

Chapter 2 Database Development

- Updating data
 - Develop the information report system
 - Electronic document system
 - Maintenance and Improvement of Database and existing Program
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One of the most important missions that Office of Transport and Traffic Policy and Planning (OTP) has to achieve is to decide the transport policy and facilitate the government units that are responsible for land, sea and air transport with efficiency. Transport and Traffic Information System needs to be developed to store all related important information with correctness, quality and update in order to be ready to use. Besides, the application needs to be able to support daily operation appropriately with the suitable search, processing, analysis and reporting tools in order to facilitate the user to utilize the information in the database with the most efficiency.

Spatial Data / Information is information that describes a position of an object or geographic incident. This information is important and useful for tracking and understanding of an incident and any relation of factors related to national transport policy decision and planning. Therefore, Geographic Information System (GIS), the technology especially designed and developed for utilizing the Spatial Data / Information, is determined to be one of the most important component of Transport and Traffic Information System of OTP.

OTP has taken an information system into their consideration which includes Spatial Data / Information that is important and necessary to accomplish the mission of country development. OTP has started the study and development of Transport Database System since 1995 (under Office of the Commission for the Management of Land Traffic (OCMLT)). After the restructuring of 3 parties: Office of the Commission for the Management of Land Traffic (OCMLT), Maritime Promotion Bureau (MPB) and constituent of the Office of the Permanent Secretary to be Office of Transport and Traffic Policy and Planning (OTP). Transport and Traffic Database System has played an important role in every aspect of all transport modes: land, sea and air so it is the time to revise, develop and maintain the Database System of OTP to support the existing and future operations.

2.1 Management Information System Development and Maintenance

In TDMC VI, the consultant follows the MIS development and maintenance plan proposed in the inception report. There are 4 main tasks the consultant has to complete:

- Data Maintenance and Update
- MIS Reports Development
- Electronic Book
- System and Database Improvement and Maintenance

2.1.1 Data Maintenance and Update

The main purpose of this task is to ensure that the information in the MIS database is clean, correct and update. In order to achieve the target, the consultant has to spend a considerable amount of time as a result of the huge size and various data mediums such as load copy, web pages etc. All 56 subgroups of data are maintained and updated using appropriate methods in the following steps.

1. Data Status Examination
2. Data Import Study and Preparation
3. Data Import

First step, the consultant receives data from OTP and related websites. Data has been examined then a checklist has been developed to keep track of the status of data. In addition, the checklist is designed to support all the activities related to the data and it is convenient to update and review.

Second step, the consultant has transformed all data from many sources into excel format to match the import method requirement. The transformation process has been done by manually input, scanning and using a customized program to assist the input process in order to ensure the correctness and efficiency.

Last step, the prepared excel files has been tested against the database input verification procedure. The step requires column, row and type of data check and has been compared with the database properties.

2.1.2 MIS Report Development

There are 14 reports that the consultant has developed in TDMC VI. All reports are installed and ready to be used in the system. The lists of MIS report are as follows:

1. Average Speed of Travel in a Rush Hour in Bangkok Metropolitan Region.
2. Value of International Goods Import and Export Sorted by Type of Goods.
3. Value of International Goods Import and Export Sorted by Mode of Transportation.
4. Value of International Goods Import and Export Sorted by Month.
5. Value of International Goods Import and Export Sorted by Country.
6. Value of International Goods Import and Export Sorted by Country Group.
7. Quantity of International Goods Import and Export Sorted by Country Group.
8. Foreign Tourists Sorted by Countries.
9. Foreign Tourists Sorted by Month.
10. Traffic Accident Sorted by Number of Daily Injury and Fatality during New Year Holidays.
11. Traffic Accident Sorted by Number of Daily Injury and Fatality during Songkran Festival.
12. Transport and Traffic Projects Sorted by Type of Project.
13. Daily Average Speed.
14. Daily Traffic Volume.

2.1.3 Electronic Book

The electronic book development processes have been studied in order to be prepared for all required input data. The Executive Information Report and the Transport and Traffic Information Summary Report of TDMC VI have been imported into the new electronic format. The Example of the electronic books are as shown:



Figure 2.1-1 Example of Electronic Book

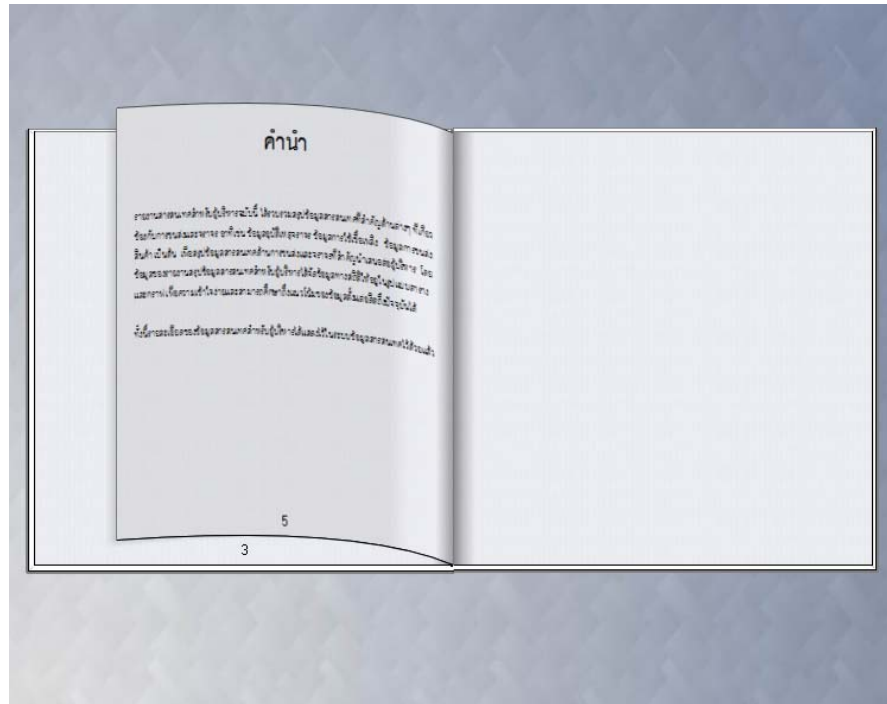


Figure 2.1-2 Example of Electronic Book (Continue)

2.1.4 System and Database Improvement and Maintenance

In order to improve the system to support OTP operation, there are 2 main tasks that have to be accomplished

- Website and Intranet Template Redesign and Development
- Data Improvement and Maintenance processes to support OLAP

2.1.4-1 Website and Intranet Template Redesign and Development

After the consultant got the valuable comments from OTP on how to improve the website, the consultant comes up with the new ideas to develop the new template of the website with 3 main concerns:

1. Design, layout and information accessibility.
2. Information structure and content.
3. Additional factor that complete the website : Counter , etc.

The following Figure is the sample of new website template that publishes the desired information of OTP.



