

**A NOVEL MODEL FOR HUMANITARIAN LOGISTICS: HOT MEAL
DELIVERY AFTERMATH OF AN EARTHQUAKE IN ISTANBUL**
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**A NOVEL MODEL FOR HUMANITARIAN LOGISTICS: HOT MEAL
DELIVERY AFTERMATH OF AN EARTHQUAKE IN ISTANBUL**

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LIST OF SYMBOLS

ACO	: Ant Colony Optimization
AFAD	: Disaster and Emergency Management Presidency
AYDES	: Disaster Management and Decision Support System
CVRP	: Capacitated Vehicle Routing Problem
DM	: Disaster Management
GA	: Genetic Algorithm
GIS	: Geographic Information System
HCA	: Hierarchical Cluster Analysis
HMPU	: Hot Meal Production Unit
ICT	: Information and Communication Technologies
LRP	: Location Routing Problem
NGO	: Non Governmental Organization
OR	: Operations Research
RO	: Robust Optimization
SA	: Simulated Annealing
MDLRP	: Multi Depot Location Routing Problem
MDVRP	: Multi Depot Vehicle Routing Problem
SDVRP	: Split Delivery Vehicle Routing Problem
TAMP	: Turkish National Disaster Response Plan
TRC	: Turkish Red Crescent
UNOCHA	: United Nations Office for Coordination of Humanitarian Affairs
VRP	: Vehicle Routing Problem
WFP	: World Food Programme
WHO	: World Health Organization

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ABSTRACT

In today's world, disasters occurring around the world in different types are still the most important factor disrupting the continuity in the development of our community.

Disasters, while reasoning loss of lives, affect the human life both on the economic level and life standards in negative manner.

Our country stated at a risky place for earthquakes especially for the most probable Istanbul earthquake. The earthquakes occurred in recent years, and the actions taken after all, ensured to raise situational awareness on the issues like developing new models to improve the resilience in the community, enhancing the capacity building actions, taking the precautions for mitigating the disruptive affects of disasters.

In this study, for improving the functionalities of Turkish Disaster Response Plan, which enlarges the area on developing new models on preparedness and response, enables to perform capacity building actions.

A MDSDLRP (Multi Depot Split Delivery Location Routing Problem) model with capacitated depots with homogeneous fleet type and without fixed facility location costs with the minimization of longest travel time objective proposed for the hot meal delivery aftermath of an earthquake. Considering the interdependency of the three sub-problems (location-assignment-routing) a Two Step Heuristic Approach including split and merge clustering with iterative boundary and genetic algorithm is used to solve the problem. The case study includes the real disaster assembly areas and the expected demand of those regions regarding the scenario based percentage of affected people for the European side of Istanbul.

ÖZET

Dünyanın birçok bölgesinde farklı tiplerde farklı şiddetlerde meydana gelen afetler, günümüz dünyasında hala, toplumsal ilerleyişteki sürekliliği kesintiye uğratan en önemli faktördür. Bir yandan, insanların hayatına mal olan afetler, diğer yandan insan hayatını hem ekonomik olarak hem de yaşam standartları açısından olumsuz olarak etkilemektedir.

Ülkemiz, depremler ve özellikle de muhtemel İstanbul depremi başta olmak üzere doğal afetler açısından riskli bir bölgede bulunmaktadır. Geçtiğimiz yıllarda yaşanan depremler, ve depremler sonrası yaşanan gelişmeler, toplumumuzdaki afet karşı dirençliliğin daha da artırılması için yeni sistemlerin geliştirilmesi, her alanda kapasite geliştirme faaliyetlerinin hızlandırılması, afetlerin yıkıcı etkilerini azaltacak önleyici tedbirlerin artırılması konusunda farkındalığı artırmaktadır.

Bu çalışmada, afet öncesi hazırlık ve afet esnası müdahale süreci kapsamında yeni modeller geliştirilmesi ve kapasite geliştirme faaliyetlerinin icra edilmesine zemin hazırlayan Türkiye Afet Müdahale Planı'nın fonksiyonlarını geliştirmek hedefiyle muhtemel bir İstanbul afeti sonrasında, sıcak yemek dağıtım faaliyetinin etkin yürütülmesi için matematiksel bir model ve çözüm önerisi geliştirilerek İstanbul'un Avrupa Yakası için uygulama gerçekleştirilmiştir.

Deprem afeti sonrası sıcak yemek dağıtımı için, en uzun servis süresini minimize etmeyi amaçlayan kapasite kısıtlı, homojen araç tiplerinden oluşan ve yerleşim maliyeti göz ardı edilen bölünmüş dağıtımli çok depolu yerleşim rotalama problemi önerilmiştir.

Üç alt problem (yerleşim, atama ve rotalama) arasındaki bağımlılığı göz önüne alınarak iki aşamalı tekrarlı sınırlandırılmalı bölme ve birleştirme yaklaşımli kümeleme ve Genetik

algoritma aşamalarını içeren iki aşamalı bir sezgisel yaklaşım ile çözüm gerçekleştirilmiştir. Uygulama, İstanbul Avrupa yakası için gerçek afet toplanma bölgeleri ve muhtemel afet senaryosunda etkilenen insan verileri üzerine bina edilmiştir.



1. INTRODUCTION

In the last years, disasters around the world are on dramatic rise that causes major losses both on human lives and economic or social life continuity. Many people lose their lives and become rendered or homeless after many kinds of disasters in different countries. Due to the climate change; hurricanes, storms, and floods are on high percentage. On the other hand, the devastating and unpredictable sides of earthquake make it again one of the top destructive disasters among the others.

Both international and national actors in disaster management, burden the complexity of the interdisciplinary area. Being wholly dynamic, including multi stake holders, being in need of high concentration of the scientific developments and information in one hand; acting in a human centered area, witnessing dramatic life times, being in the heart of the community due to the human life saving on the other hand make disaster management a highly complex and attention caring area.

International community is focusing on mitigating risks by implementing comprehensive political instruments and having fresh agenda like Sendai Framework for Disaster Risk Reduction 2015-2030. On the other hand, the capacity building efforts are on high interest to overcome the devastating affect of sudden onset disasters like floods, earthquakes, storms, hurricanes, and tsunamis.

Turkey, being in a high-risk geographical environment, witness different typed disasters very often. Still, in its history, earthquakes have the most devastating memories in recent years. Being very familiar to earthquakes, our community, without hesitation and any stop needs to increase their situational awareness on how to live with earthquakes. Being on the way of transformation on disaster management and aiming to be integrated with

the international community Turkey is increasing its capacity on both risk management and very promoted disaster response capacity.

In some cases, disaster response is considered to be the phase should be focused less than risk management and mitigation. However, due to the difficulties and the necessities of a mind shift underline that is not an easy way to go. Among these, disaster preparedness and response capacity are of high importance because the coordination term which is accepted as a key but difficult factor. Capacity building to perform a better coordination and effective response is not only means to increase the personnel, equipment and technical capacity but also means having situational awareness, planning, training and exercising, building up better and highly scientific models, using highly favorable technological products.

Overall, the term « model », even it's a systematic management model, a response model, a scientific model or a mathematical model stays in the heart of disaster management and response structure. However, the coherence between all types of models is crucial. An effective response to disasters needs comprehensive planning and preparedness efforts to be implemented during disasters.

Actors on the local, national, and international level face up highly critical and timely decision-making situations. Therefore, the level of understanding the core body of disaster management and information based scientific decision-making is of high importance. Due to its well understood on the area, both international level strategy builders and national, local actors pay great attention to information management and its products like GIS based information systems, timely reacting model based systems, early studied models to be implemented during the disaster.

Tüfekçi and Wallace (1998) state that researchers and the implementing actors are raising on developing new ways of responding to emergencies using ICT, modeling techniques, operations research, risk analysis, decision support systems, expert systems and geographical information systems.

Aforementioned coherence among the models improved, increases the necessity of well studying legislative frameworks, institutional responsibilities and action areas, management models implemented and focusing on high importance areas, gaps and applicable solutions. To best our knowledge this is the first and foremost part of developing models to be implemented.

Inspired by the National Response Plan in Turkey, we addressed the hot meal delivery problem aftermath of an earthquake in mostly focused area Istanbul. The shared responsibility among the institutional actors in Turkey, like as food delivery map on very promising areas such as search and rescue, medical care, evacuation, sheltering, psychosocial support, resource management, information management, transportation infrastructure, debris removal, energy, procurement.

In our problem, the hot meal production units planned to be active due to their resistance aftermath of an earthquake and mobile hot meal delivery units are considered to serve the affected people at gathering areas in the first days of the disasters.

We proposed a Multi Depot Location Split Delivery Routing Problem with capacitated production units and capacitated vehicles without facility location costs (due to hot meal delivery units). Due to its complexity and NP-hardness, two-phased boundary based clustering and routing procedure with genetic algorithm is presented. The split delivery structure is easily managed by predefined sized clusters allowing split assignment of a demand location by several hot meal production units. Boundary based clustering led to overcome the falling apart demand locations from the clustering phase.

The remainder of this study as follows: Chapter 1 throws light on the area of disaster management putting stress on the (a) disaster occurrences in the world, especially in Turkey, (b) disaster management as a phenomenon and the system in Turkey also touching the necessity of a focus on food delivery aftermath of an earthquake. Chapter 2 provides knowledge on the main subjects related to this study in the literature. Chapter 3 summarizes the parts of thesis and underlines the necessity of the study and the contribution to the literature. Chapter 4 shows the scientific background that our

approach stands on. Chapter 5 demonstrates the proposed mathematical model and its solution structure. Chapter 6 covers the real life problem with its components and related data for the European side of Istanbul and its computational results. Chapter 7 concludes the thesis summarizing the overall body.



1. DISASTERS IN THE WORLD

Earthquakes and tsunamis have been the deadliest and devastating disasters around the world including the Papua New Guinea Indonesia, South East Asia (CRED, 2018).

EM-DAT data shows that 504 earthquakes occurred between 2000 and 2017. In the Europe, Italy and Greece are the mostly affected countries suffering from earthquakes. Europe in the overall situation, witnessed 34 earthquakes between 2000 and 2017 (CRED Crunch). According to WHO, every year disaster kill around 90,000 people and affect around 160 million people worldwide.

Munich-Re NatCatservice shows that, the eastern part of American Continent and the eastern part of Europe may be suffering from hurricanes and middle Africa suffering from drought has the highest fatality rate index regarding between 2013-2018 (Natcatservice.munichre.com).

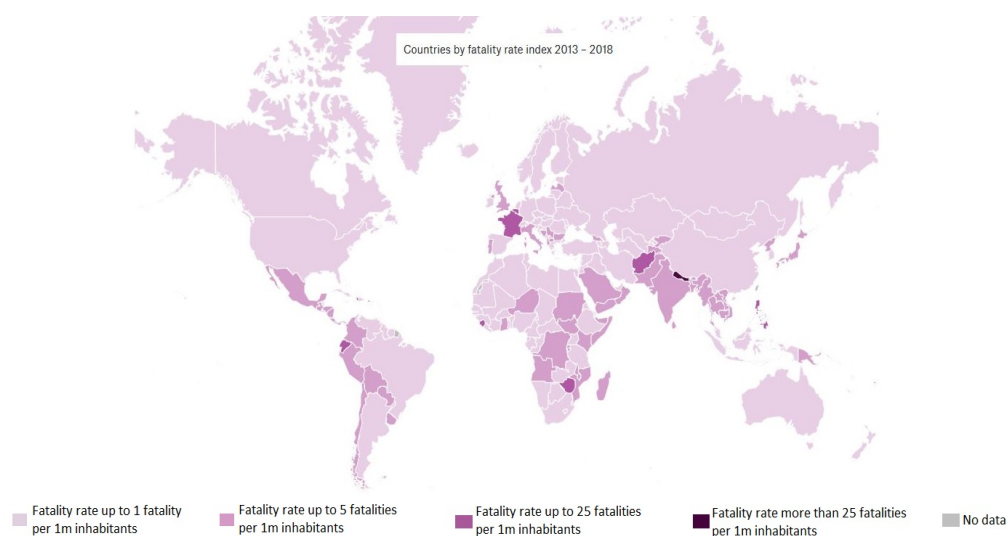


Figure 2.1: Fatality index (Munich Re, NatCatService, 2019)

When we change the time range to 1980-2018 the results change in an interesting way. Russia jumps to the risky place regarding the nuclear accident between these years. Again, the earthquakes in Turkey increase the fatality index of Turkey. The devastating earthquakes in this period make Iran, Myanmar, even France and Spain stay higher on the fatality index.

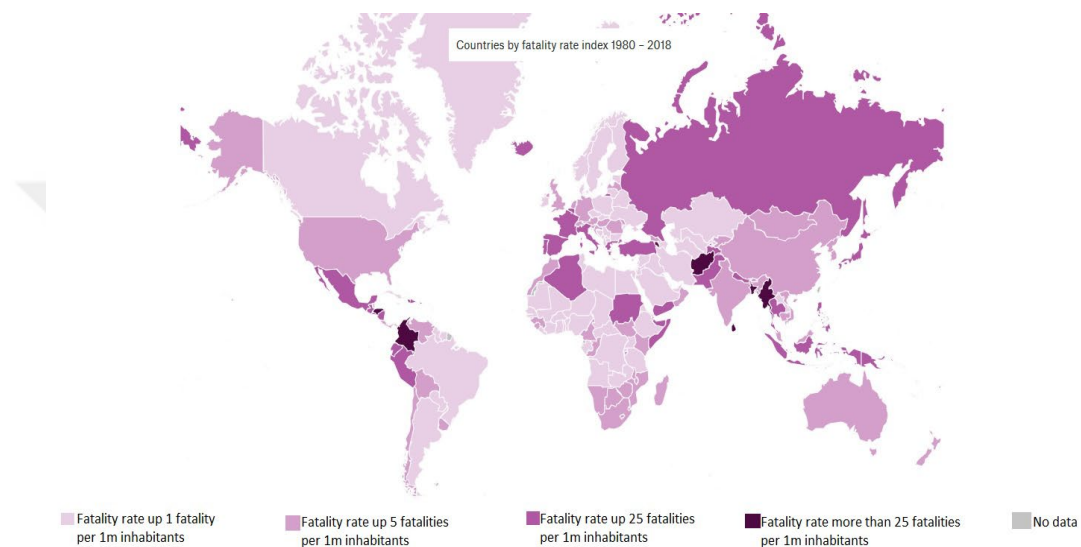


Figure 2.2: Index of deaths resulting from disasters

According to the INFORM Global Risk Index, the vulnerability value is between medium and high while the lack of coping capacity is on the low level which means that it has institutional and systematic resilience.

The main reason for this risk measure in Turkey based on Syria Crisis impact. The escalation of the humanitarian crisis in Syria caused a large-scale displacement of affected people. The increasing uprooted people are counted in INFORM as a vulnerable group, which can contribute to the overall vulnerability and risk of the country in which they are located (INFORM, 2019).

