-Junction (A high grade arterial with a minor collector)	Not signalized (a single blinking amber warning light)	A median opening without RT lanes on Superhighway, Not originally intended for an intersection.	Clear markings on highway	U turns prohibition signs on highway but ignored by drivers	No pedestrian crossing facility	Extremely dangerous intersection due to many conflicting movements, illegal U-turns, high speeds on highway and poor visibility from minor road attempting to RT. The warning amber light is of no effect. Closure or opening or signalize with geometric improvements are urgently needed.
J-8	Chiang Mai Land Road/ Soi 15	Chang Klang Road	Cross JTN (Off-set intersection of 2 minor collectors with an arterial)	Not Signalized	Off set intersection. Wide roadway with no channelization facility.	Poor and faded markings on main road	Inadequate signage	No pedestrian crossing facility on Chang Klang Road	Very high traffic volume during peak hours between Chang Klang and Chiang Mai Land Road. Soi 15 functions as a oneway outgoing during peak hours. Signalization and channelization/geometric improvements are needed.
J-9	Ra-kheng Road	Kam-pheng Din Road	Cross JTN (major collector w/ minor rd)	Not Signalized	Very poor intersection geometrics with offset approaches	No visible markings except center yellow mark	No stop signs	None	Confusing intersection – no clear indication of priority movement-potential for hazards. Geometric improvement is needed.
J-10	Rattanakin Road	Tat Wong Road	T-junction (An arterial with an access road)	Not Signalized	T junction (with direct temple access at intersection), with a short minor road	Turning markings in intersection creating confusing on priority movement	No stop signs.	No facility	Night blinking signal light installed, but still dangerous as turning vehicles do not stop at intersection. Markings are confusing. Signalization and geometric, especially better markings needed. Visibility must be improved.

Table E-1 Summary Table on Problems at Selected Study Intersections (Continued)

No.	Name of Intersecting Streets		Type of Junction	Signalization	Conditions based on Site observations				Overall Assessment
					Geometric	Markings	Signs	Pedestrian Crossings	
J-11	Ratta-nakosin Road	Bum-rung Rat Road	T-Junction (an arterial with a collector )	Not Signalized	Segregated bicycle lanes on major road	Markings are fading. Poor stop lines	No stop signs	Incomplete crossing markings	High traffic volume during school hours. Blinking warning light is not working. Geometric improvements are needed. Signalization is also necessary.
J-12	Boonruang Rit Road/ Hasadhi Sawee Road	Huay Kaew Road/ Maneeparat Road	Cross JTN (2 arterials) Boonruangrit and Maneeparat are one ways	Signalized	Channel is provided for RT from Boonruangrit, only painted markings for LT from Boonruang Rit and Hasadhi.	Poor markings on Hasadhi Road	Poor signage on minor road	Pedestrian crossing markings are provided but not signals	Very high traffic on Boonruangrit and Maneeparat road. Proximity of bus stop on Huay Kaew in front of Central often causes traffic backups. Signal is effective for vehicle traffic but pedestrians have difficulty crossing the major roads. Pedestrian crossing signals is needed.
J-13	Charoen Muang Road	Charoen Rat Road/ Chiang Mai Lamphun Rd.	Cross JTN (2 arterials at Nawarat bridge)	Signalized	Island provided for LT from Nawarat bridge. Up slope of Charoen Muang approach causes loss green time.	Lane markings and pedestrian crossing markings are fading	Visibility of signs are obscured by ad poles and structures.	No pedestrian signals.	Very high traffic volume on all approaches. Delay on Charoen Muang and Taphae road are serious during peak hours. Signal timing or phasing plans are necessary to reduce delays. Pedestrian signals are also needed.
J-14	Ratchawithi Road	Ratchaphakhini Road	Cross JTN (two collector roads in old city)	Signalized (Control box is broken)	Small radii for turning at intersection – poor visibility	Poor markings	Poor signage, obscured by hedges and poles	Pedestrian crossing markings on 2 approaches only – no pedestrian signals	Poor visibility of signal lights and broken controller. Improvements to signal equipment, geometric and markings are all necessary.
J-15	Ratchawithi Road	Phraklao Road	Cross JTN (an arterial with a collector in old city)	Signalized	Very large intersection area with exclusive LT lane on main road from north	Markings are not clear	Pedestrian crossing markings are faded.	No pedestrian signals	A large intersection but without proper channelization islands. Pedestrian traffic is high from nearby schools. Geometric improvements and pedestrian signals are needed.

**Table E-1 Summary Table on Problems at Selected Study Intersections (Continued)**

No.	Name of Intersecting Streets		Type of Junction	Signalization	Conditions based on site Observations				Overall Assessment
					Geometric	Markings	Signs	Pedestrian Crossings	
J-16	Intha-wororot Road	Singhar at Road/ Phra Singh Rd	Cross JTN (an arterial with a major collector in old city)	Signalized	Large intersection area with exclusive LT lane from Phra Singh Rd and poorly located island	Markings are not very clear	Inadequate signage	Impossible to cross Phra Singh road due to high traffic	Confusing intersection with no clear priority movement, dangerous to high pedestrian traffic volume due to proximity to Temple. Geometric and signal improvements are all needed.
J-17	Phra Sing Road	Phra Pokklao Road	Cross JTN (two arterials in old city)	Signalized with broken controller boxes	Very small radii for turning. Poor visibility of signals and signs.	Fair	No stop signs	Sidewalks obstructions – lights, trees, consoles	Poor visibility of signal lights, signs. Improvements to signal equipment, geometric improvement, improving visibility are all needed at this intersection.
J-18	Super Highway	Charoen Muang Road	Cross intersection (two major arterials)	Signalized	Islands are provided for LT traffic. RT storage lanes are provided on Super Highway. A very large intersection	Faded markings especially for pedestrian crossings	Adequate	No pedestrian signals. Dangerous to cross the high speed traffic	Very high speed traffic on all approaches. Pedestrian signals are necessary to ensure safety.
J-19	Chang Khlang Road	Loi Kroh Road	Cross JTN (2 one way street, an arterial with a collector)	Not Signalized	One way operation on both streets but small radii for turning	Markings are fading	No stop signs	Significant pedestrian volumes at night. Illuminated pedestrian warning signs are installed	Traffic speed is not high but there is high pedestrian traffic especially during the night. Pedestrian signals are needed or alternatively convert Chang Klang road into a pedestrian mall.
J-20	Rot Fai Road	Sa Na Lung Road	Cross JTN (2 minor roads at railway crossing)	Not Signalized.	Junction with railway crossing, poor surface pavement and alignment on the crossing	Poor markings on major and minor roads	No stop signs or lines	No facility	Poor visibility making it accident prone. Traffic is not very high but railway crossing interruptions create long queues. Improvements to crossing pavement, signs, signals lights are necessary.

Source: This Study Team.