ระบบเผยแพร่ข้อมูลด้านการขนส่งและจราจร
Public Information

ข้อมูลสารสนเทศด้านการขนส่งและจราจร

นโยบายการทำงานของ สบข.
สบข.มีหน้าที่ในการวิเคราะห์ เสนอแนะนโยบาย ยุทธศาสตร์ มาตรการ บริหารแผนยุทธศาสตร์ใน
พัฒนาการขนส่ง จราจร และความปลอดภัย ให้บริการ Intelligent Services เพื่อสนับสนุนการ
นโยบาย ยุทธศาสตร์ หรือมาตรการ ตลอดจนสร้างความเข้มแข็งให้กับการกำกับดูแลเชิงเศรษฐกิจ
การพัฒนาการขนส่ง

เกี่ยวกับข้อมูลสารสนเทศด้านการขนส่งและจราจร
นำเสนอข้อมูลเกี่ยวกับการขนส่งการจราจร และความปลอดภัยจากการขนส่ง โดยจำแนกตาม
ประเภทการขนส่ง เช่น การขนส่งทางบก, ทางน้ำ, ทางอากาศ, การจราจร และความปลอดภัยจากการ
ขนส่ง นอกจากนี้ยังรวบรวมข้อมูลกฎหมายต่าง ๆ และสถิติต่าง ๆ ที่ทาง สบข. ได้เข้ามาเผยแพร่ให้รับทราบ

ข้อมูลทางด้านภูมิศาสตร์ (GIS)



เกี่ยวกับข้อมูลทางด้านภูมิศาสตร์ (GIS)
ข้อมูลด้านการขนส่งและจราจร ซึ่งจะนำเสนอระบบ
แผนที่ทางด้านภูมิศาสตร์ นอกจากนี้ยังรวมถึงข้อมูลโครง
ข่ายทางด้านการขนส่ง

ค้นหาตามเงื่อนไข

ช่วงเวลา : [ช่วงเวลาที่ต้องการเรียกดูข้อมูล]
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จำนวนครั้งการเข้าใช้งาน
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Figure 2.1-3 Sample Template of OTP Website (Continue)



Figure 2.1-4 Sample Template of OTP Website

2.1.4-2 Data Improvement and Maintenance processes to support OLAP

OLAP (Online Analytical Processing) is a system that enables online information analysis and reporting system to help a user search and analyze data using less time. OLAP is suitable for the organization that has to collect a huge data size with complicated structure.

After the consultant proposed the data cleansing plan, the consultant has followed the processes by customizing the database tables as follows:

1. Imported Goods Information
2. Exported Goods Information
3. Countries Group Information
4. Peak Period Survey Result Information
5. Daily Accident Information

2.2 GIS Development and Interlinking with MIS for Integrated Transportation Database

The development of information system for transportation, under TDMC VI project, was principally based upon the GIS database of Minister of Transportation. Based on data dictionary of TDMC project, there are only 13 data groups have been required for development of National Model (NAM) and Local Area Model (LAM). These data groups have been updated in accordance with database structure of TDMC V project (Bangkok and Peri-Urban area) in MIS system and model. Among the data, 3 data groups was acquired by field surveys which are data group no.17 Trip Fare Rate, data group no.19 Passenger Count, and group no.20 Travel Time and Delay Time. Therefore, consultant team will process and update these data groups when Office of Transportation and Traffic Policy and Planning provides the additional survey data. Furthermore, the interlink of data group no.4 (Accident) will be improved. The interlink and displaying of GIS data will be provided in provincial level for the whole country.

2.2.1 GIS Database in TDMC VI Project

Based on integrated national GIS data in TDMC VI project, the GIS data of MOT with the scale of 1:20,000 were selected in the present study. There are 11 data layers required for transportation analysis and planning in National Area Model (NAM) and Local Area Model (LAM).

- 1) Administration Layer: Tambon (admin.shp)
- 2) Administration Layer: Province (admin_province.shp)
- 3) Express Way Layer (expressway.shp)

- 4) Intersection Layer (intersection.shp)
- 5) Landmark Layer (landmark.shp)
- 6) Area of Responsibility of Metropolitan Police Station Layer (policearea.shp)
- 7) Railways Layer (railway.shp)
- 8) Road Layer (road.shp)
- 9) Bus Terminal Layer (station.shp)
- 10) BTS and MRTL Layer (transit.shp) : transit.shp

2.2.2 Improvement of Transportation Network Model on GIS Database

To improve the transportation network in National Area Model (NAM) and Local Area Model (LAM), the road layer was principally chosen from 11 data layers of Minister of Transportation.

1) National Area Model (NAM)

Due to the huge amount of transportation network links in NAM, the improvement process of the transport network requires significant amount of time. In this project, the interlink of transportation network was mainly paid attention to main highway up to third-order classification and the others depend on data availability. Nodes and links of the model will be adjusted to improve the network of the model. This adjustment will not effect to the transportation routes having different coordinates and networks of road data of MOT.

The National Model (NAM) has completely been done in GIS system. The network was adjusted to be realistically replicated the real highway network covering 76 provinces of Thailand (Figure 2.2-1).

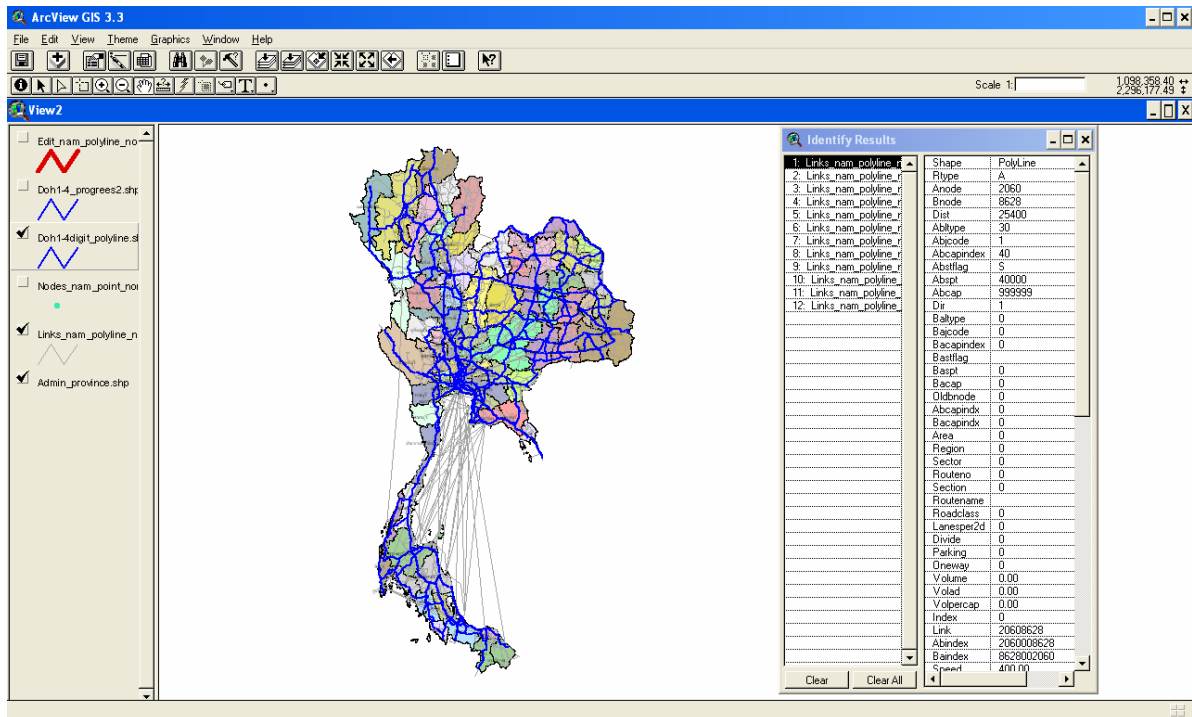


Figure 2.2-1 Adjusted Network Model of National Model (NAM)

Transport network of eBUM, under TDMC V project, was selected for Bangkok Metropolitan Region. The network was then updated further under the TDMC VI project (Figure 2.2-2).