Turkey is ranking 45th with the overall 5.0 Inform Risk Score having stable 3-year trend. Furthermore, the hazard and exposure index is 7.8 with increasing 3-year demand with

5.8 natural hazards, 9.0 human conflict (due to the Syrian Crisis) risk score. Earthquake has the major effect on 5.8 natural hazard risk with 9.3 risk score which means that among the natural hazards, it is highly understandable that risk reduction and capacity building efforts should focus on the earthquake scenario. (INFORM, 2019)

Table 2.1: Total number of people affected by disaster type (EM-DAT)

Event	2018	Average (2000-2017)
Drought	9,368,345	58,734,128
Earthquake	1,517,138	6,783,729
Extreme Temperature	396,798	6,368,470
Flood	35,385,178	86,696,923
Landslide	54,908	263,831
Mass Movement (dry)	0	286
Storm	12,884,845	34,083,106
Volcanic Activity	1,908,770	169,308
Wildfire	256,635	19,243
Total	61,772,617	193,312,310

Table 2.2: The disruptive disasters happened in Turkey between 1990-2017 (EMDAT)

Type of Incident	Province/Region	Date	Loss of Life	Injury
Earthquake	İzmit Bay	17.08.1999	17,480	43,953
Earthquake	Düzce	12.11.1999	763	4,948
Earthquake	Erzincan	13.03.1992	653	3,850
Earthquake	Van (Erciş and Edremit)	23.10.2011	644	1,966
Avalanche	Southeastern Anatolia (14 incidents)	1992	328	53
Earthquake	Bingöl	1.05.2003	177	520
Earthquake	Adana (Ceyhan)	27.06.1998	145	1,600
Avalanche	Eastern and Southeastern Anatolia	1993	135	95

2.1 Disaster Management System

The milestone for the transformation survey in Turkey is Marmara Earthquake, which happened in 1999. The devastating affect of the earthquake updated the community to redesign the system itself. The three separate directorates responsible for disaster management combined and became a solid organization called AFAD, which is responsible for overall coordination of disaster management.

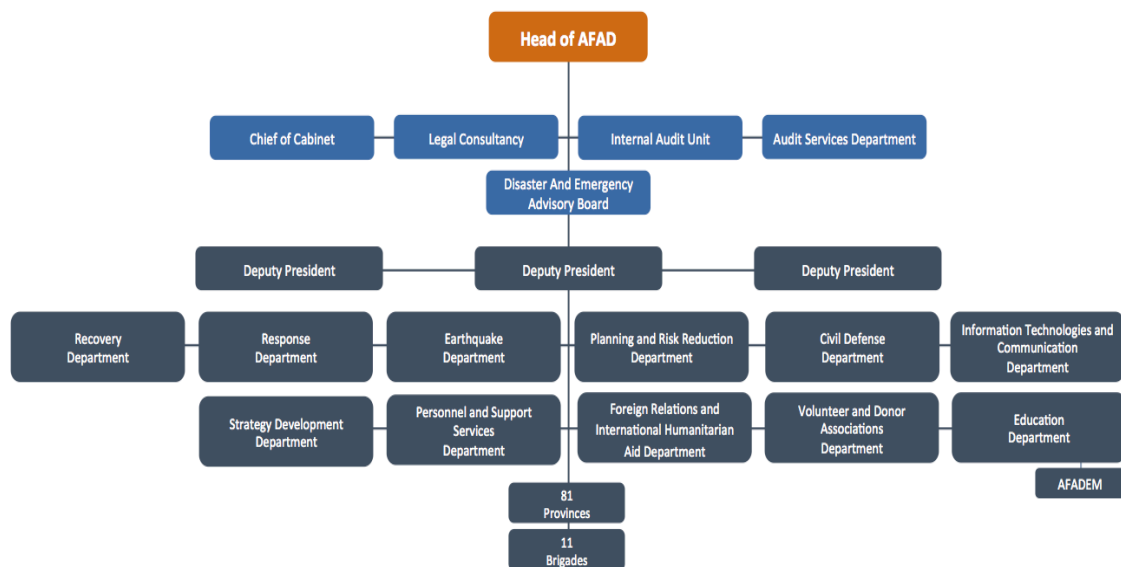


Figure 2.3: AFAD organizational structure

After establishment of AFAD, the system of approaching to disaster management structure has been also changed. The cyclic approved system of four phased composed of mitigation, preparedness, response and recovery started to be performed.

The Turkish Disaster Response Plan is one of the mind-shifting activity and transformation model for the response phase. It ensures the responsibilities of the stakeholders and makes it possible to build capacities.

Aims of TAMP are saving more lives, restoring daily activities among the community disrupted due to the disaster, performing the response activities in a rapid way ensuring the effective usage of resources.

The response service legislation ensures to maintain response service activities by giving responsibilities to the related institutions in order to allocate sufficient resources effectively to the disaster area.

The main implementing actors, during the capacity building process may decide to improve their personnel, equipment, and operational capacity.

The Turkish Red Crescent (TRC) according to the Turkish National Disaster Plan, is responsible for coordinating the food delivery activities for the affected people in disaster area including the hot meal delivery by putting the standards and establishing the supply chain system.

On the other hand, information management service group is responsible for establishing necessary information system including standardized software for gathering and sharing with the actors in the field. Starting before the disaster, they manage to collect, analyze and disseminate the crucial information with the key players. AFAD is also responsible for establishing a system to utilize the availability of the information system. One of the main capacity building projects regarding the information system is Disaster Management and Decision Support System (AYDES) which is a web based, GIS supported information system to leverage the decision making process covering whole phases of disaster management. AFAD not only developed the technology, but also improved the legal and institutional infrastructure to maintain its sustainability.

Table 2.3: Service groups in TAMP

Service Groups in TAMP
Communication Service Group
Transportation Infrastructure Service Group
Damage Assessment Service Group
Food, Agriculture, Livestock Service Group
Infrastructure Service Group
Sheltering Service Group
Food Service Group
Burial Service Group
Psychosocial Support Service Group
Firefighting Service Group
Security and Traffic Service Group
Search and Rescue Service Group
Transportation Service Group
Evacuation and Placement Planning Service Group
CBRN Service Group
Energy Service Group
Healthcare Service Group
Debris Removal Service Group
Service Groups Logistics Service Group
Technical Support and Supply Service Group
Resource Management Service Group
Donations in Kind and Warehouse Management and Distribution Service Group
Information Management, Assessment and Monitoring Service Group
Purchasing and Leasing Service Group
Accounting, Budget, and Financial Reporting Service Group
Damage Assessment Service Report

According to service groups responsibilities and capacity building efforts it can be inferred that the information gathering system will be improved before the disaster and will be activated aftermath of a disaster. Furthermore, the transportation infrastructure will be monitored and the failures will be repaired in a systematic way. The inference ,responsibilities and the enough time aftermath of a disaster regarding the food service drive the model and the problem into a deterministic place, although the problem in its nature includes uncertainty.

2.2. Food Delivery During Disasters

It is very important to maintain the food availability even during the disasters. The effective coordination of food and health services fastens the overcoming process of individuals both in mental and physical ways. The food delivery service including the hot meal delivery is a system to be handled in a well-defined way. The main scope of disaster time food consumption program is avoiding the shortcomings of undernourishment (Turkish Red Crescent, 2017).

The total energy requirement per human during the disaster is 2100 kcal/day on average. The mentioned energy could be gained from protein 10-12 % percent, 17 % percent fat (Damerell et al., 1998). One of the main issues on disaster nutrition is pregnant and lactating mothers need more calories than average (Turkish Red Crescent, 2017).

Turkish Red Crescent is providing services of food delivery and nutrition responsibility of disaster response time with disaster operation Center, 9 regional disaster management centers and 23 local disaster management centers (Turkish Red Crescent, 2017).

After the (24-72 hours), hot meal delivery units start to produce hot meals due to the probable poor nutrition. The strategic planning states the possible distribution centers afterwards the temporary sheltering centers are located. However, to the best our knowledge, due to the limited sheltering areas, and the duration of establishment of a sheltering area takes longer time than 3 days even if high quality is required. During the response time, rapid reaction sometimes could be mixed being in a hurry, which may cause bad results. That means affected people at assembly areas should get service for hot meal delivery. This may be encountered suddenly during a disaster. It is highly recommended to be prepared.

The distribution system should be modeled to avoid making the affected people walk much or wait much. As it is stated before, the service groups also gather information related to their operations. Regarding our model, this is important that after the 3rd day the information gap is decreases. So, the model becomes deterministic.

3. LITERATURE REVIEW

Before throwing light on the literature, it is highly crucial to underline the mostly used terms regarding the humanitarian, humanitarian logistics, disaster, emergency and emergency logistics. Humanitarian logistics concept may differ in different level organizations even in the national or international level. Firstly, the concept of « disaster management » and « humanitarian aid » differ in the context of their focus areas and people.

Disaster management is the common use regarding the four phases: mitigation, preparedness, response and recovery. Furthermore, the response activities aftermath of highly disruptive disasters may intersect with the humanitarian activities. Disaster response starts with the national efforts of a government, continues with the support on the international level in case of its high scale. The assistance from the international level aftermath of a disaster can be of expertise, in kind assistance and team-personnel. However, the scope of humanitarian activities is people in need around the world immediate aftermath of disasters and beyond like the natural continuous emergencies like droughts in Africa, and the continuous complex emergencies as in Syria, Bangladesh, and Yemen. Thus, we may indicate that, humanitarian logistics term cover the term emergency logistics. On the other hand, we should underline that the term « emergency management » that deals with the disasters is different from the term « emergency management » that deals with the daily occurrence of security or medical events.

Due to the structure of the problem that lies on very different areas and disciplines, we designed the literature review as: (1), disaster management, (2) humanitarian logistics, (3) disaster management case studies in Turkey, (4) location routing problems respectively.

3.1. Operations Research and Disaster Management

The common use of disaster management scheme in different countries, international organizations and also in Turkey after the establishment of AFAD in 2009 considers that there are integrated phases of disaster management coined as mitigation, preparedness, response and recovery respectively. The studies and the activities are commonly included in the aforementioned phases. However, the legislative framework, institutional structure and the systematic approach in different countries affect the mapping of the activities, which may cause some additions of newly defined activities and different mapping results. We may group the operations research studies considering the disaster management phases into: mitigation, preparedness, response and recovery.

Risk management and mitigation efforts before disaster mainly focus on building disaster resilience in the community. Insurance for decreasing the effect of sudden disasters, vulnerability models, loss estimation, forecasting possible effects of disaster, early warning studies and risk analysis are the main areas to study in risk management and mitigation.

From the individual to the societal perspective of risk, Mehrez and Gafni (1990) evaluated risk of possible loss of life due to the effect of a disaster or disease and accident during a planning period. They found out the probability of dying because of a disaster or a disease or an accident is same.

Early warning related studies try to decrease the risk factor of a possible effect of disaster. Current and O'Kelly (1992) solved the problem of locating emergency early warning sirens. The sirens they consider are used for early warning in case of tornadoes and accidents involving hazardous materials. Considering the cost function and covering radii of the sirens they used set covering and maximal covering location models.

To combine the risk measures, loss estimation and insurance system, Hsieh (2004) developed an analytical model to forecast the next record insured loss to property caused

by natural disasters. The method required the knowledge of an expert and consider the uncertainty.

Preparedness studies are in a vast majority due to its planning side and its effect on the response activities. The studies mainly focus and planning the response activities to enhance the coordination and increase the effect of the operation. Evacuation planning, shelter planning, site planning, warehouse planning and resource planning have high effect on response activities.

As an example, Shreali et al. (1991) developed a computer-based tool for location allocation model for the planning and operational horizon to cope with the shelter selection and evacuation route selection while seeking to minimize the total distance travelled.

Yamada (1996) aimed to optimize the city evacuation plan by using two network flow methods. The problem is assigning each resident to a place of refuge.

Takamura and Tone (2003) in their paper concerned with the site selection problem for the project of relocation of several government agencies out of Tokyo. Because of the strategy that underlines the rationality and the openness to public is crucial, they offered to utilize the analytic hierarchy process and data envelopment analysis.

Barbarosoğlu and Arda (2004) addressed the issue of planning the transportation of vital first-aid commodities (medicine, food, clothing, machinery, etc.) and emergency personnel to disaster-affected areas by developing a generic modeling framework to be used in case of earthquakes.

Wang and Ren (2010) integrated three models to the natural disaster logistics decision support system. In the first phase, they use fuzzy clustering grades by historical data, the second phase shows the grade distinguishment of new disaster areas, and last phase plans the incorporation relief commodities and equipment distribution in proper sequence.

Similar to the preparedness based studies, response oriented studies are common. Jainshe et al. (1994) explored the design and development parameters of decision support system for emergency decision making problems. Firstly, they analyzed the problem types and then proposed a conceptual structure for knowledge-based distributed emergency decision support system.

Barbarosoğlu et al. (2002) developed a mathematical model for helicopter operation planning during disaster relief operation. The problem then decomposed into two sub-problems: (1) tactical level problem, (2) operational level routing and loading problem. The consistency between the problems is utilized by iterative coordination procedure.

Özdamar et al. (2004) developed a logistic planning model for emergency cases to be embedded into a Decision Support System. They addressed a dynamic-time transportation model which is necessary to be solved repeatedly during ongoing aid delivery operations. The planning scheme includes the optimal mixed pick up and delivery schedules for vehicles.

Recovery phase is very intersected with response phase regarding the early recovery and with the mitigation phase regarding the efforts to build up the resilience. Thus, in the literature, recovery seemed to be the least taking attention area among the others. However, in some classification methods; even the damage loss estimation analysis recorded as recovery phase studies.

As an example to recovery phase studies; Nikolopoulos and Tzanetis (2003) analyzed a model considering housing allocation of homeless people afterwards of a natural disaster. Their model consists of a non-linear ordinary differential equations.

An overall perspective for the understanding of OR applications about disaster management can be easily understood by well known survey. Altay and Green (2006) analyzed and grouped the OR applications and underlined the gaps and prospective areas.

3.2. Humanitarian Logistics

Humanitarian logistics take attention in the literature because of its type that maps on a place intersecting the facility location, location allocation, relief distribution, vehicle routing, scheduling, transportation, decision making problems.

Among the variety of papers related to the humanitarian logistics term which involves several issues like evacuation of affected people, ambulance location, relief distribution, debris removal, finding sheltering alternatives, fire fighting problems, inventory management regarding the resource management during a disaster. Disaster relief based studies date back to 1980s when Sheffi et al. (1982) simulated the traffic patterns to have better emergency evacuation schemes and results.

Considering the relation similarity in the concept of demand supply of affected people during a disaster, between the problems of food delivery and relief distribution we focused on that subject of humanitarian logistics.

Fereiduni et al. (2016) formulated a robust optimization model for distribution and evacuation in the disaster response phase where the multi-period at each period model finds out the quantity and bases of relief centers, the number of rescue vehicles in each relief center, the quantity and bases of emergency tents, the quantity of relief commodities and finally the number of injured people that are carried to hospitals.

Yılmaz and Kabak (2016) addressed the location of distribution centers. They proposed a multi objective decision model aiming to locate the different level distribution centers simultaneously with the objectives of finding minimum number of distribution centers located, minimizing the distance between the demand points and distribution centers. .

Bai et al. (2017) studied the prepositioning problem of emergency supplies where they developed a modeling framework to increase the availability of tools for natural disasters. Because, prepositioning has the characteristics of unknown data such as demand, supply,

transportation cost and transportation capacity, they constructed a risk-averse fuzzy optimization model.

Özen and Krishnamurthy (2017) presented a model and solution procedure that is able to evaluate the performance of a relief center, considering the parameters of waiting time for victims and throughput.

Maharjana and Hanaoka (2017) in their paper determine the optimal number of warehouses to be located to the selected places for humanitarian relief in Nepal. They presented a new version of maximal covering problem having additional constraints reflecting the real world structure in Nepal. They solved the problem by using simplex method with branch and bound algorithm.

3.3. Disaster Management Case Studies in Turkey

The case studies regarding disaster management and its related areas mapping on the operational research have importance on the improvement of both disaster management system and interdisciplinary studies. Being in a disaster prone region, İstanbul comes first on the case studies considering its contribution to overall resilience to disasters in the community.

Gül (2008) used multi period mixed integer programming aiming to evaluate the post-disaster casualty logistics in case of an expected Istanbul earthquake. He presented a dynamic casualty transportation model to assess the expected performance of the response system. The availability of ambulance and hospitals for emergency care highly affect to performance results.

Tanrıöven (2010) tested different ambulance dispatching strategies for aftermath of an earthquake in Istanbul. He simulated the ambulance dispatching operations in seven districts of Istanbul and their neighborhoods with the two criteria: (1) elapsed time from the rescue of the patient to the hospital, (2) the time between rescue of the patient and leaving time of emergency department of the patient.

Özdiñç (2011) in her master's thesis considered the prepositioning the emergency response facilities and distribution phase considering the failures on the network. She constructed a two-stage stochastic programming model to find out where to locate the facilities and developed a tabu search heuristic that relies on sampling network scenarios.

Karaca (2012) offered a methodology to cope with the three-layer supply chain mapping both the pre-disaster and post-disaster phase. Assuming that the demands and road capacities are jointly continuously distributed, she obtained deterministic equivalent through the sample average approximation method. Finally, she solved the problem through stochastic dual dynamic programming and applied on a real life data obtained for Asian side of Istanbul.

Berktaş (2014) focused on the debris removal problem and developed two mathematical models with different objectives. First, one is to minimize the total time spent to reach all critical nodes and second to minimize weighted sum of visiting times. She used data sets of Bakırköy and Kartal to test the model and heuristics proposed.

Sebatlı et al. (2016) proposed a simulation based approach to firstly predict the necessary quantity of relief supplies to be served to the affected people before the governmental and institutional capacity reach to the affected area, second develop a plan structure to allocate temporary disaster response. They constructed an earthquake scenario based study for the Yıldırım district of Bursa. .

Uslu et al. (2017) used the multi depot vehicle routing problem with stochastic demand and developed a mathematical model with chance constrained approach to cover the aid distribution in humanitarian relief logistics which is implemented for the capital city of Turkey, Ankara.

Ağlar (2018) proposed a strategy for post disaster assessment to increase the effectiveness of the response phase where the fast relief routing is crucial. She developed a bi-objective mathematical model with heterogeneous vehicles, firstly to maximize the total value

added by the assessment of the roads and secondly to maximize the overall profit gained by assessing point of interests.

Pamukçu (2018) threw light on the importance of information gathering during the response phase of disasters underlining the fact that timely and precise information for needs assessment directly affect the relief efforts. She defined the Post-Disaster Needs Assessment Routing Problem where the decision to be made is the finding out the locations, visiting sequence and spent time in each site. She performed a case study based on 2011 Van Earthquake.

3.4. Location Routing Problems

Location routing problem is a historical problem that integrates the facility location, location allocation and vehicle routing problems. From the general perspective, combined location-routing approach solves the problem of finding the locations; number and capacity of facilities for serving geographically distributed customers and finding the optimal usage of vehicles in designed schedules.

On the practical usage of the LRP, Or and Pierskalla (1979) were one of the earlier efforts that examined the regional blood bank location problem to serve hospitals. They presented algorithms for finding how many blood banks to be located in which places with the allocation to the hospitals and how to route so that the travelling cost are minimized. Jacobsen and Madsen (1980) focused on real life newspaper delivery system and tried to offer a better modelling by using LRP approach and heuristic based solution procedure.

The known surveys in the literature addressing the LRP and earliest attempts to classify the LRP date back to early 1980s (See Madsen, 1981; Balakrishnan et al., 1987; Laporte, 1988).

The studies on LRP might be divided into two groups. First one is the contribution efforts of evolving the problem. Second one is the contribution to the approaches of solving location routing problems.

As an example to the first group contributors, Laporte in 1981 firstly described the typical LRP. Apart from its variations, the general type of the problem tries to find the minimum cost valued solution of selection of depots in candidate alternatives, allocation the customers and routing the vehicles.

Perl and Daskin (1985) defined the Warehouse Location-Routing Problem as one of solving simultaneously the location and vehicle routing problem. They proposed a heuristic solution method for the WLRP, based on dividing the problem into three subproblems and solving them in a sequential manner considering the dependence between them.

Laporte et al (1986) visited the capacitated location-routing problem presenting an exact algorithm. In the problem they studied, the nodes have some weights and the vehicles to visit that nodes have given capacities. For the problem, they developed a formulation of an integer linear program, which involves degree constraints, generalized sub tour elimination constraints, and chain barring constraints. The exact algorithm, which is capable of solving problems up to 20 sites, uses an initial relaxation for the constraints.

On the stochasticity side of problem, Laporte et al (1989a) examined the stochastic location-routing problems, which consist simultaneously locating a depot among candidate sites, of determining the vehicle fleet size, and of finding routes where the customers have random supplies. They studied two variants: minimizing the first stage costs so that the probability of route failure does not exceed a preset threshold, and minimizing the first stage costs so that the expected penalty of any route does not exceed a fraction of its planned cost.

Chien (1993) in his paper proposed an approximate approach for the LRPs, which first generates and improves feasible location/allocation schemes with the associated multi stop routing costs approximated using length estimators.

Min et al. (1998) synthesized the evolution of location-routing problem by reviewing the LRP literature and developed a useful taxonomy and classification with regard to solution perspective and solution method to find out the mapping of efforts for LRP models and the necessities in the real life problems.

Second part contributors to the LRP world include the solution approaches to the different types of the problem. Laporte and Dejax (1989b) presented solution approaches to the dynamic location-routing problems, which add to the known LRP the planning horizon dimension.

Srivastava (1993) proposed three heuristic models called SAV1, SAV2, CLUST heuristics respectively to solve the location routing problems. SAV1 model considers approximate routing costs while determining the depot locations via dropping an open depot. SAV1 integrates the drop and assign procedure iteratively until obtaining a final solution where only one depot or desired number of depots remains open. The criterion used to drop the depot is the travel time (cost) savings. While SAV1, starts with the assumption that all depots are open, SAV2 assumes all depots are closed and to be opened one by one. CLUST heuristic assumes that customers may be placed in groups, and locate first route second approach might be better to perform.

Tuzun and Burke (1999) present a two-phase tabu search procedure for the solution of LRP. In their paper, firstly for the location phase of the algorithm, a TS is performed to be effectively used for distribution while on the other hand another TS runs for the routing decision considering routing variables. They compared their TS approach with SAV1 and CLUST algorithms introduced by Srivastava.

Bouhafs et al (2006) proposed a two stage for the capacitated location-routing problem (CLRP). In their work, they present a Simulated Annealing (SA) and Ant Colony System

(ACS) approach in which is the coordination of better facility location desired SA and a good routing finder ACS.

Lin and Kwok (2006) explored assigning several routes to a vehicle during the routing procedure. They applied metaheuristics of tabu search and simulated annealing on real data to compare the performances under two versions: simultaneous or sequential routes assignments to vehicles.

Barreto et al. (2007) presented a clustering analysis for a capacitated location-routing problem. In the problem, first they consider a discrete LRP with capacitated distribution centers, homogeneous fleet of vehicles carrying a single product and each customer to be visited once, second they intend to determine the set of distribution centers and related routes. In their paper, in a sequential heuristic algorithm they integrated several hierarchical and non hierarchical clustering techniques. In their sequential heuristic for the CLRP, firstly, the customers are grouped regarding the capacity limit, then in each group the routes are determined and improved, finally the distribution centers are located and the routes are assigned to the located distribution centers.

Berger et al. (2007) presented a set partitioning-based formulation of an uncapacitated location-routing model including the distance (route length) constraints aiming to cover the application areas such as perishable good delivery or time-critical delivery problems. They also identify an alternative set of constraints that improves the linear programming (LP) relaxation bound. Finally, they develop a branch and price algorithm for the LRP with distance constraints.

Gao et al. (2016) introduced a K-means clustering algorithm to combine with Ant Colony Optimization (ACO) for addressing the dynamic LRP (DLRP) in which the random factors stemming from the traffic delays caused by accidents and the cyclic factors stemming from the rush hours are applied. In their paper, K-means is used for tackling the sub problem LAP and the proposed a clustering ant colony algorithm resolves the other sub problem VRP in dynamic environment.

In their work Rabbani et al. (2018) inspired from a real-life problem in soft drink industry. There is a need for the DCs due to the traffic regulations for transportation of large trucks to be used between the factories, which are out of the city, and the restaurants, hotels that are in the city. Therefore, in a two-echelon distribution system, they tried to determine the places to locate the DCs and the number of trucks in the first stage, the allocation and their sequence of visiting in the second stage. They considered soft time windows for each client to make the model more realistic.

The studies on solving the LRPs at realistic size and real life problems remain a necessity.



4. GENETIC ALGORITHM

Inspired by Darwin's theory, genetic algorithm (GA), which is a family of iterative search algorithms, is the adaptation of the natural selection process to other scientific procedures in order to imitate the natural process of producing better individuals from a preselected population and improving the characteristics of the individuals' properties so that the final selected individual has the best preferred fitness characteristics after a predefined stopping criteria.

Four major steps thought to differ from the other conventional approaches are; (1) GAs firstly encodes their parameters to be optimized and base their search procedures on the codes, (2) GAs work in parallel on the search points which defines the process of global search principle, (3) GAs only need the information of fitness function (objective function) from the environment to evaluate the individual, (4) both selection and recombination steps are utilized by probabilistic rules that reflects the scope of genetic algorithm's being randomization apart from being deterministic in its nature. (Renders et al, 1992).

The chromosome encoding is one of the processes in GA that has most effect on the solution procedure. A well-defined encoding scheme helps to overcome the possibility of a complex and ill-defined structure of chromosome that leads very poor genetic operations.

Genetic algorithm's power lies behind two major properties. The first one is; the chromosomes with better fitness value carry their genes to the next generation with higher probability to be selected for the mating operations. Second one is diversity which supports the first one and overcome its negative parts. Carrying out the better genes to the next generations sometimes result as not achieving finding the global optimum. Bu the

diversification and the probabilistic side of genetic algorithm recovers it falling inside the local optimum.

Mainly known steps and functions of genetic algorithm is given in Figure 4.1

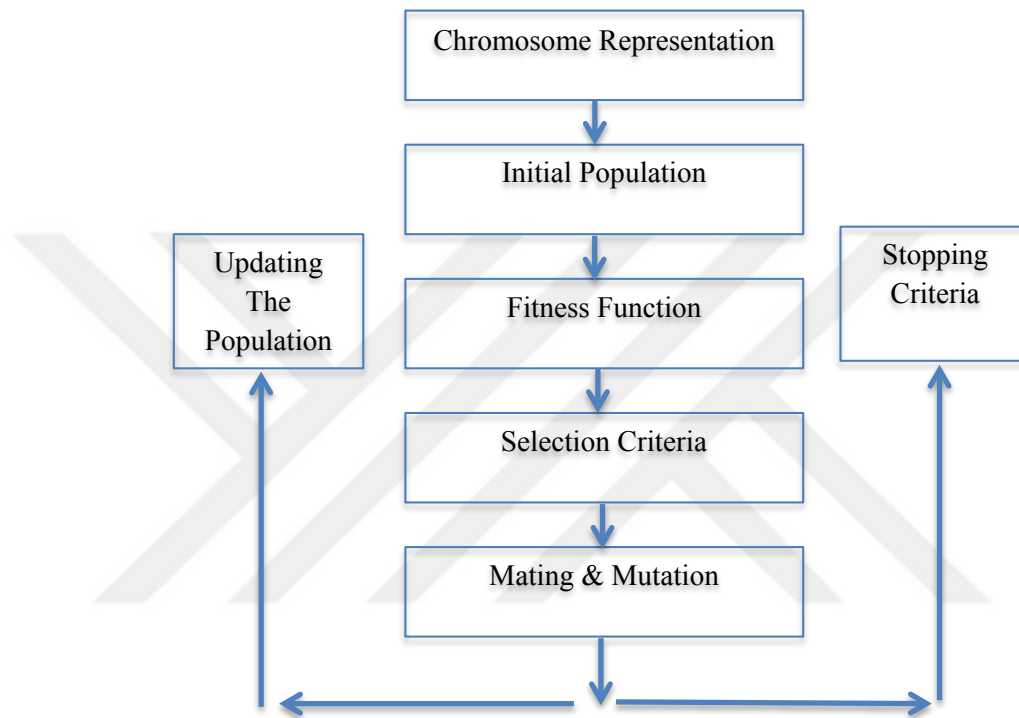


Figure 4.1: Genetic algorithm steps

The process of population production and its random nature is shown in Figure 5.2. The basic concepts of crossover and mutation is also can be seen.

4.1. Chromosome Representation

The way of representing the encoded values of an individual to perform genetic algorithm operations is chromosome representation. Chromosome representation is the key of all processes. If not the key is suitable, the other steps become useless. Thus, there are different encoding types fitting to different types of problems.

The common chromosome encoding types are binary encoding and permutation encoding. While binary encoding is highly suitable for selection problems, decision analysis, location problems, permutation encoding is very effective for the scheduling problems and routing problems.

The representation of chromosome is too much dependent on the problem type. The reason why binary coding and permutation encoding are useful and popular is their applicability to commonly faced daily problems. However, in the world of operations research, each day, a new problem type is evolved and new type of encoding systems are crucial.

4.2. Parent Selection

Parent selection procedure is the process of finding out the parents among the initialized population to create the off-springs which will be transferred to the next generation.

Parent selection process is of high importance regarding its possible effect of decreasing the diversity. One individual of better fitness value may effect and change all other individuals which may cause searching the solution in a limited area.