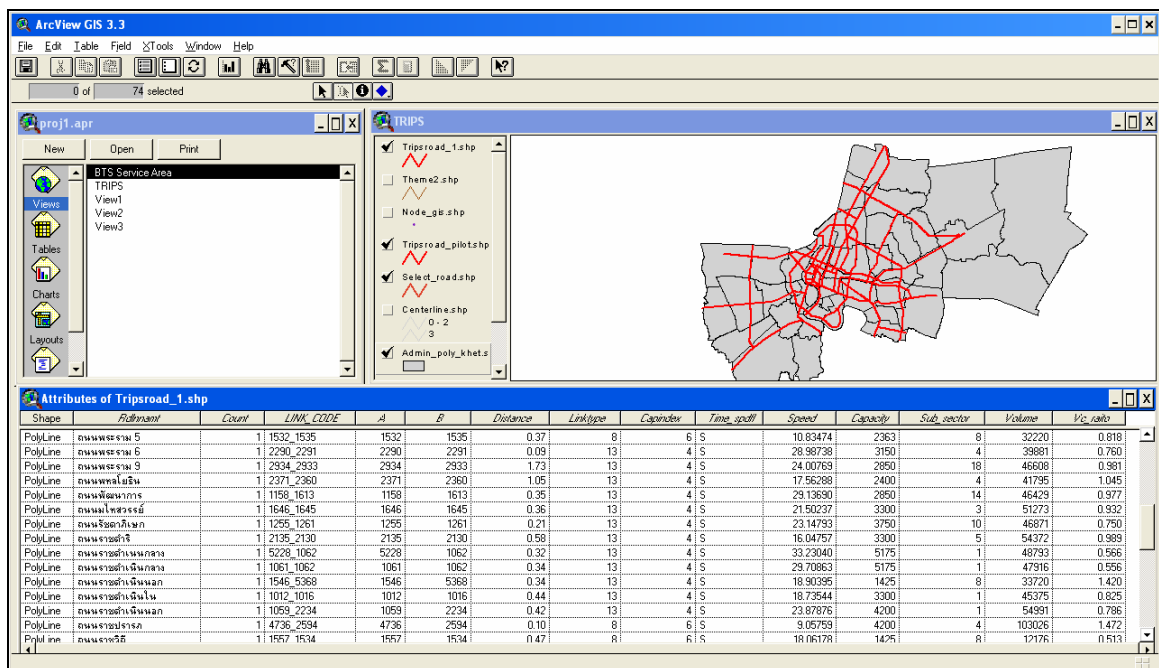


Figure 2.2-2 Network Model in GIS database for Bangkok

2) Local Area Model (LAM)

Transportation network in GIS database was linked with Local Area Model (LAM) under the TDMC VI project. Satellite images covered the local area were provided. The satellite images for Chiang Mai and Songkhla were rectified and used as the base maps of the Local Area Model as shown in Figure 2.2-3 and 2.2-4.