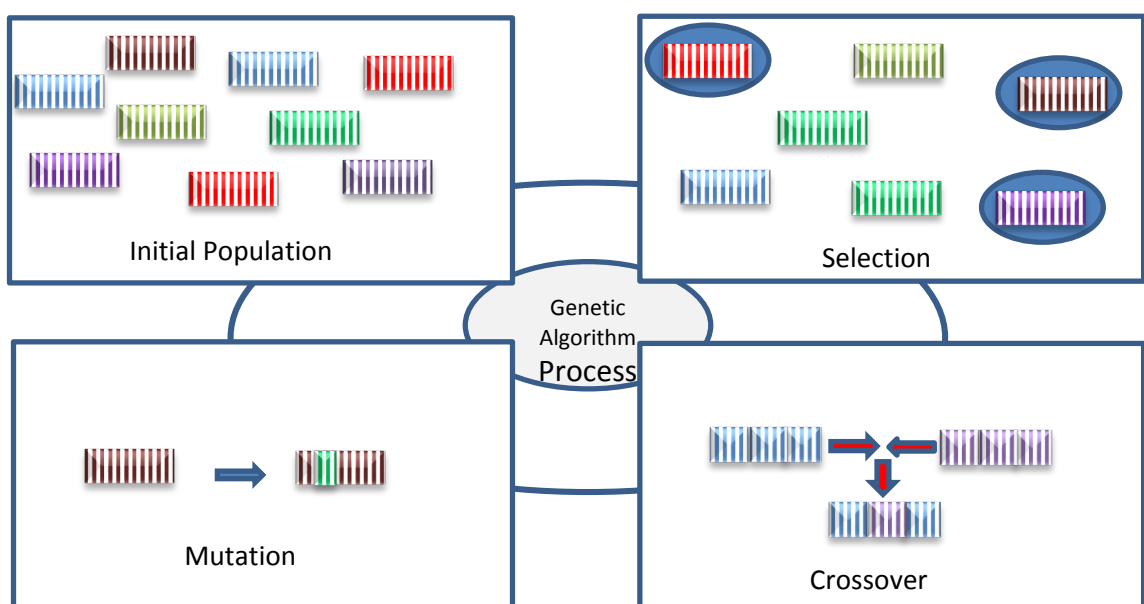


Figure 4.2: Genetic algorithm overview

As it can be seen in Figure 4.2, parent selection is the starting of crossover and mutation operations. Thus, in the literature, there are various research on finding out the best selection and improving new selection models.

Fitness Proportionate Selection is one of the most popular selection methods. Every individual has a probability to become a parent only depending on its fitness proportionate. The individuals which have high fitness proportionate have high chance to become parents. However, the randomized character of choosing the selection range protects the diversity property of genetic algorithm.

Roulette Wheel and Stochastic Universal Sampling are the implementation strategies of fitness proportionate selection.

Tournament selection is highly used method because of its efficiency. The randomized selection of parents maintain diversity and the tournament selection between the randomized selected individuals increase the solution quality.

4.3. Crossover & Mutation

Crossover is the process of creating new individuals from the selected parents. Mutation is the proportionate gene changing of the individual. Crossover operations between the high finessed value individuals increase the quality of the offspring. However, mutation maintains the diversity even randomly creates chance to find better solutions.

Crossover operator highly depends on the problem structure and chromosome representation. The limitations and advantages of the chromosome representation mainly focus on the crossover operator.

First and commonly used crossover operator is single point crossover which is easy to understand, implement and code.

If chromosome encoding is binary, after single point crossover the changes in the genes must be noticed. If the chromosome encoding is permutation encoding, the interchanging of genes between chromosomes can be handled in different ways. Each method can have advantages and disadvantages that should be monitored carefully.

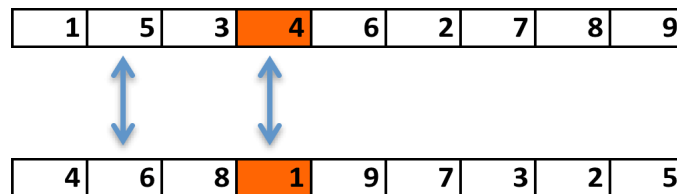


Figure 4.3: Single point crossover

Two points crossover is very similar to the single point crossover. Two points are selected at the chromosomes. And the parts between the genes are interchanged. Again, while putting the other genes from the other parent individual to the main individual, there are different types of interchanging having advantages and disadvantages.

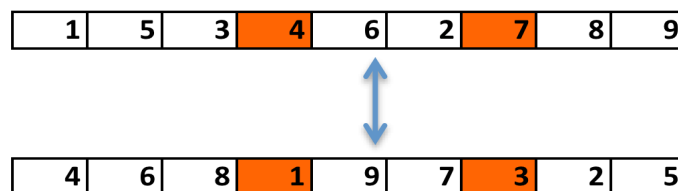


Figure 4.4: Two points crossover

Mutation is interchanging the selected genes of an individual. Mutation doesn't need another partner. It is the change inside the chromosome. Shown in Figure 4.5, the randomly selected points are interchanged.

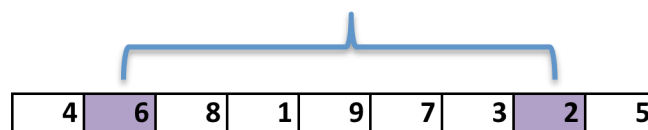


Figure 4.5: Mutation operator

5. MATHEMATICAL MODEL

The real life problem, hot meal delivery aftermath of an earthquake, which stems from the disaster management structure in Turkey, is considered. As a result of the structure, standards and derivations the assumption necessary for the problem are given below:

Assumptions

- 1- Hot meal delivery is performed once per day (single period) considering the daily calorie consumption standard which is 2100 kcal per day (Sphere) for the disaster affected assuming the meal proportion is convenient for calorie needed.
- 2- The demand locations are known prior. The assembly areas for all the citizens according to their resident areas are predetermined by the governmental institutions and can be accessible via the web information system called www.turkiye.gov.tr.
- 3- Considering the past disaster experiences and the operational horizon; while citizens are staying at the assembly areas, construction of “temporary sheltering areas” may last at least 3-10 days. Therefore, for the times 3-10 days, the citizens are to be served hot meals.
- 4- Demands at the assembly areas are known at the time of hot meal delivery due to the start of delivery (3rd day of disaster). Regarding the disaster management structure, the service groups gather all types of data. In addition, it is assumed that in the 3rd day demand, information will be collected and it is deterministic. So in this paper, demands are structured by the scenarios, which are most likely, happen according to the JICA Report (2002).
- 5- There will be volunteers or people ready to serve the hot meals, which are distributed by the delivery trucks. Therefore, no time will be spent to serve the people. Just, unloading time is considered.
- 6- For each delivery truck, only one trip can be assigned.

- 7- Split delivery is allowed in demand locations.
- 8- Each assembly area may be served by multiple facilities, which also means partial assignment.
- 9- There are already hot meal production units known and constructed for hot meal delivery during the response phase, so there are known production places.
- 10- In addition, there are mobile kitchens to be placed to the known edges.
- 11- Mobile hot meal delivery units (mobile kitchens) are to be located at the assembly areas and because mobile kitchens are generally used to serve their located places, these mobile kitchens will serve firstly the people at their locations.
- 12- There is no fixed facility cost of deploying a mobile hot meal delivery unit. So, this cost criteria is not considered.
- 13- Due to the National Response Plan capacity building activities, institutional capacity including the hot meal, delivery units at different capacities are considered increase. Not having the data of hot meal production unit quantities, we established different type of scenarios wholly capable of covering the demand.
- 14- The daily speed of the trucks is considered known and same.
- 15- Transportation network is symmetrical and distance is Manhattan type.
- 16- Every hot meal delivery unit has a known loading capacity.
- 17- Every hot meal delivery unit has delivery rucks near by to be used to serve the affected people around their locations.
- 18- At the constructed hot meal production units, according to their capacities, there are also known capacity delivery trucks.
- 19- Every tour of a truck starts at a hot meal delivery unit and returns back to the same place.
- 20- The tours of the dispatched trucks from a hot meal delivery unit can't access the number of vehicles stationed there.
- 21- A truck could only visit an assembly area if and only if it will serve the people there.

5.1. Formulation

Sets

$G = (W, E)$, an undirected complete graph, where W is the vertex (locations) set indexed by i and j , E the edge (arcs) set denoting the potential routes between locations. The vertex set W (locations) is partitioned into a subset $M = \{1, \dots, q, \dots, m_s\}$ (at scenario s) of depots and a subset $N = \{1, \dots, n\}$ of customers. The subset M is also partitioned into subset $M' = \{1, \dots, q\}$ of mobile depots and $M'' = \{1, \dots, p\}$ static (already present) depots. $M \subset W$, $M' \subset N$, $N \cup M'' = W$, $N \cap M = M'$.

S : set of scenarios in which the demand at locations and the mobile kitchens with available capacities are determined.

D_s = set of people (demand) at assembly areas at scenario s .

F_{mbs} = set of mobile hot meal production units at scenario s .

F_{ps} = set of present (stable) hot meal production units at scenario s .

F_s = set of all hot meal production units at scenario s which is $F_{mbs} \cup F_{ps}$.

V_{fs} = set of homogeneous distribution vehicles belonging to hot meal production unit f at scenario s .

V_s = set of all homogeneous distribution vehicles at scenario s

Parameters

B = the number of elements of M' .

D = the number of elements of M'' .

Dem_{is} = the total number of people to be served at location i at scenario s , $\forall i \in N, s \in S$.

$Resdem_{imbs}$ = The residual number of people to be served at location i after the service of mobile hot meal production unit located at i at scenario s , $\forall i \in N, s \in S$.

Dst_{ij} = the Manhattan distance between the nodes i and j , $dst_{ij} = dst_{ji}$, $\forall i, j \in W$.

T_i = the service time (unloading) of people at location i , $\forall i \in N$.

SP_{vij} = The speed of vehicle v between the nodes i and j .

TT_{ij} = the travel time between the nodes i and j and which is equal to $D_{stij} / SP_{vij} \forall i, j \in W$.

Cap_{vfs} = the capacity of vehicle v belonging to hot meal production unit at scenario s , $\forall v \in V, s \in S$.

Cap_{fms} = the capacity of mobile hot meal production unit f at scenario s , $\forall f \in F, s \in S$.

Cap_{fps} = the capacity of constructed hot meal production unit f at scenario s , $\forall f \in F, s \in S$.

$Rescap_{ifms}$ = the residual capacity of hot meal production unit f located at location i after serving the people at i at scenario s , $i \in N, \forall f \in F, s \in S$.

R_v = the set of nodes including the departing node in the route of vehicle v .

LR_v = the length of route of vehicle v .

TR_v = the total time spent during the route of vehicle v .

Decision Variables

X_{ijvs} = 1, if demand point i immediately precedes point j by vehicle v at scenario s , $\forall i, j \in N, v \in V, s \in S$; 0 otherwise.

H_{ivfs} = 1 if demand point i is visited by the vehicle v at scenario $s \in S$; 0 otherwise.

Y_{ifms} =1 if mobile hot meal production unit f at scenario s is located at point i , $\forall i \in N, f \in F_{mbs}, s \in S$; 0 otherwise.

Z_{fjjs} =1 if demand point j is served by the hot meal production unit at i at scenario s , $\forall i \in M, \forall j \in N, f \in F_{ms} \cup F_{ps}, s \in S$; 0 otherwise.

Sq_{ivfs} = the nonnegative integer number denotes the people at location i served by vehicle v belonging to hot meal production unit f at scenario s .

L_{vjfs} = load of vehicle v departing from the hot meal production unit f located at j at scenario s , $\forall j \in M, \forall v \in V$.

L_{vijfs} = load of vehicle v belonging to hot meal production unit f located at j after (fully or partially) serving the people at location i at scenario s , $\forall j \in M, \forall i \in (N - M') \forall v \in V$.

5.2. Mathematical Model

Objective function focuses on the delivery structure, that during the response phase of the disaster, rapid reaction, and rapid delivery is high importance. The maximum waiting time of the affected people are to be minimized by minimizing the maximum travel time.

$$\min(\max(\text{TR}_1, \text{TR}_2, \text{TR}_3, \dots, \text{TR}_v)) \quad (5.1)$$

Where V is the total number of vehicles and TR is the time spent for the route of vehicle v).

Constraints

Constraint 2 ensures that the overall demand is covered at an assembly area. Because, hot meal delivery units are to serve the demand where they are located, the demands at their locations are out of vehicle demand coverage.

$$\sum_{v=1}^V H_{ivfs} S q_{ivfs} = \text{dem}_{is}, i = 1, \dots, (n - q), \forall f \in F, \forall s \in S \quad (5.2)$$

Constraint 3 depicts that every vehicle has a predefined capacity and cant be accessed by the delivered amount at the visited assembly areas.

$$\sum_{i=1}^N H_{ivfs} S q_{ivfs} \leq Cap_{vfs}, v = 1, \dots, V, \forall f \in F, \forall s \in S \quad (5.3)$$

Constraint 4 ensures that any vehicle located at a hot meal production unit or nearby a mobile hot meal delivery unit should depart from the depot.

$$\sum_{i=1}^M X_{ijvs} = 1, v = 1, \dots, V, \forall j \in (N - M'), \forall s \in S \quad (5.4)$$

Constraint 5 stress the rule that any truck departing from the depot should turn back to the same depot.

$$\sum_{j=1}^{(N-M')} X_{jivs} = 1, v = 1, \dots, V, \forall i \in M, \forall s \in S \quad (5.5)$$

As a result of the split delivery allowance (different from the common- each location can be visited by only one vehicle constraint) constraint 6 shows that one assembly area could be visited more than one truck.

$$\sum_{j=1}^W X_{jivs} \geq 1, \forall i \in (N - M'), \forall s \in S, \forall v \in V \quad (5.6)$$

Because the constructed production units have known locations and need to use trucks for delivery, constraint 7 ensures that the production quantity at a hot meal production unit should be equal to the quantity departed from this unit.

$$\sum_{v=1}^{V_{fs}} L_{vjfs} X_{jivs} = Capf_{psj}, \forall i \in N, \forall s \in S, \forall v \in V, \forall P \subset M \quad (5.7)$$

Hot meal delivery units can serve the people where they are located. The amount produced at a hot meal delivery unit is equal to the amount served at the assembly location of the unit and the amount departed from the location is ensured by the constraint 8.

$$\sum_{j=1}^N L_{vjfs} X_{jivs} + dem_{js} = Capf_{mbsj} Y_{jmbss}, \forall i \in (N - M'), \forall s \in S, \forall v \in V, \quad (5.8)$$

Constraint 9 limits the total located mobile hot meal delivery unit to a known number.

$$\sum_{i=1}^N Y_{ifmbs} = b, \forall i \in N, \forall s \in S, \forall v \in V \quad (5.9)$$

The total spent time by a delivery truck, which the maximum travel time is minimized according to our objective function, is equal to the sum of the time spent at the arcs (roads) after departing from the hot meal production unit and the time spent and the time spent at the assembly areas they visit according to the constraint 10.

$$\begin{aligned}
& \sum_{i=1}^{N-M'} \sum_{j=1}^{N-M'} X_{ijvs} tt_{ij} + \sum_{i=1}^M \sum_{j=1}^{N-M'} X_{ijvs} tt_{ij} + \sum_{j=1}^{N-M'} \sum_{i=1}^M X_{jivs} tt_{ji} \\
& + \sum_{i=1}^{N-M'} t_i H_{ivfs} = TR_v, \quad \forall f \in F, \forall v \in V, \forall s \in S
\end{aligned} \tag{5.10}$$

The number of vehicles used and departed from a production unit is predefined and can't be accessed by constraint 11.

$$\sum_{v=1}^{v_s} V_{fs} = |V_{fs}|, \quad \forall f \in F, \forall s \in S \tag{5.11}$$

Constraint 12 ensures that the load of a truck while departing from a depot is equal to the load delivered at the assembly areas the truck visited. The truck returns to the depot back empty load.

$$\sum_{i=1}^{N-M'} H_{ivfs} S q_{ivfs} = L_{vjfs}, \quad v = 1, \dots, V, \quad j \in M, f \in F, \forall s \in S \tag{5.12}$$

Constraint 13 demonstrates the flow constraint in which a truck has to depart the location it visited. A truck can't stay at an assembly area it visit.

$$\sum_{i \in W} X_{ilv} - \sum_{j \in W} X_{ljev} = 0, \quad \forall l \in N \setminus M, \forall v \in V \tag{5.13}$$

Constraint 14 equals the demand and the total production capacity including the mobile hot meal delivery units and constructed hot meal production units.

$$\sum_{i=1}^M Cap_{fpsi} + Cap_{fmbpsi} = \sum_{j=1}^N dem_{js} \quad (5.14)$$

Constraints 15, 16, and 17 underline the rule that there is no allowance a tour visit between the hot meal production units even if it is mobile or stable one.

$$\sum_{i=1}^{M'} \sum_{j=1}^{M''} X_{ijvs} = X_{jivs} = 0, \forall i \in \forall s \in S, \forall v \in V \quad (5.15)$$

$$\sum_{i=1}^{M''} \sum_{j=1}^{M'} X_{ijvs} = X_{jivs} = 0, \forall s \in S, \forall v \in V \quad (5.16)$$

$$\sum_{i=1}^{M'} \sum_{j=1}^{M'} X_{ijvs} = X_{jivs} = 0, \forall s \in S, \forall v \in V \quad (5.17)$$

5.3 Solution Approach

The NP-Hardness of the problem drive us to investigate on the heuristic solution process. Due its structural properties itself, we propose a two phase algorithm where for the demand allocation phase, boundary based clustering used with merging criteria which is defined in lieu of the problem properties. Then, VRP for each cluster assigned hot meal production unit is improved via genetic algorithm.

Clustering process involves the predefined and calculated cluster size in regard of the capacity of the hot meal delivery units. The different size production units and the objective function formulation that takes into consideration both the time travelled between the locations and the time spent while serving the people at assembly areas. However, the serving structure only bases on unloading at the location and leaving immediately.

The boundary scheme is important in regard of covering the whole area, starting from a seed point and continues its cluster development without any break under the constraints of intersection on the boundary points. It depicts the clustering principle.

One of the important phases of the algorithm is merging the clusters in different size. We consider the parameters of weighted centroid of the clusters and the intensity of the assembly areas in each cluster due to the rule of spending time at serving times. In one size, three scattered assembly areas might be preferable than the intense locations with 45 assembly areas with considerably less demand and less distance from each other.

The location routing problem is sensitive to the location decisions, because it affects the routing structure. By applying the merging criteria, considering the objective function we consider the information exchange between the location phase and the routing phase.

The solution phase follows the steps given below:

1. Defining the minimum sized unit cluster properties considering the capacities of hot meal production units.
2. Clustering the demand locations via boundary based clustering considering the demand at locations.
3. Merging the clusters by defining the merging fitness function, assigning the merged clusters to hot meal production units and using GA to optimize.
4. Routing after assigning the clusters to hot meal production units.

The model for merging the clusters for matching to the hot meal production units is given below:

CG_s = the set of cluster groups which match the demand of locations with hot meal production unit capacities in scenario s .

$Node_{is}$ = the number of demand locations to be served at cluster i at scenario s .

X_{ijs} = 1, if cluster i belongs to the cluster group j at scenario s ; 0 otherwise.

$Size_{clust}$ = the size of unit cluster which has the smallest size regarding the demand 5,000 in our problem.

BG_s = the set of clusters having the predefined size which is 5,000 in our problem.

$Cluster_{group_j}$ = the cluster group of different predefined size according to different scenarios.

$Group_{num_j}$ = the number of clusters of size 5,000 inside the cluster group j .

$Clust_i$ = the index of clusters after the process of designing clusters of demand of 5,000.

$Centroid_j$ = the location information of cluster group j including the X Y coordinates.

$Dist_{cluster_{ij}}$ = the distance between the centroid of cluster i and the centroid of cluster group j .

$Dist_{f_{mbsj}}$ = the distance between the present hot meal production unit f at scenario s and the centroid of cluster group j .

$Cap_{f_{mbs}}$ = the capacity of mobile hot meal production unit f at scenario s .

$Cap_{f_{ps}}$ = the capacity of present hot meal production unit f at scenario s .

$Speed$ = the average speed of all vehicles.

ST = service time, unloading time at every location.

$$\begin{aligned} \text{Min} \left(\max \left(\left(\sum_{i=1}^{BG} (Node_{is} * X_{ij}) / Group_{num_j} \right) * ST + \left(\sum_{i=1}^{BG} \frac{Dist_{cluster_{ij}}}{Speed} \right) \right. \right. \\ \left. \left. + \sum_{i=1}^{BG} Dist_{f_{mbsj}} / Speed \right) \right), \forall j \in CG_s \end{aligned} \quad (5.18)$$

s. t.

$$Size_{clust} * Group_{num_j} = Cap_{f_{mbsj}} \quad (5.19)$$

$$\text{Sizeclust} * \text{Groupnum}_j = \text{Cap}_{\text{fpsj}} \quad (5.20)$$

$$X_{ij} \in \{0,1\}$$

Objective function minimizes the maximum of the sum of each groups average locations and service times, time function of average distance of clusters' centroids to cluster group centroid and time function of the distance between present hot meal production units and allocated cluster group centroids. Constraint 1 ensures the capacity constraints of present hot meal production units, which are assigned to the cluster groups in scenarios. Constraint 2 ensures the capacity constraints of mobile hot meal production units, which are assigned to the cluster groups in scenarios. Final constraint shows the binary variables.

The solution of aforementioned model ensures the interchange of information between the location allocation problem and the routing problem in our predefined model. Finding the capacity constrained clusters, in which the split assignment also covers the split delivery case, and their assignments to the hot meal delivery, transforms the MDSDL RP to the SDVRP, which is less complex to solve.

Genetic algorithm covers the steps of (1) defining a well prepared chromosome representation shown in Figure 5.1, (2) establishing a randomized properties initial population, (3) selection of parents for mating with the tournament selection which is called to be the most effective strategy for mating selection in the literature, (3) 1 point crossover operations, (4) 1 point mutation operations by using a randomized mutation point, (5) updating the population by selecting the new children and using the elitism strategy not to lose the best individuals in the next generation.

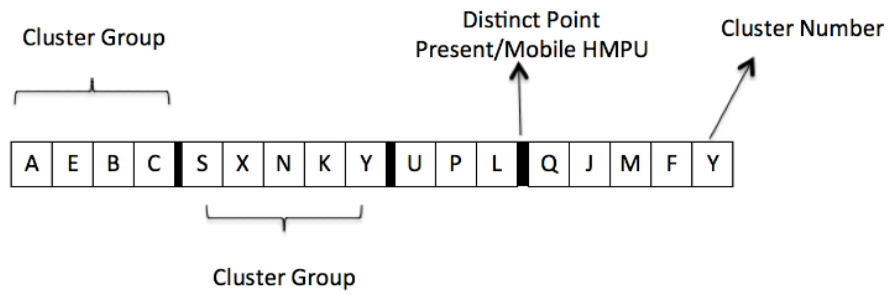


Figure 5.1: Clustering/allocation chromosome scheme

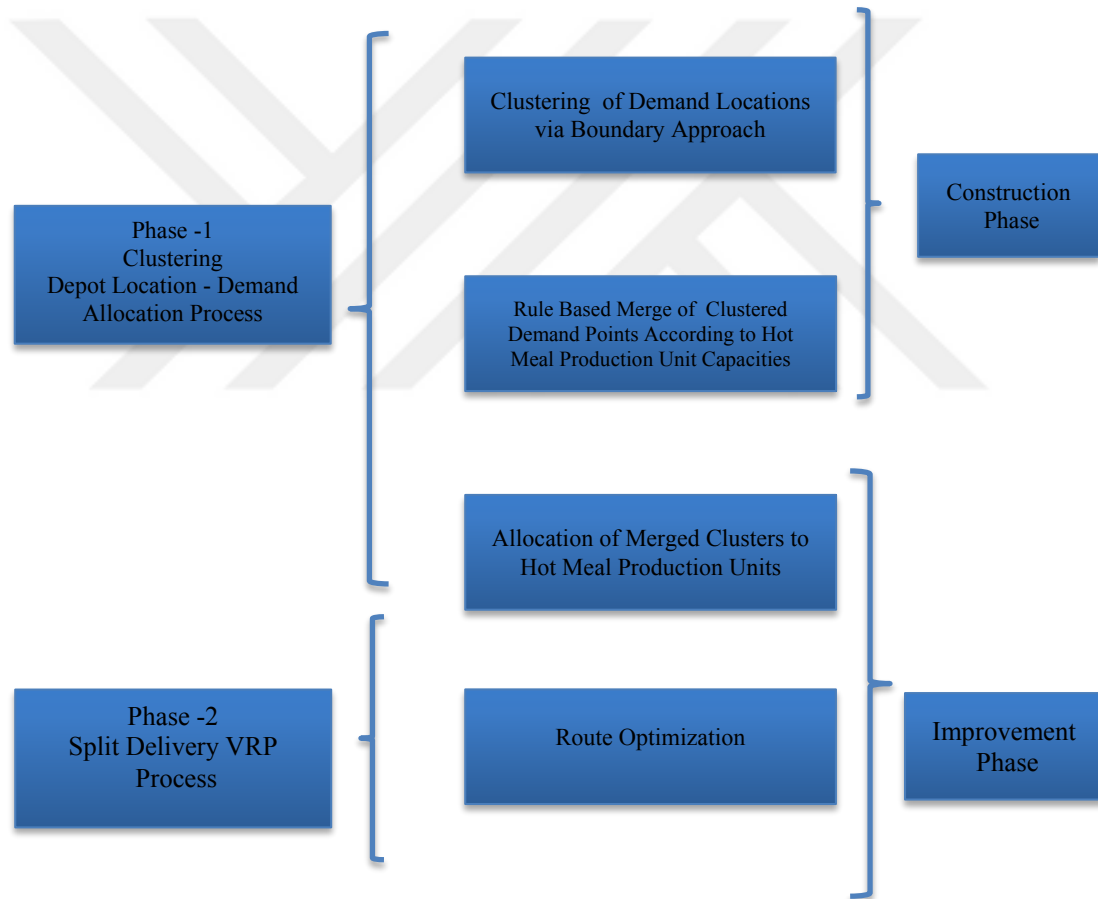


Figure 5.2: Boundary based clustering and genetic algorithm

Figure 5.2 shows the flow chart of the proposed algorithm. The intersection between two common phases also covered during the genetic algorithm phase. It improves the quality of routing structure when the problem downsized to a one depot Split Delivery Vehicle

Routing Problem (SDVRP) for all hot meal units each. Above this, the split delivery is mostly covered in the first phase by allowing the clusters split assignment.

After merging, the assignment of the assembly areas to the hot meal production units can be called split assignment.

Both on the GA stage, the clusters may also intersect and share the information then efficient route and assignments can be obtained.



6. CASE STUDY

6.1 Data Collection

An earthquake prone city, Istanbul, is taking attention on very different type of model applications. We applied the proposed model and solution process for the European side of Istanbul.

Scattered in the place of eastern parts and very densely populated in the middle and south east parts, European side of Istanbul has 1,789 assembly areas to be used by the affected people aftermath of an earthquake. Mostly the parks, sports areas, school gardens, green places are stated as the assembly areas.



Figure 6.1: Assembly areas for disaster in the European side of Istanbul

To be used and to serve the disaster affected people during a disaster, firstly at Halkalı region in the year of 2016, the logistics center, moved to Alibeyköy at 2014 by Istanbul Metropolitan Municipality. It is capable of serving around 230,000 people per day during a disaster, which is an important capacity. Both in Sarıyer, Sultangazi there are stable hot meal production units which are around 15,000 or 20,000 that can be considered for our problem.



Figure 6.2: Constructed hot meal production units in the European side of Istanbul

However, considering the proximity of the affected people number aftermath of an earthquake, also taking into account they are all in the disaster region, the mobile hot meal delivery units are of high importance and a very important part of capacity building efforts both in private sector and public sector. Pioneered by Turkish Red Crescent (being the main implementing actor of Food Delivery and Nutrition Services according to The Turkish National Response Plan), municipalities, NGOs, and private sector procuring

mobile hot meal delivery units, which is an important action for hot meal delivery problem.

In our scenarios, we consider 2 types of affects in which the population is affected at %10 and % 15 levels. While the level of disaster impact increase, the number of affected people also increases. The more number of people need service, the more number of hot meal delivery units considered in the problem.

Table 6.1: Istanbul European Side 2018 Population Data
(Turkish Statistical Institute, 2018)

District	Population
Arnavutköy	270,549
Avcılar	435,625
Bağcılar	734,369
Bahçelievler	594,053
Bakırköy	222,667
Başakşehir	427,835
Bayrampaşa	271,073
Beşiktaş	181,074
Beylikdüzü	331,525
Beyoğlu	230,526
Büyükkçekmece	247,736
Çatalca	72,966
Esenler	444,561
Esenyurt	891,120
Eyüpsultan	383,909
Fatih	436,539
Gaziosmanpaşa	487,046
Güngören	289,331
Kağıthane	437,026
Küçükçekmece	770,316
Sarıyer	342,503
Silivri	187,621
Şişli	274,289
Sultangazi	523,765
Zeytinburnu	284,935

Table 6.2: Hot meal production unit numbers and their capacities scenarios

Scenarios						
HMPU1	HMPU2	HMPU3	HMPU4	MHMPU1	MHMPU2	MHMPU3
230,000	20,000	15,000	10,000	20,000	15,000	10,000
1	2	1	1	30	4	2
1	2	1	1	20	14	7
1	2	1	1	15	20	8
1	2	1	1	40	15	14
1	2	1	1	30	27	16
1	2	1	1	20	33	27

Table 6.2 shows the data for different types of scenarios. First group of hot meal production units are the present ones the number and the locations of which can't be changed. Second group of hot meal production units are mobile hot meal production units the number of which can be calculated considering the population data. Every hot meal production unit's capacity information is shown in the second row of the table. First three rows show the hot meal production unit numbers for the case of % 10 of population is affected. Last three rows show the hot meal production unit numbers for the case of % 15 of population is affected. Each unit has its capacity on the below of itself.

6.2. Computational Results

For the assembly areas on the European side of Istanbul in the first step, the boundary scheme is implemented to start with a seed, which is called a search point and the continuous clustering on the boundary line. This avoids the points' falling very far from the given group.