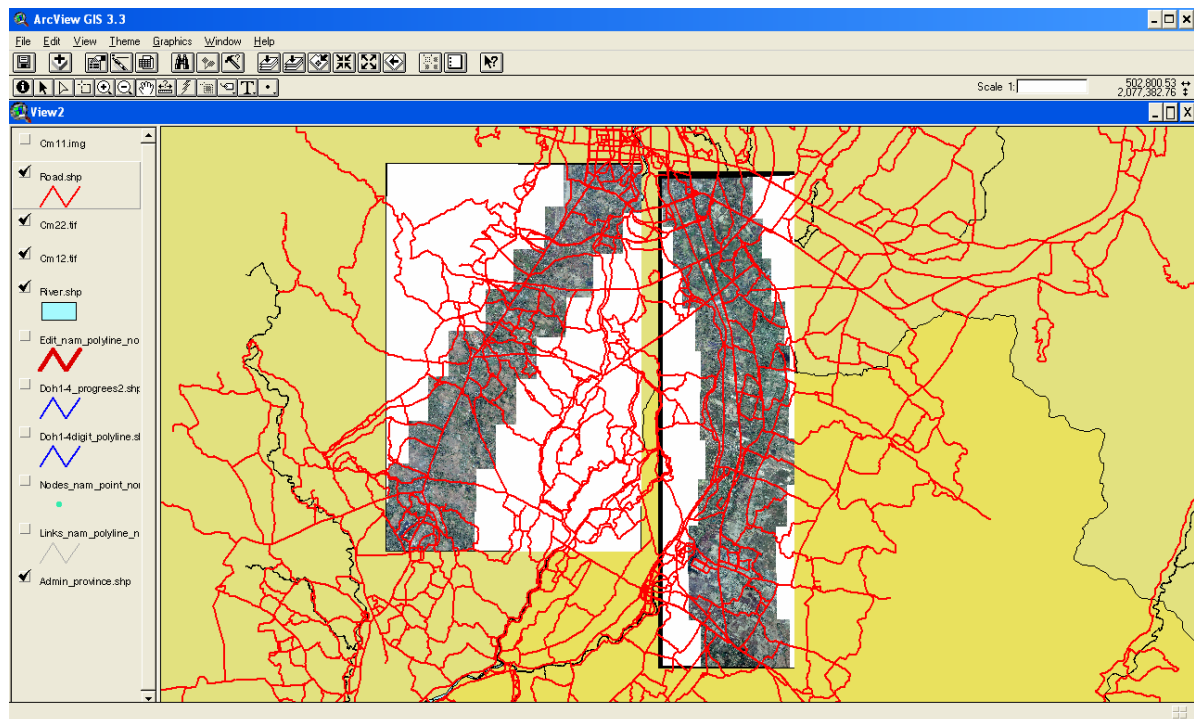


Figure 2.2-3 Satellite image rectification for Local Area Model of Chiang Mai

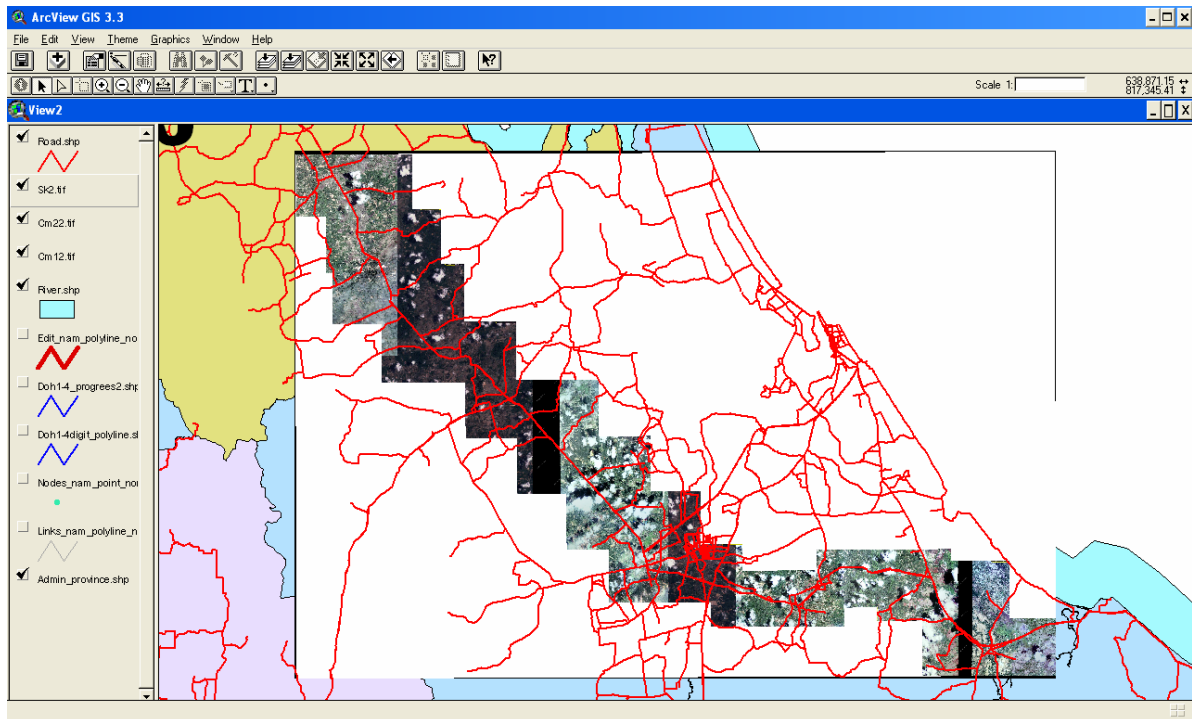


Figure 2.2-3 Satellite image rectification for Local Area Model of Songkhla

2.2.3 Data Interlinking between GIS and MIS

From the data dictionary under TDMC project, 20 data groups in MIS database have been examined. There are 13 out of 20 data groups were required for model analysis and could be linked with GIS. The list of 13 data groups can be listed as follows;

- 1) Group no. 1 Fixed Infrastructure Inventory
- 2) Group no. 2 Schedule of Services
- 3) Group no. 4 Accident
- 4) Group no. 5 Socio-Economics
- 5) Group no. 6 Transportation Economics
- 6) Group no. 7 Environment
- 7) Group no. 8 Vehicle Inventory
- 8) Group no. 11 Land Use
- 9) Group no. 13 Programs and Projects concerning Transportation
- 10) Group no. 17 Trip Rate
- 11) Group no. 18 Vehicle Count

12) Group no. 19 Passenger Count

13) Group no. 20 Travel Time and Delay

In TDMC VI project, all of 13 data groups will be updated and reformatted according to data structure of TDMC V project (Bangkok Metropolitan Region) both in MIS database and model. Among the data, 3 data groups were acquired by field surveys which are data group no.17 Trip Fare Rate, data group no.19 Passenger Count, and group no.20 Travel Time and Delay. Therefore, the consultant has processed and updated these data groups in MIS system when Office of Transportation and Traffic Policy and Planning provides the additional survey data. Then, MIS database and GIS database will be linked together.

In order to link and display the country accident data, the data group of accident in MIS database was linked with province layer in GIS database. But the accident data in MIS database was available as monthly accident for each province in year 2005 and 2006 including the additional data in 2007. Due to limitation of GIS, the accident data in MIS database was modified to be annual data. These annual accident data is then joined with province layer (Admin_province.shp) in GIS database.

2.2.4 Integrating Real Time Traffic Data with GIS

The traffic problems in Bangkok Metropolitan Region have dramatically increased especially the main road connecting the Ratchada Pisek ring road and outer area for both in- and out-bound direction. At present, there is no traffic investigation and assessment system that can reduce the urgent or immediate traffic problem efficiently. Office of Traffic and Transportation Policy and Planning, therefore, proposed a new technology, named as Intelligent Transport System (ITS), to deal with the traffic and transport management. The ITS system can facilitate the traffic and transport management, reduce the loss of energy consumption as well as increase the transportation safety.

Development of Real Time Traffic Report Project is an example project that employed the ITS system. The aims of the project are to dissemination of the traffic status and to provide the data supporting the trip planning to road users. This project emphasizes on the dissemination of the traffic status throughout internet website.

In this TDMC VI project, the data linking of Real Time Traffic system phase 1 was studied. This real time data was then used for model analysis and displayed in GIS system for Ratchada Pisek ring road. The equipment for monitoring the traffic status was installed at 15 locations. The road

network and location of real time traffic station in GIS format were then linked with the real time traffic report system. The data linking procedure can be explained step by step as following;

- 1) Export the reported real time transportation from transportation report database in form of database file (.dbf)
- 2) Create a GIS tool for linking the real time transportation report with road network at the observed station. Report the analysis results under GIS system for example, hourly traffic report, comparison of rush hour traffic status, and so on.
- 3) Design the report format in GIS system for displaying the analysis results

The consultant has prepared the database and linked to GIS system at the real time traffic stations. Real time data have been exported and linked to GIS system for further analysis and visualization as shown in Figure 2.2-5. Besides, a GIS tool for opening the real time data was also developed as shown in Figure 2.2-6.

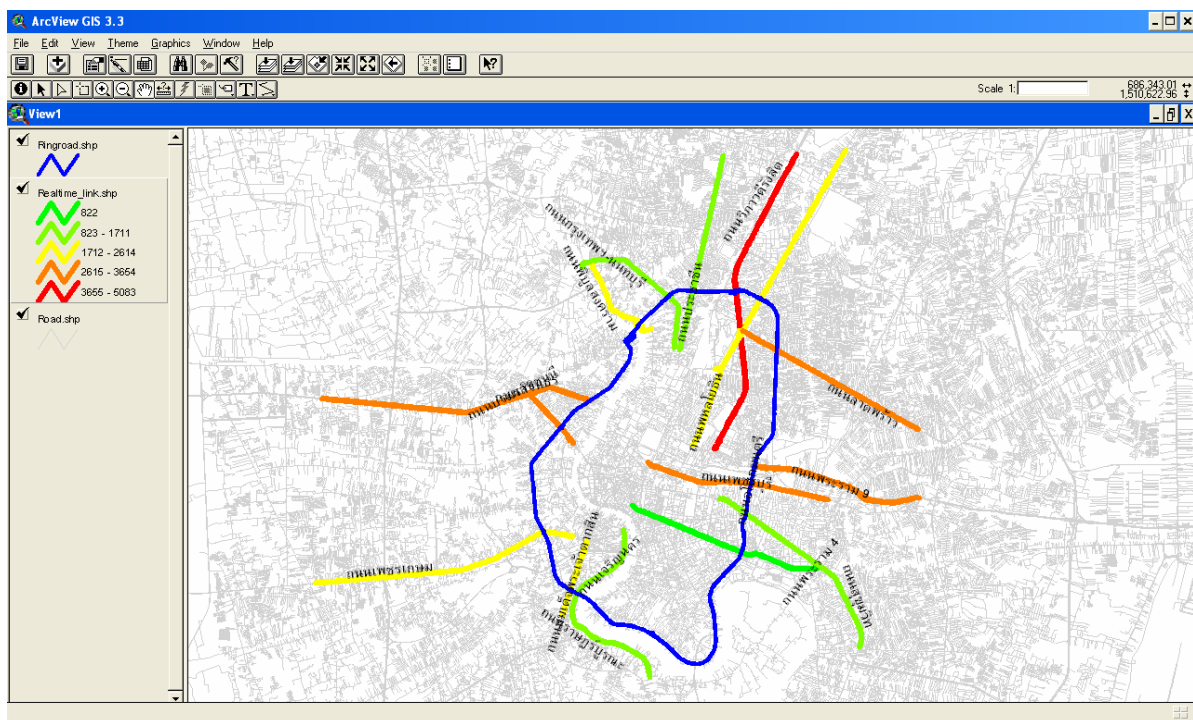


Figure 2.2-5 GIS map displaying the average real-time traffic volume under rush hour in the morning

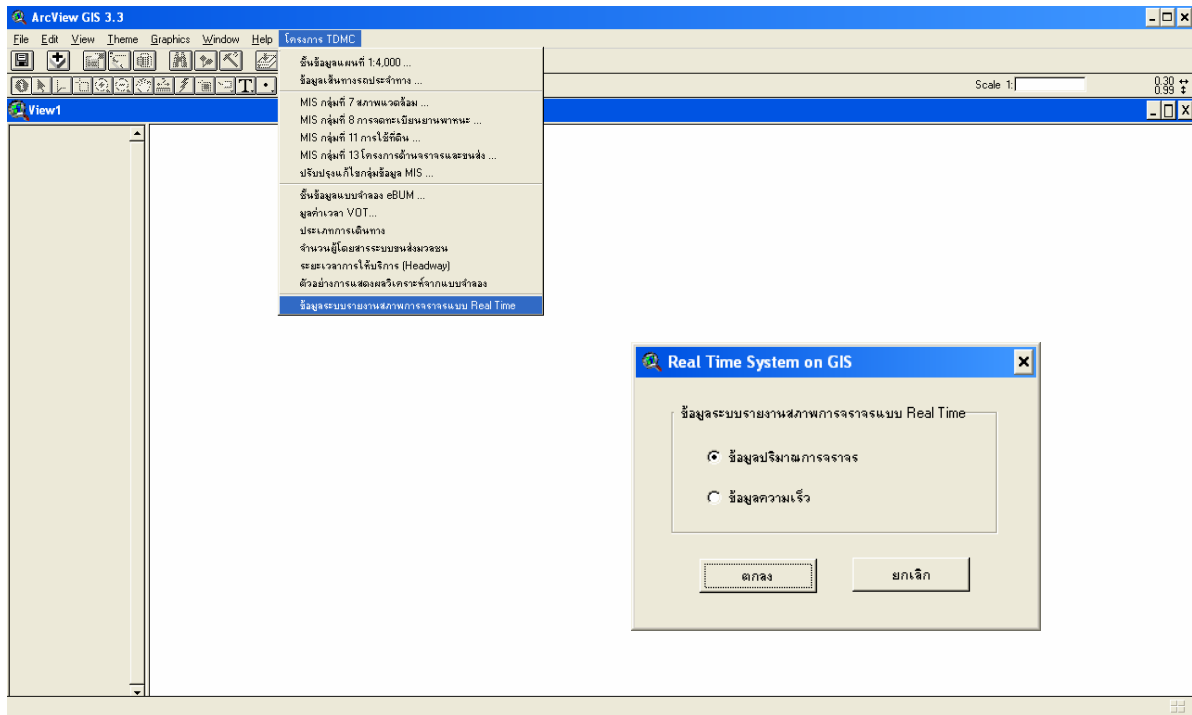


Figure 2.2-6 A Developed GIS tool for reporting real-time traffic data in GIS system

2.2.5 Development of GIS Data Dissemination System

The consultant has designed a GIS database based on ArcView and developed the dissemination system through internet and intranet channels. The analysis output and GIS map output has been transferred to MIS system and display on OTP's website. the dissemination system is one way communication system which people can take a look or capture the map for their use. The data in TDMC VI project were converted from PDF format to PMF format. Therefore, all published data were ready in PMF format which could be opened with ArcReader, (Free download). The complete sets of the linking of MIS and GIS system were shown in Figure 2.2-7 to 2.2-15.

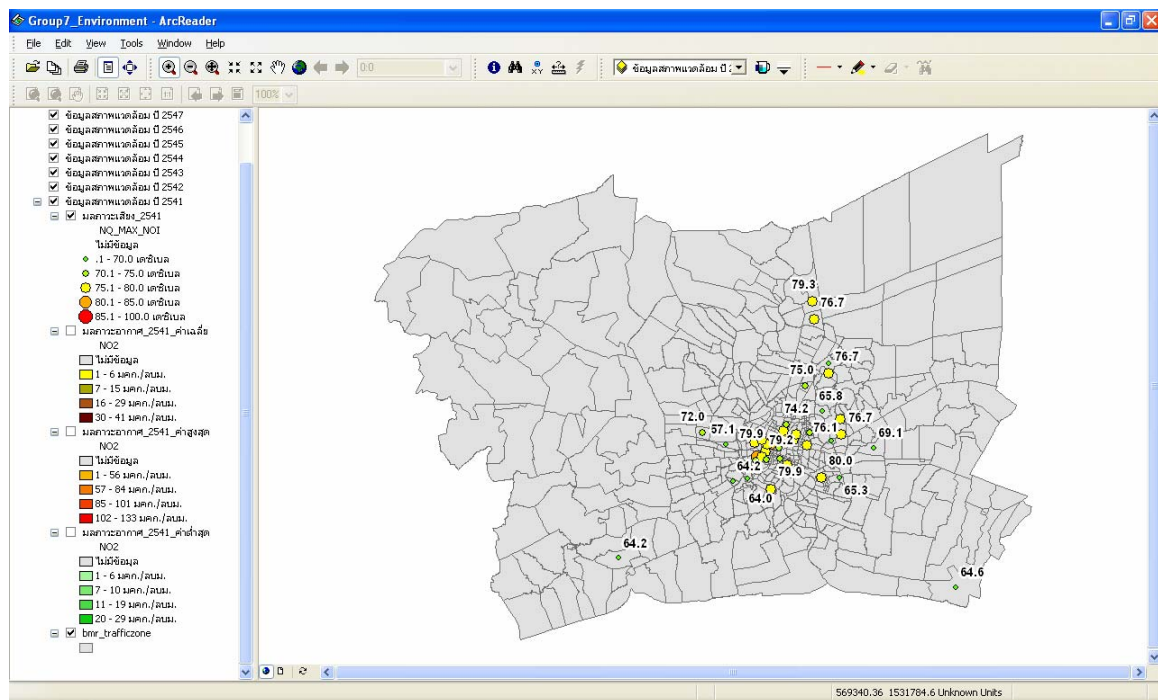


Figure 2.2-7 Environment Data (group no.7) in PMF format.