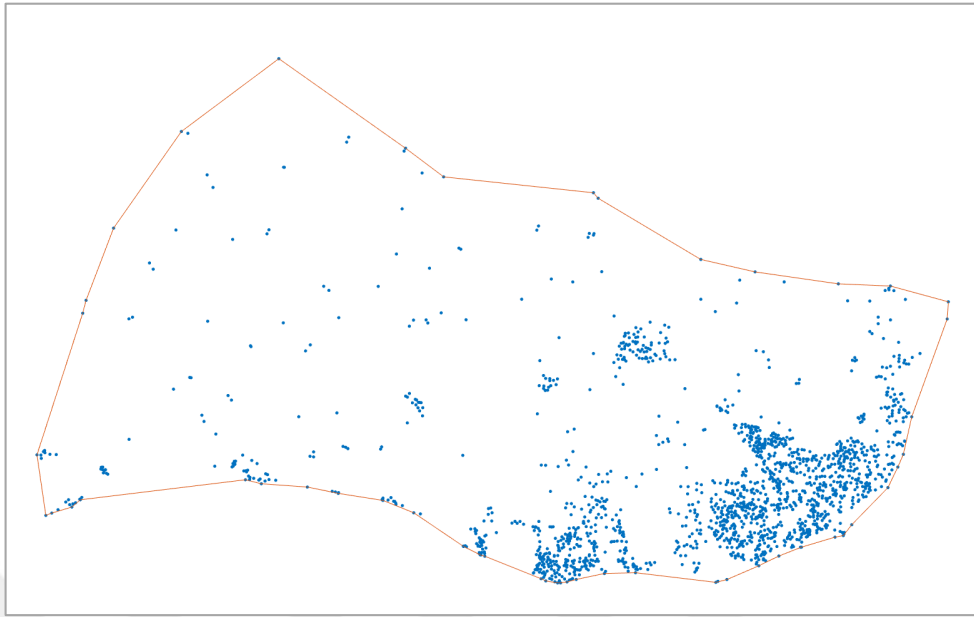


Figure 6.3: Initial boundary for clustering

After the first boundary, the iterative boundaries are established for better understanding of the applied concept (Figure 6.3). It also converges in the most populated areas, which is preferred for better results. However, on the next steps, the distance parameter is not only the one to consider. The intensity of the demand locations will affect our objective function fitness.

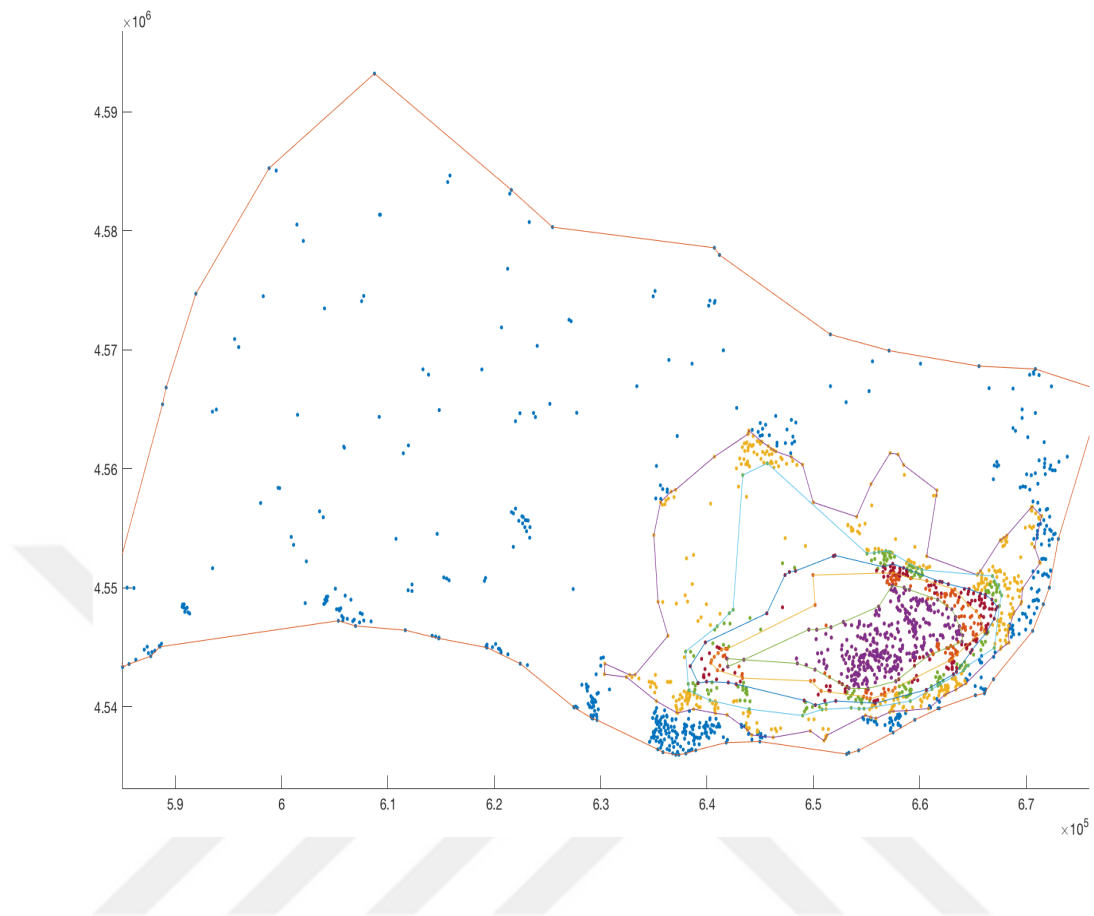


Figure 6.4: Iterative boundaries

In the next step the algorithm shows the clustering scheme after finding 138 clusters for the 1st scenario of demand quantities 5,000. It can be seen that (Figure 6.4), some districts are so crowded that three demand locations might form a cluster of 5,000 demands. On the other hand, rarely populated parts in the eastern parts may form a cluster more points in one.

It can be assumed that the highly populated districts are very close to each other, so, problem may converge if we avoid the objective function. That drives us to the additional parameter of clustering scheme, which might have more effect on the objective function in this situation.

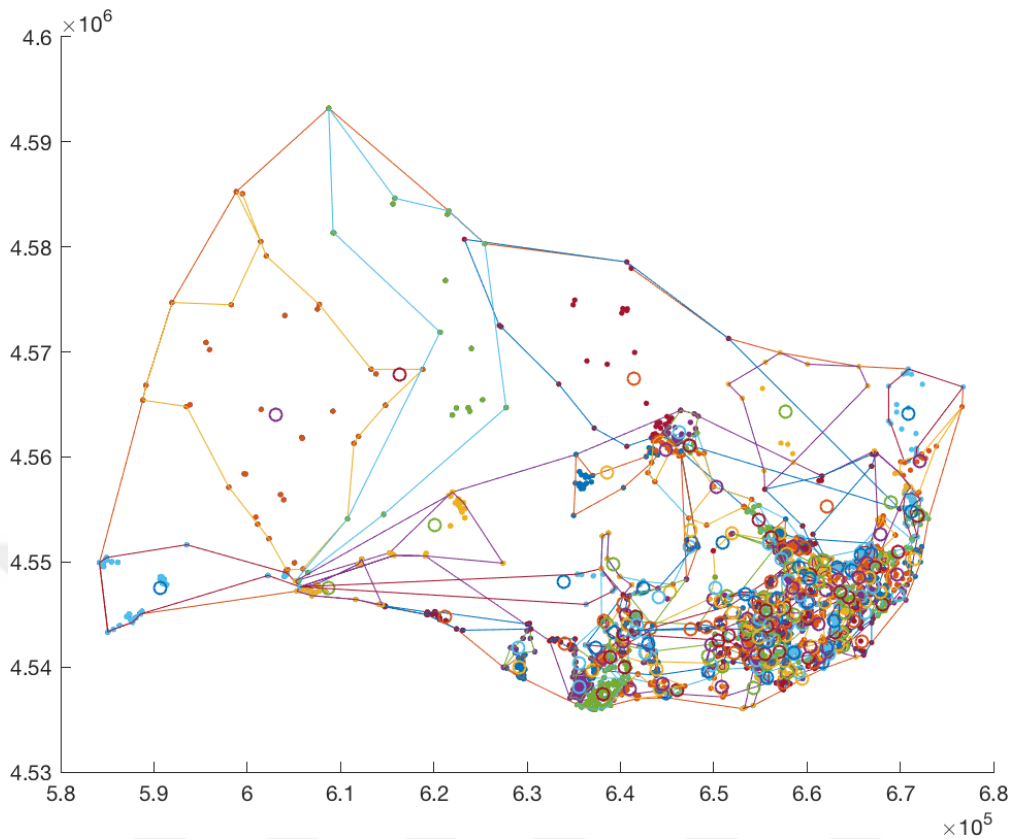


Figure 6.5: 1st step clusters for scenario 1

Starting from the first seed, boundary and clustering, for the scenario 1 where the affected population is % 10, the number of clusters after boundary based clustering is 196 including the last points the total amount of which is less than 5,000 (Figure 6.5). Each cluster reflect the population density of the area. Eastern parts are highly dense, but the western parts are rare and far away from each.

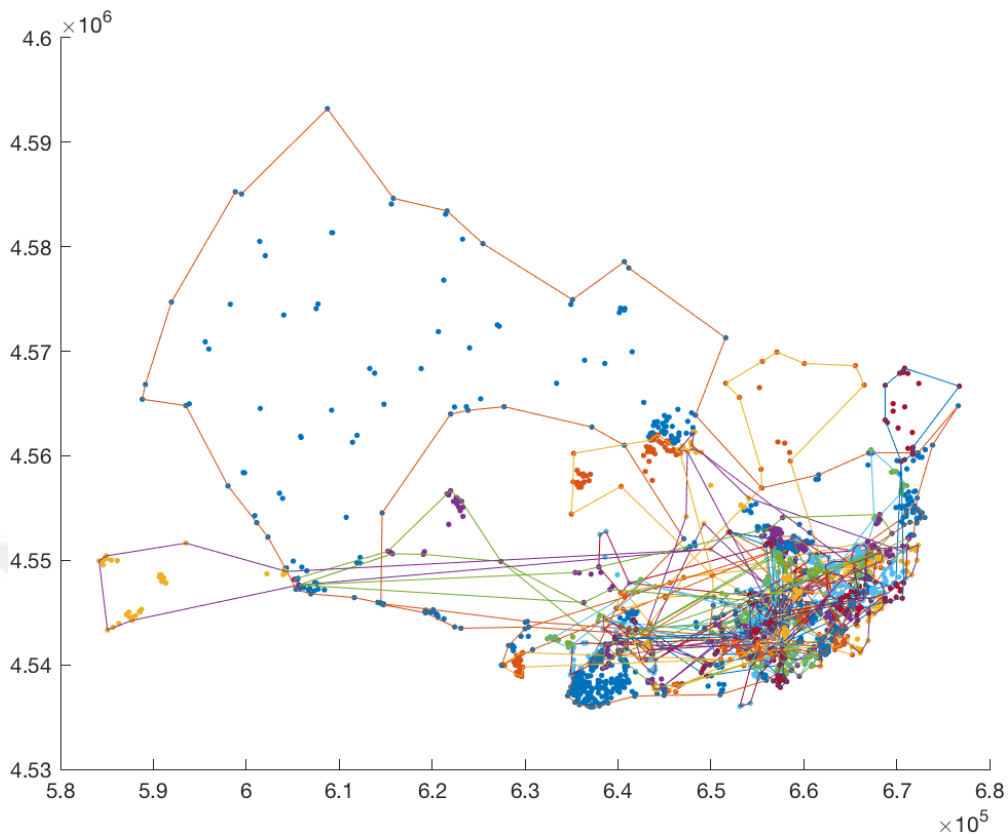


Figure 6.6: Clusters after merging for scenario 1.a

Once the clustering step is finished, the genetic algorithm process starts with the given fitness function. After genetic algorithm process, we can see the greater merged clusters each of which is compatible with the scenario given in Table 3.3. In the first scenario with % 10 of population is affected, 196 cluster of 5,000 formed. Then after the GA optimization process, 42 merged and greater clusters formed (Figure 6.5). Among this 42 merged clusters, each of one merged cluster signs one of the stable or mobile hot meal production units. For this 1.a scenario, 1 merged cluster is for 230,000 capacity stable HMPU, 2 clusters are for 20.000 capacity stable HMPU, 1 cluster is for 15,000 capacity HMPU, and 1 cluster is for 10,000 capacity HMPU. Among these 42 clusters; 30 clusters are for 20,000 capacity per each, 4 clusters are 15,000 capacity per each, and 2 clusters are 10,000 capacity per each. For scenario 1.a genetic algorithm process, the maximum average tour length is 117 minutes with 10 minutes service time and 58.5 minutes with 5 minutes service time.

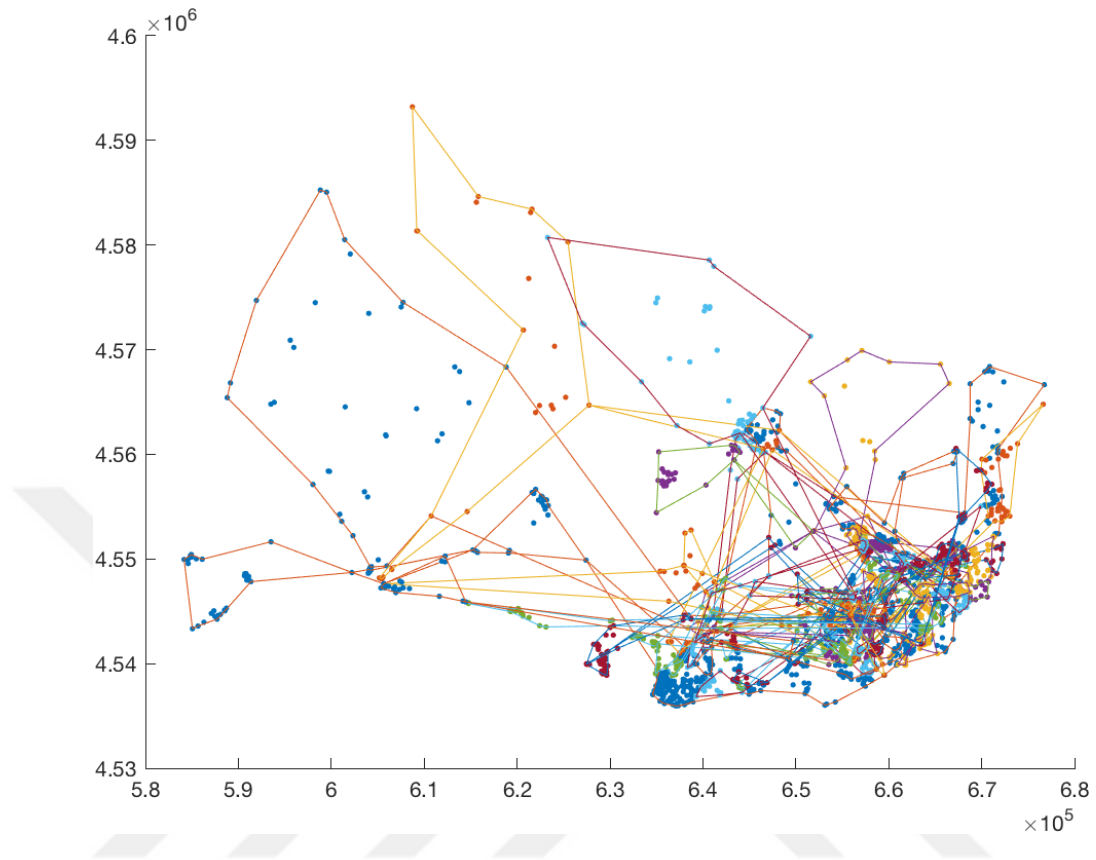


Figure 6.7: Clusters after merging for scenario 1.b

After genetic algorithm process for scenario 1.b, 47 merged and greater clusters formed. Among this 47 merged clusters, each of one merged cluster signs one of the stable or mobile hot meal production units (Figure 6.7). For this 1.b scenario, 1 merged cluster is for 230,000 capacity stable HMPU, 2 clusters are for 20,000 capacity stable HMPU, 1 cluster is for 15,000 capacity HMPU, and 1 cluster is for 10,000 capacity HMPU. Among these 47 clusters; 20 clusters are for 20,000 capacity per each, 14 clusters are 15,000 capacity per each, and 7 clusters are 10,000 capacity per each. For scenario 1.a genetic algorithm process, the maximum average tour length is 132 minutes with 10 minutes service time and 66 minutes with 5 minutes service time.

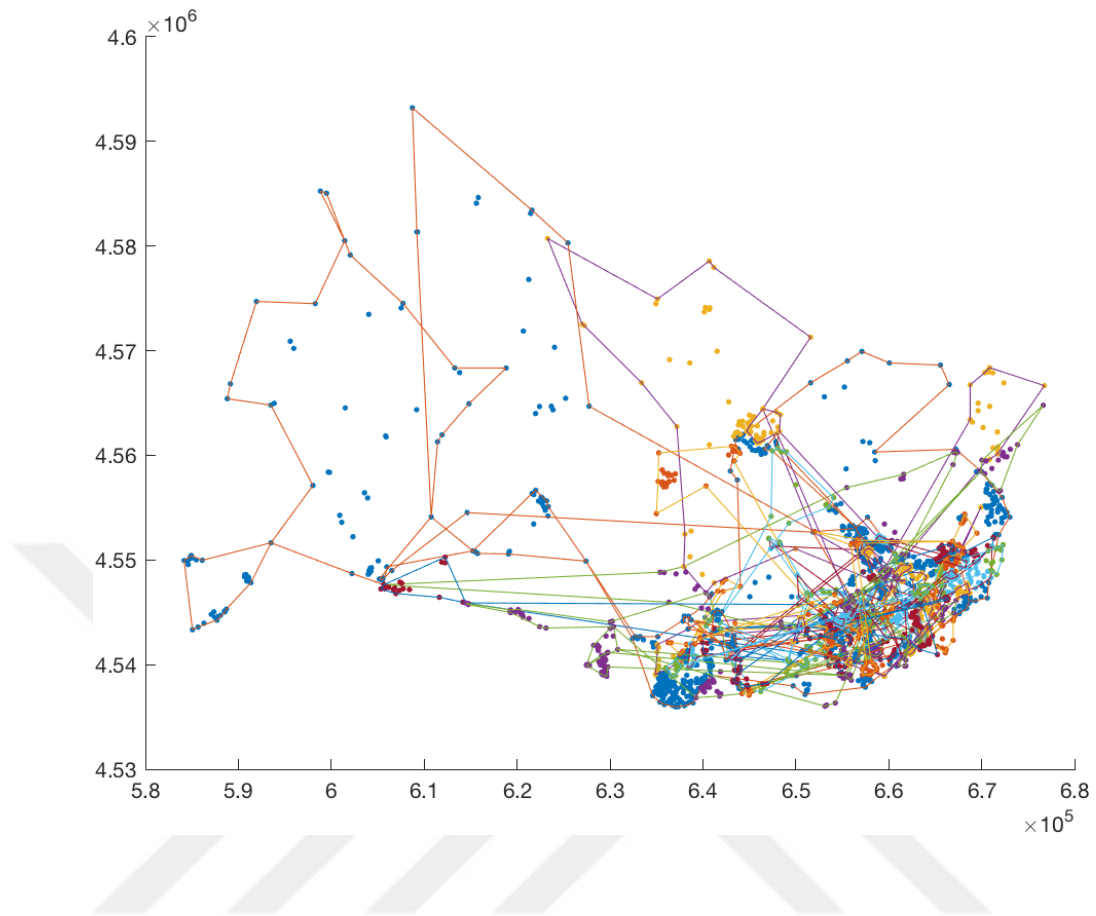


Figure 6.8: Clusters after merging for scenario 1.c

After genetic algorithm process for scenario 1.c, 39 merged and greater clusters formed. Among this 39 merged clusters, each of one merged cluster signs one of the stable or mobile hot meal production units (Figure 6.8). For this 1.c scenario, 1 merged cluster is for 230,000 capacity stable HMPU, 2 clusters are for 20,000 capacity stable HMPU, 1 cluster is for 15,000 capacity HMPU, and 1 cluster is for 10,000 capacity HMPU. Among these 39 clusters; 15 clusters are for 20,000 capacity per each, 20 clusters are 15,000 capacity per each, and 8 clusters are 10,000 capacity per each. For scenario 1.c genetic algorithm process, the maximum average tour length is 132 minutes with 10 minutes service time and 66 minutes with 5 minutes service time.

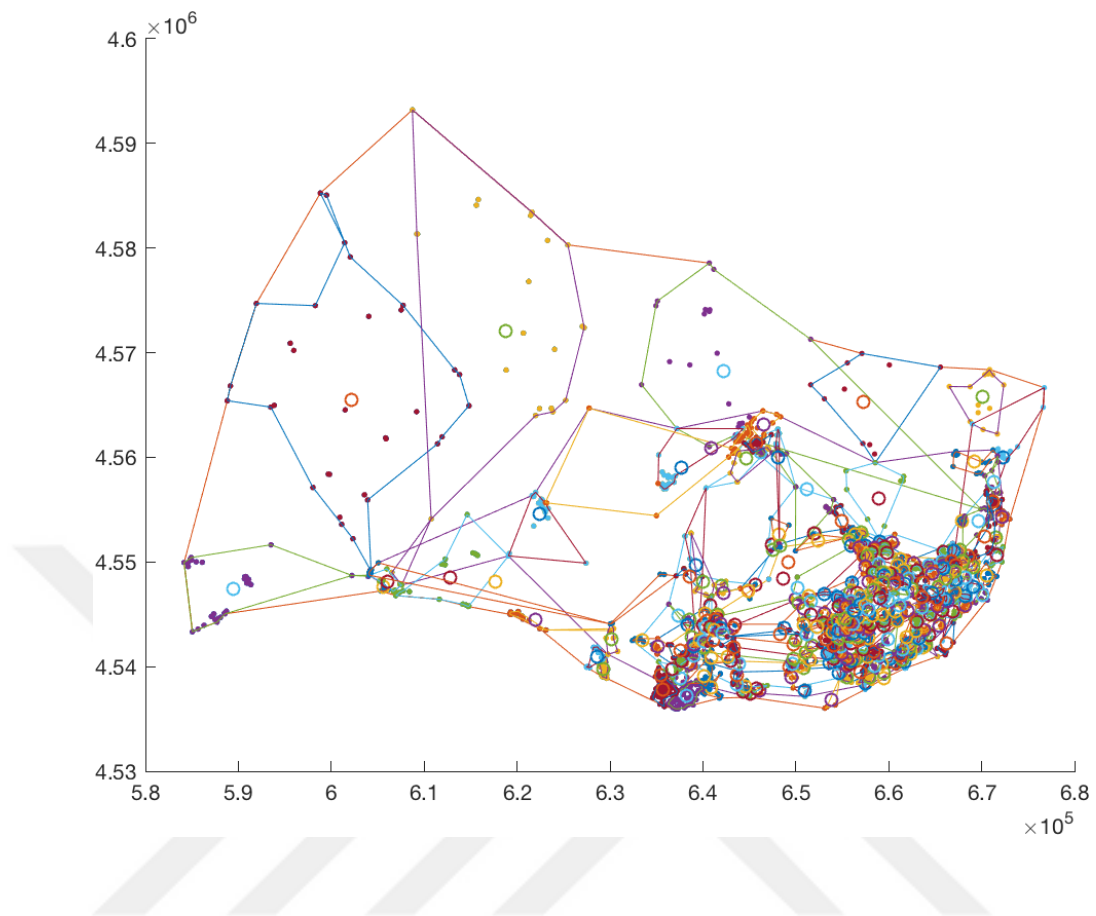


Figure 6.9: 1st step clusters for scenario 2

Starting from the first seed, boundary and clustering, for the scenario 2 where the affected population is % 15, the number of clusters after boundary based clustering is 293 including the last points the total amount of which is less than 5,000 (Figure 6.9). Each cluster reflect the population density of the area. Eastern parts are highly dense, but the western parts are rare and far away from each.

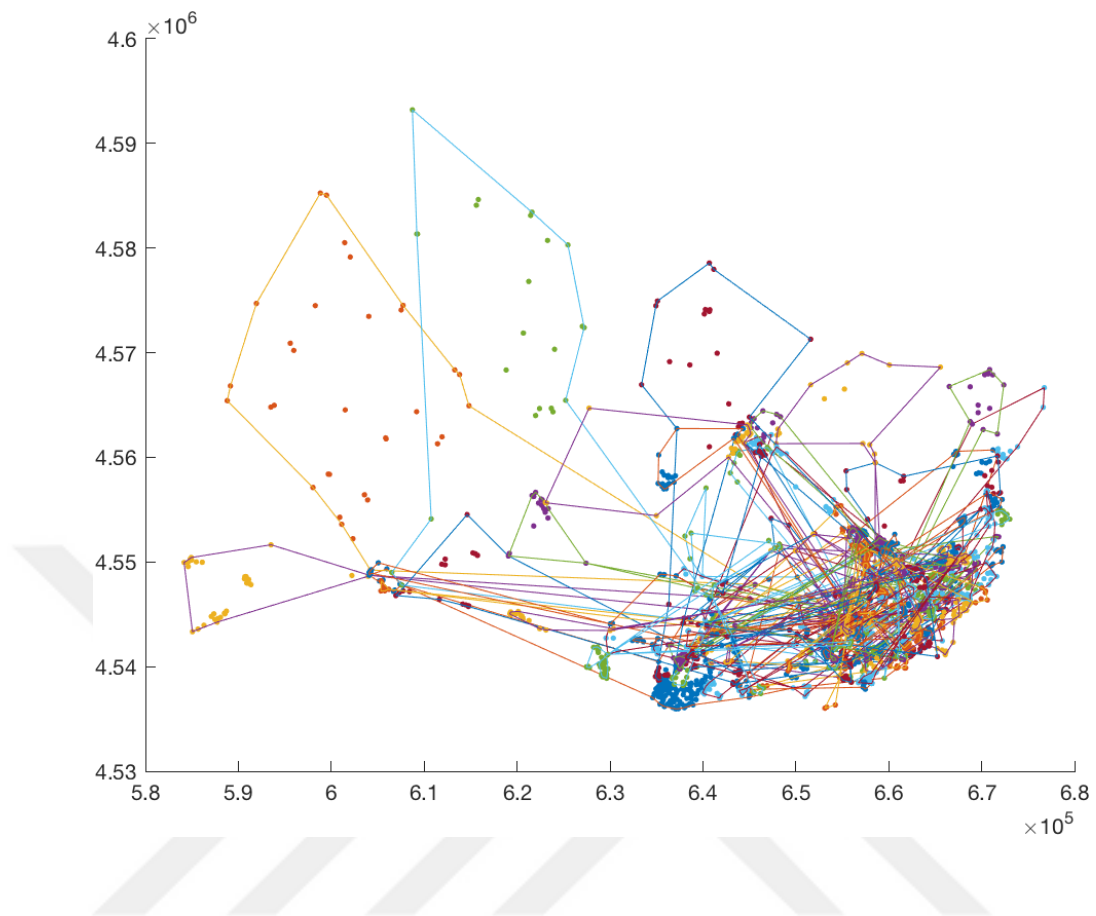


Figure 6.10: Clusters after merging for scenario 2.a

After genetic algorithm process for scenario 2.a, 75 merged and greater clusters formed. Among this 75 merged clusters, each of one merged cluster signs one of the stable or mobile hot meal production units (Figure 6.10). For this 2.a scenario, 1 merged cluster is for 230,000 capacity stable HMPU, 2 clusters are for 20,000 capacity stable HMPU, 1 cluster is for 15,000 capacity HMPU, and 1 cluster is for 10,000 capacity HMPU. Among these 75 clusters; 40 clusters are for 20,000 capacity per each, 15 clusters are 15,000 capacity per each, and 14 clusters are 10,000 capacity per each. For scenario 2.a genetic algorithm process, the maximum average tour length is 123 minutes with 10 minutes service time and 61.5 minutes with 5 minutes service time.

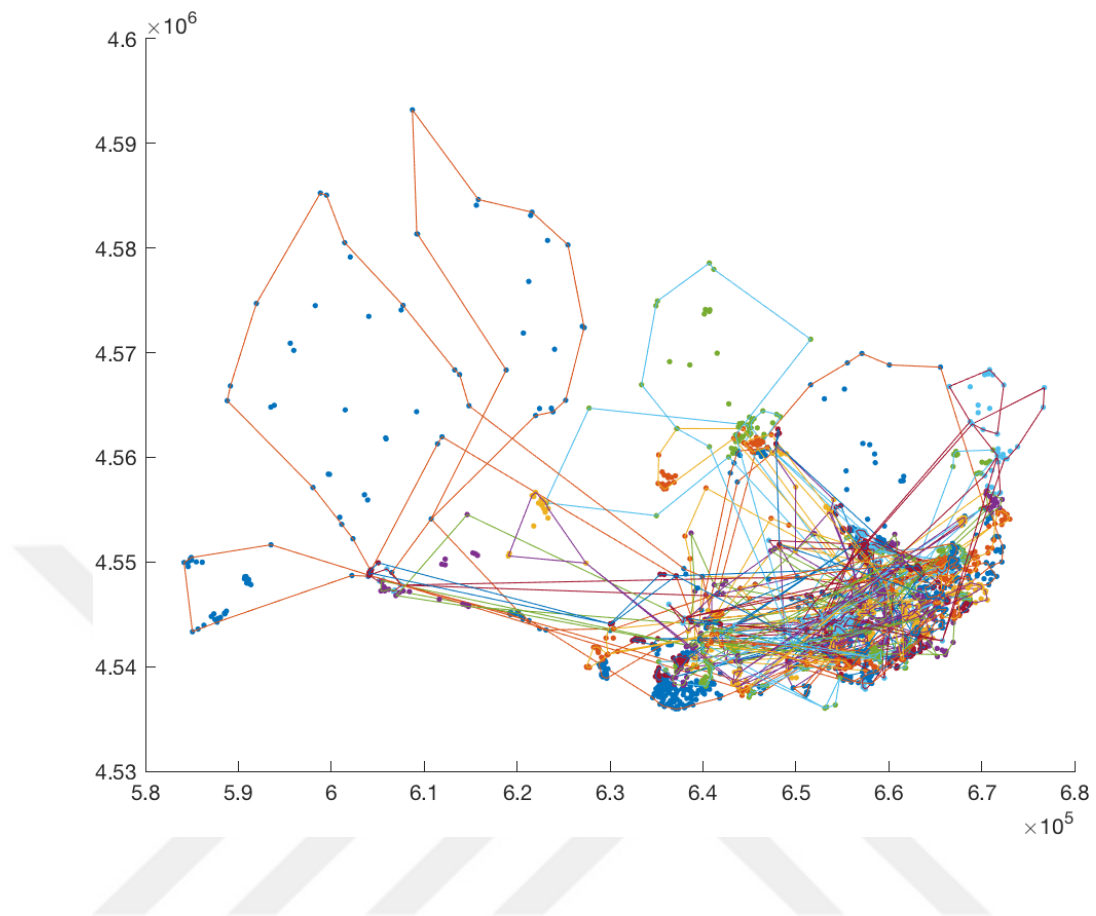


Figure 6.11: Clusters after merging for scenario 2.b

After genetic algorithm process for scenario 2.b, 79 merged and greater clusters formed. Among this 79 merged clusters, each of one merged cluster signs one of the stable or mobile hot meal production units (Figure 6.11). For this 1.c scenario, 1 merged cluster is for 230,000 capacity stable HMPU, 2 clusters are for 20,000 capacity stable HMPU, 1 cluster is for 15,000 capacity HMPU, and 1 cluster is for 10,000 capacity HMPU. Among these 79 clusters; 30 clusters are for 20,000 capacity per each, 27 clusters are 15,000 capacity per each, and 16 clusters are 10,000 capacity per each. For scenario 1.c genetic algorithm process, the maximum average tour length is 120 minutes with 10 minutes service time and 60 minutes with 5 minutes service time.