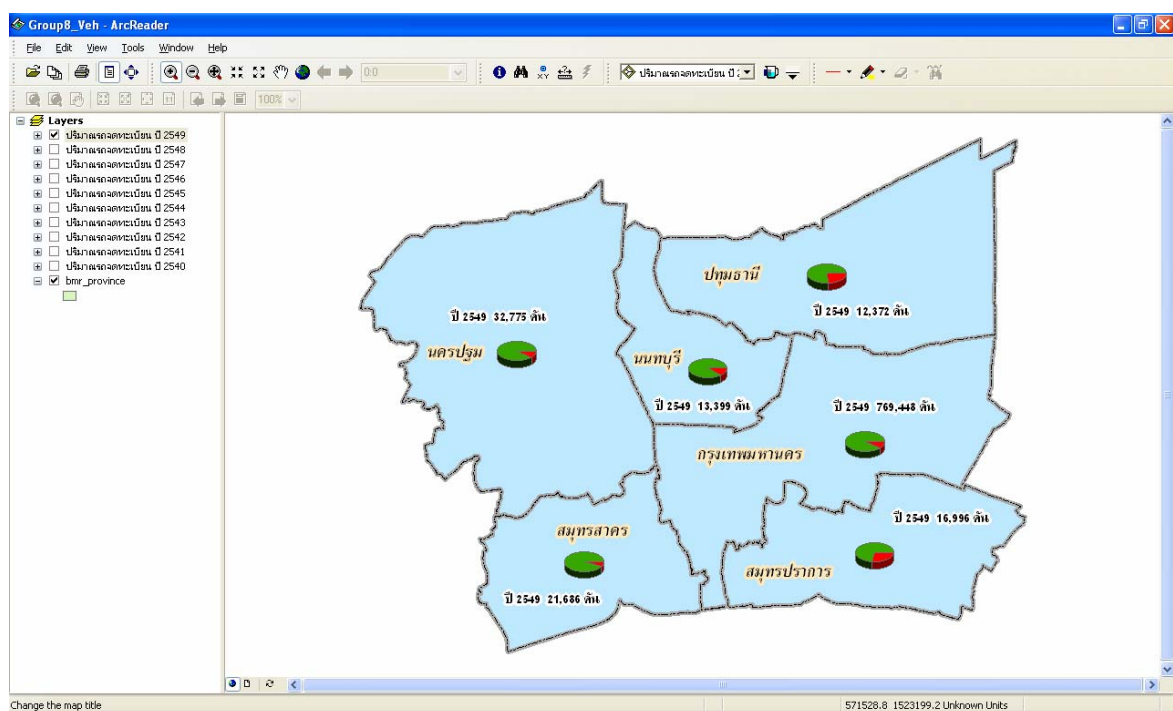
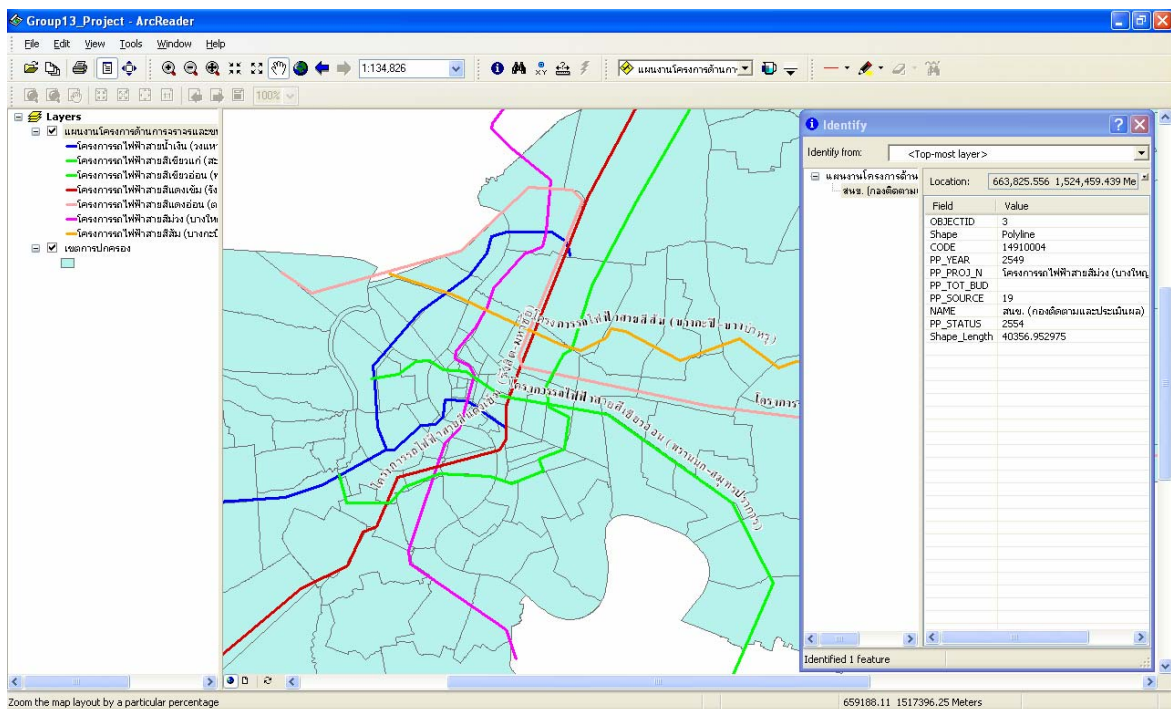
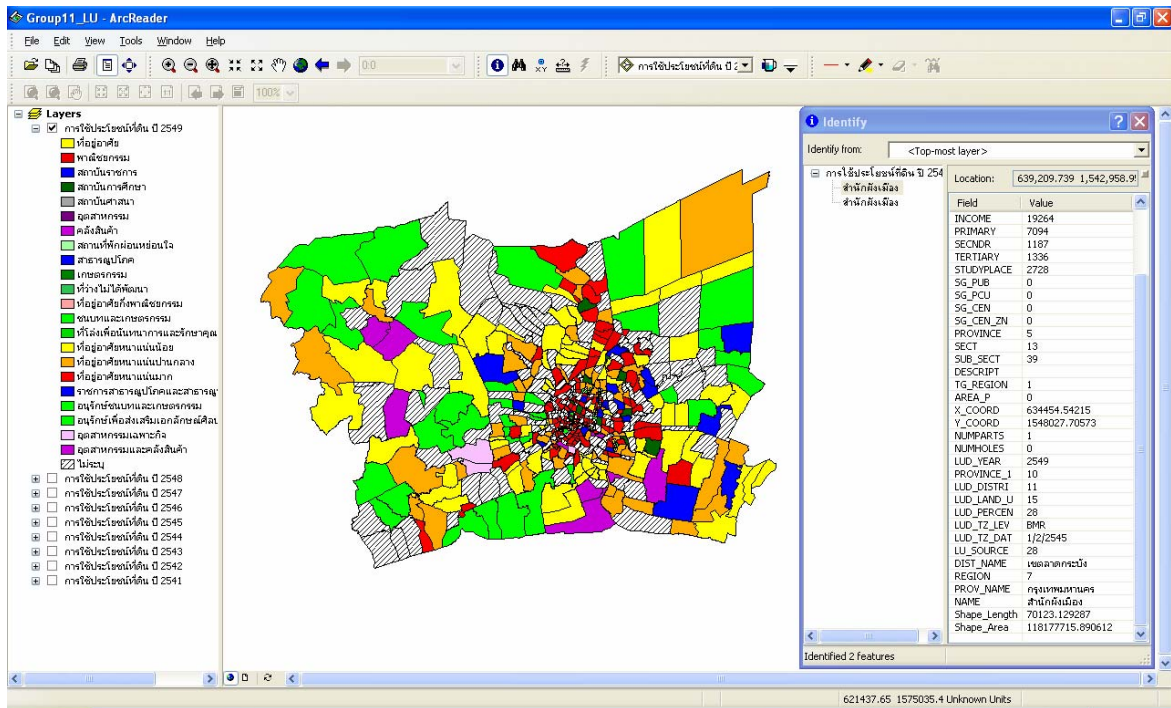


Figure 2.2-8 Vehicle Inventory Data (group no.8) in PMF format.



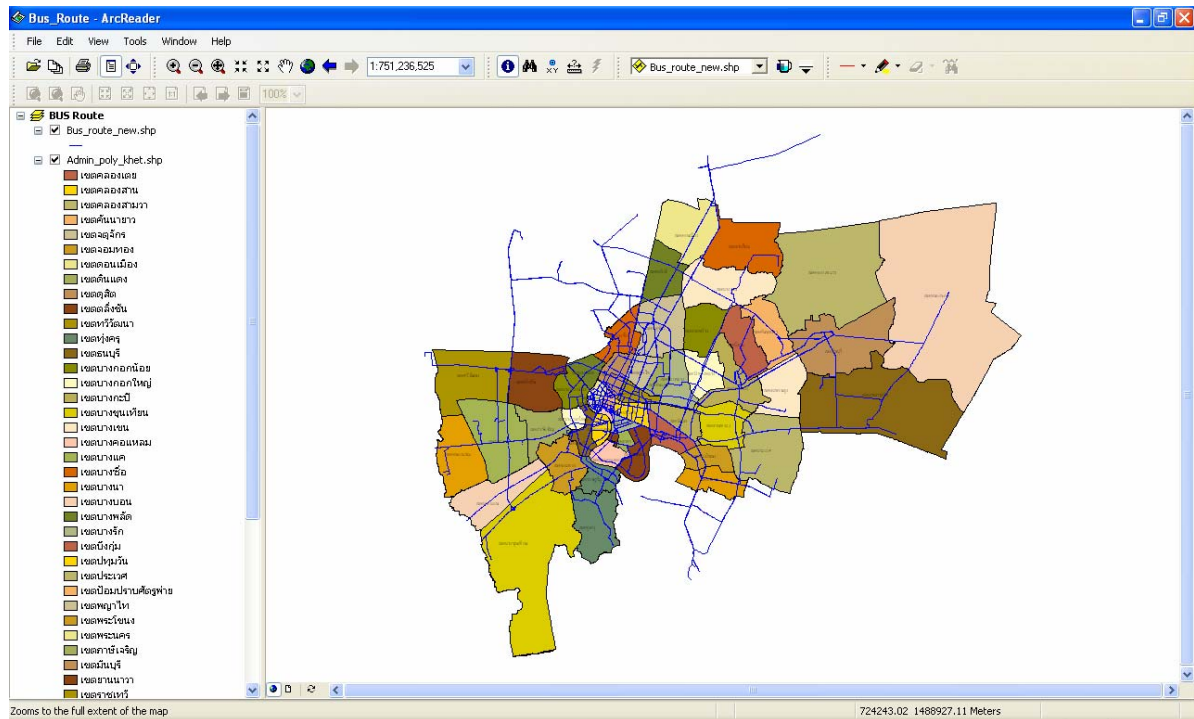


Figure 2.2-11 Mass Transit Systems in PMF format.

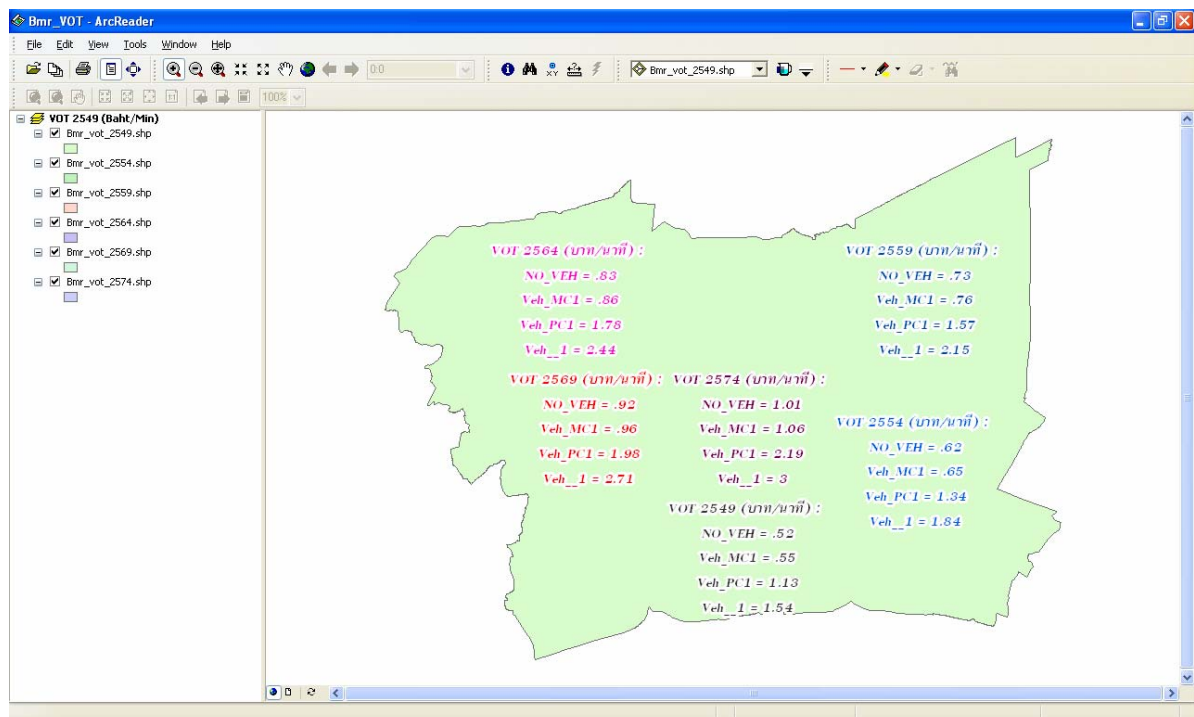


Figure 2.2-12 Value of time in Bangkok Metropolitan Region (BMR) in PMF format.

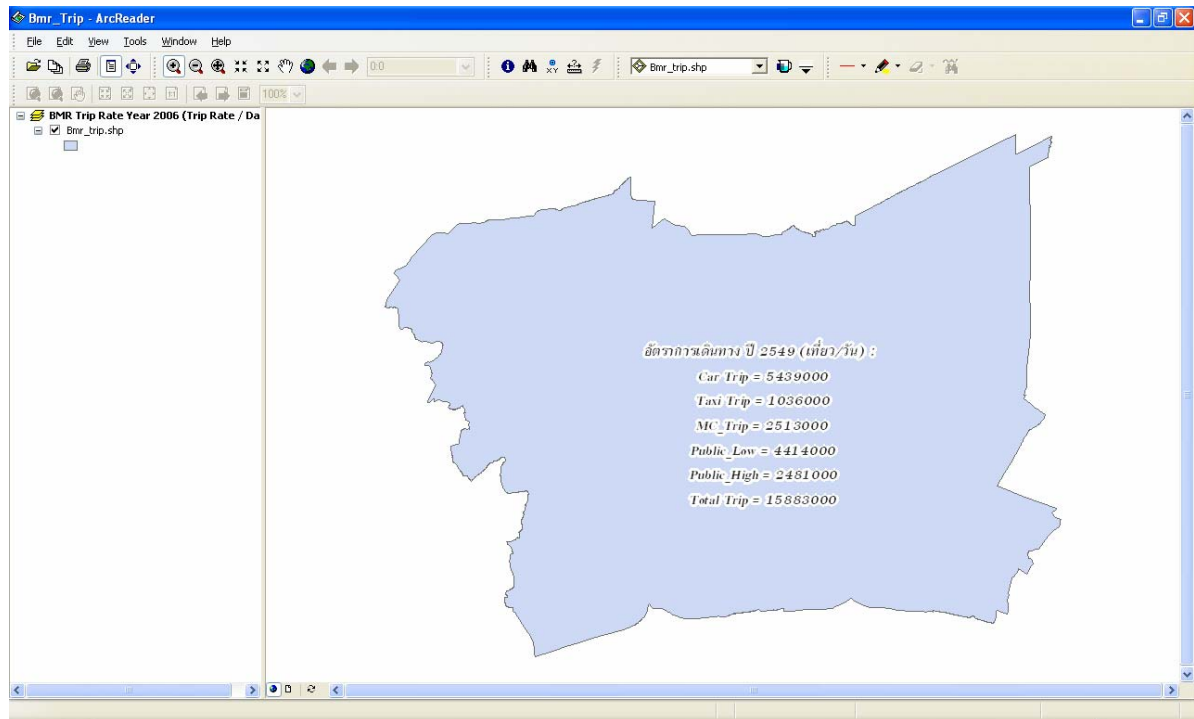


Figure 2.2-13 Trip Rate in Bangkok Metropolitan Region (BMR) in PMF format.

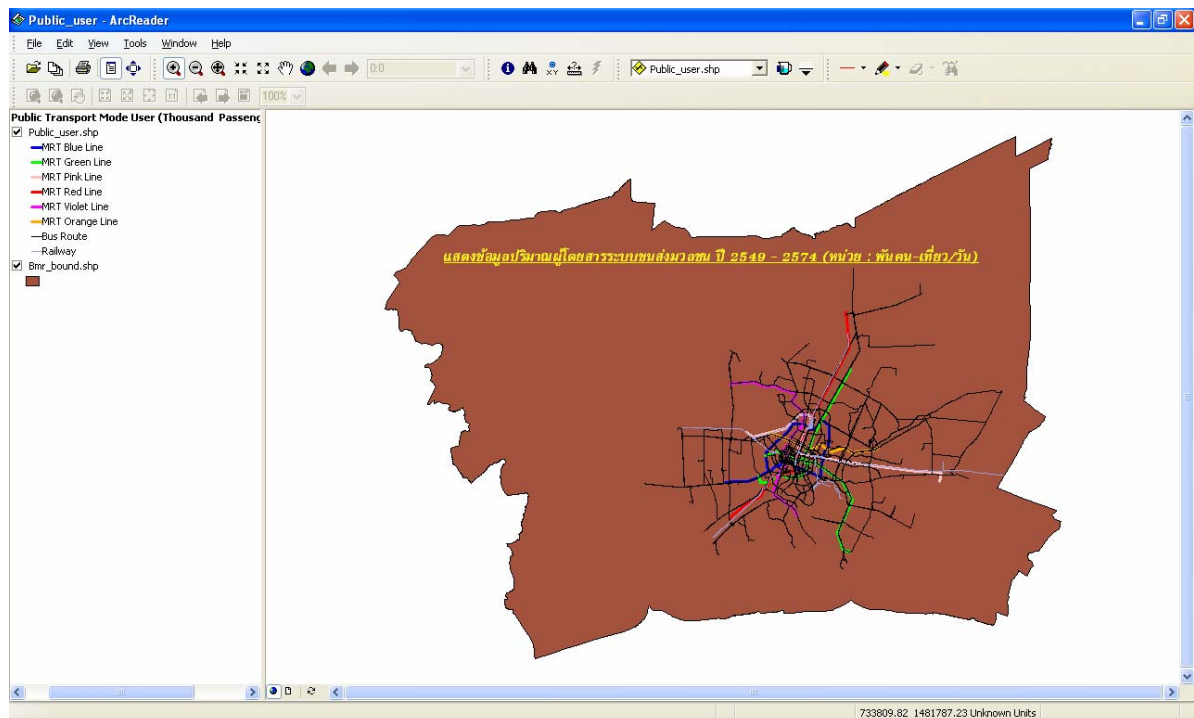


Figure 2.2-14 Public Transport Passengers in PMF format.

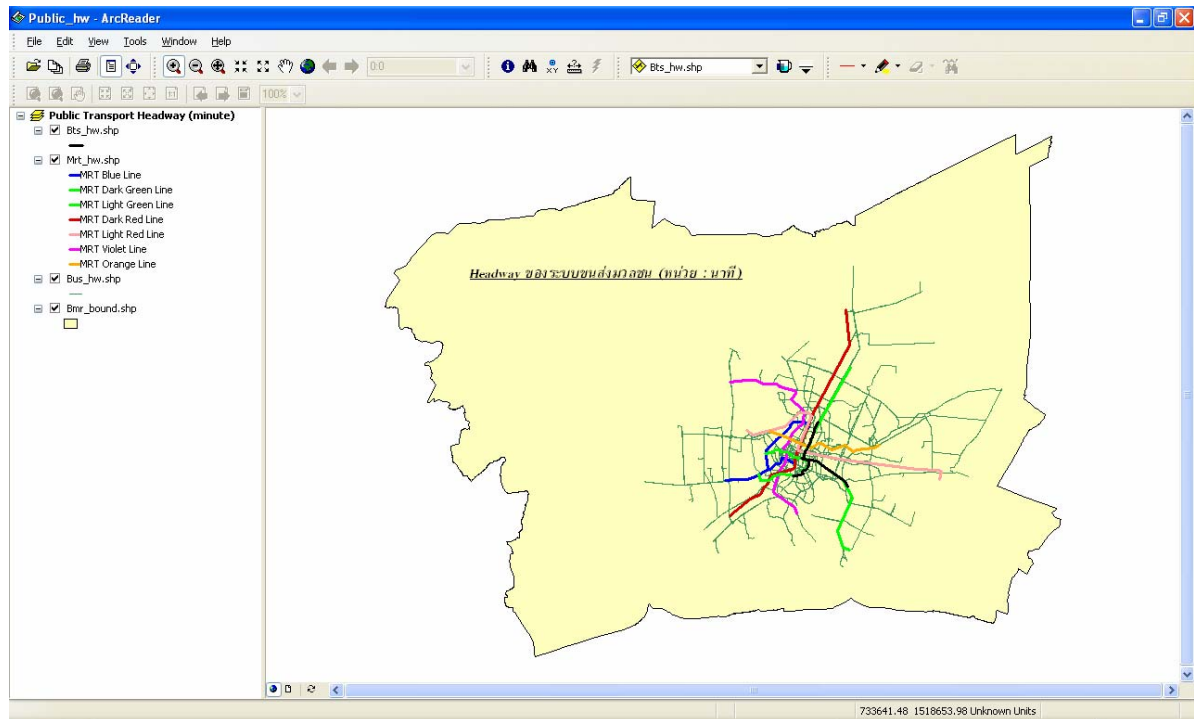


Figure 2.2-15 Headways of Public Transport in PMF format.