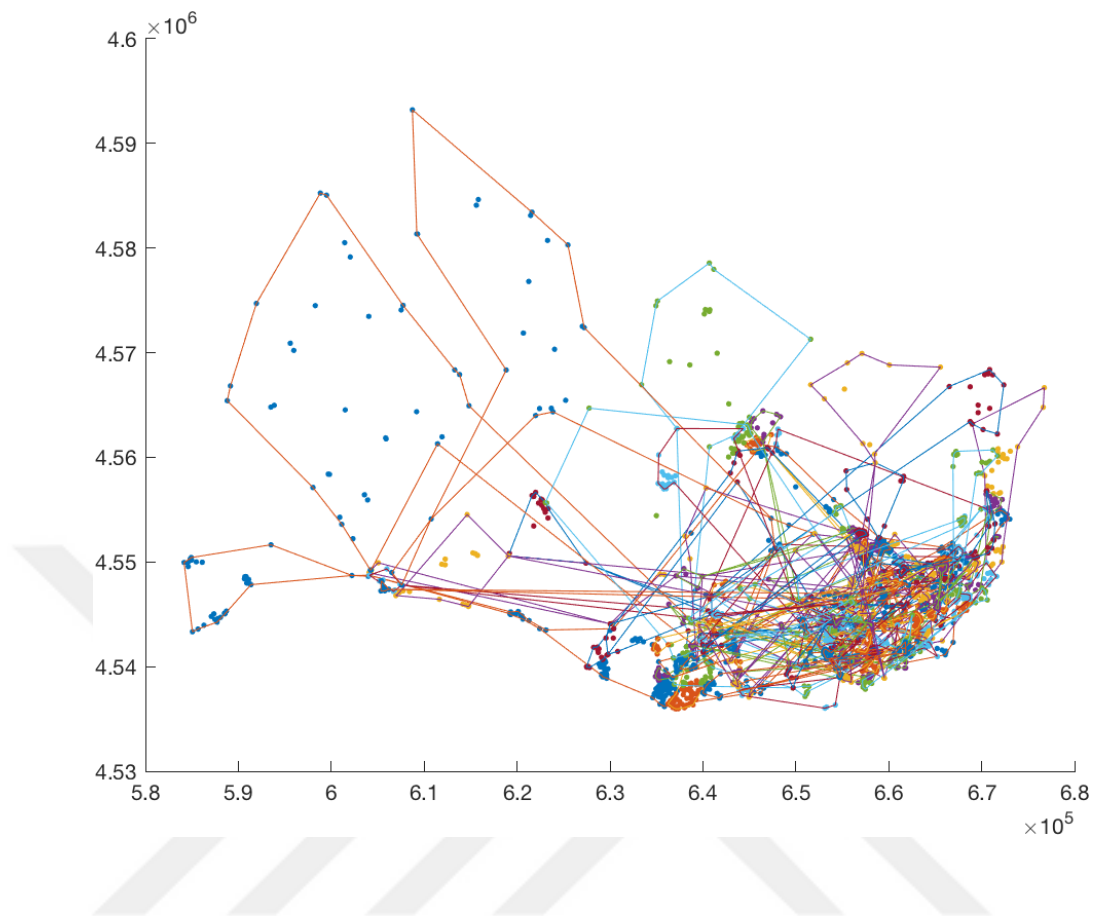


Figure 6.12: Clusters after merging for scenario 2.c

After genetic algorithm process for scenario 2.c, 86 merged and greater clusters formed. Among this 86 merged clusters, each of one merged cluster signs one of the stable or mobile hot meal production units (Figure 6.12). For this 1.c scenario, 1 merged cluster is for 230,000 capacity stable HMPU, 2 clusters are for 20,000 capacity stable HMPU, 1 cluster is for 15,000 capacity HMPU, and 1 cluster is for 10,000 capacity HMPU.. Among these 86 clusters; 20 clusters are for 20,000 capacity per each, 33 clusters are 15,000 capacity per each, and 27 clusters are 10,000 capacity per each. For scenario 2.c genetic algorithm process, the maximum average tour length is 119 minutes with 10 minutes service time and 59.5 minutes with 5 minutes service time.

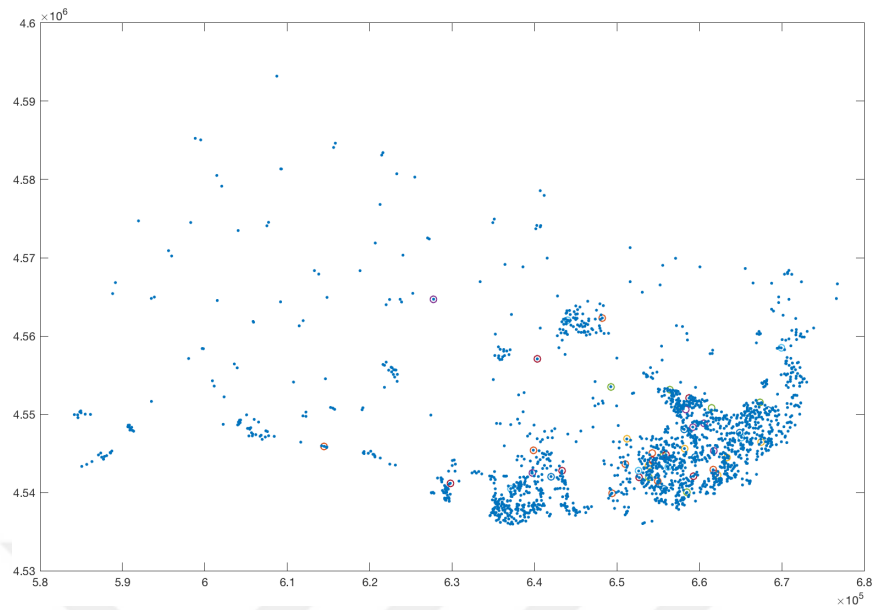


Figure 6.13: Selected locations of HMPU in scenario 1.c

For scenario 1.c and 2.c, the known locations of stable hot meal production units and selected mobile hot meal production units locations are given in Figure 6.13 and 6.14.

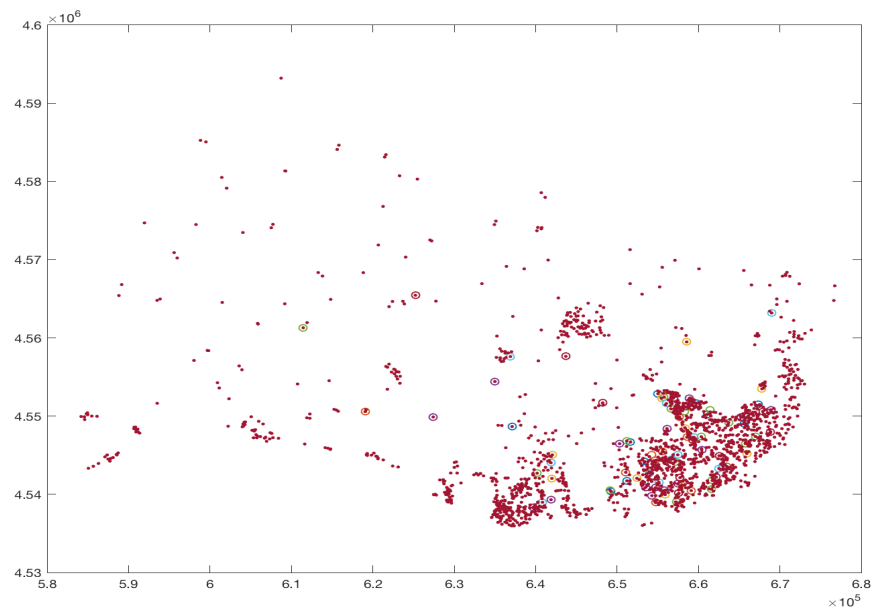


Figure 6.14: Selected locations of HMPU in scenario 2.c

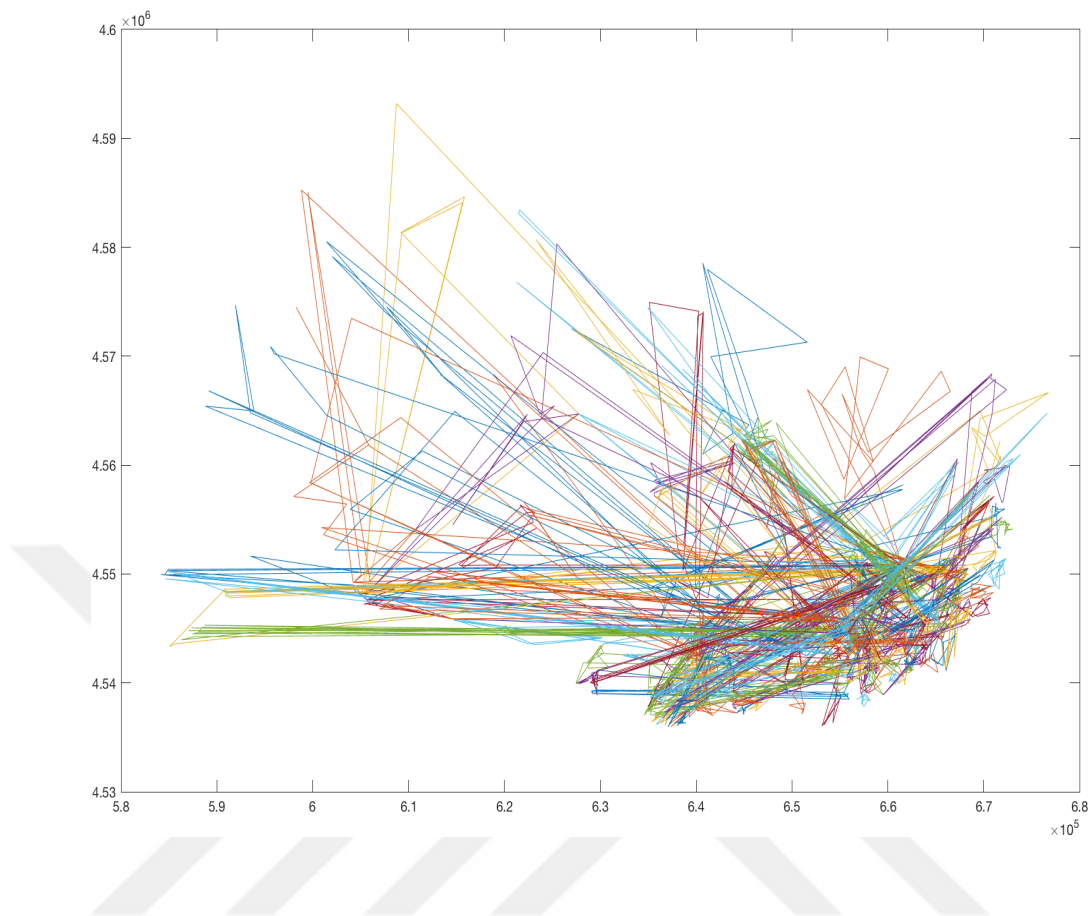


Figure 6.15: Routing results for scenario 1.c

Great size merged clusters are formed to map the HMPUs. For the merged clusters, every sub cluster represents a route for trucks to serve the people at the assembly areas. After the 1st period results the clusters inside the merged ones are re-clustered. This process is necessary not to be dependent to the sub cluster size after merging. Each sub-cluster size is 5,000. Each cluster is assumed to be served by a 5,000 capacity service truck. Scenario 1.c includes 196 routes in which there are also split deliveries. After optimizing each route, maximum route length of scenario 1.c is 242.75 minutes and the average route length is 96.60 minutes the minimum tour length is 5 minutes due to the demand quantity and the service time. Due to its demand type, some routes include only 1-2 route nodes. Figure 6.15 shows the routes in different colors for each.

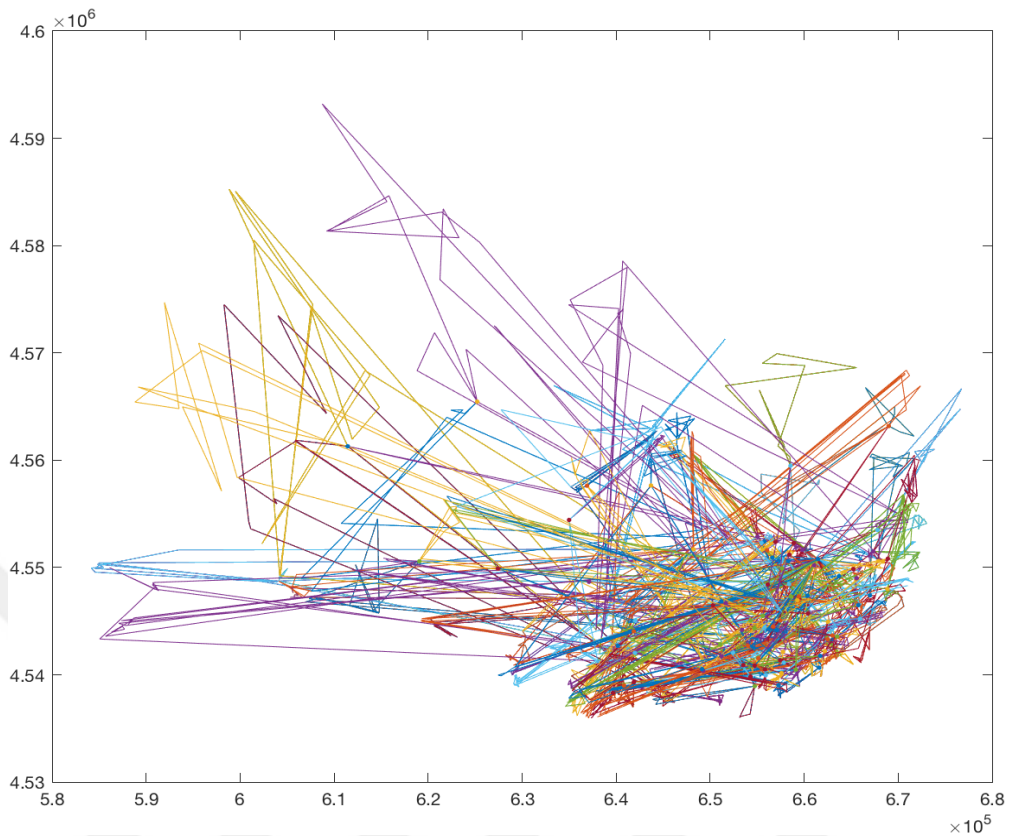


Figure 6.16: Routing results for scenario 2.c

Scenario 2.c includes 293 routes in which there are also split deliveries (Figure 6.16). After optimizing each route, maximum route length of scenario 1.c is 218.26 minutes and the average route length is 63.21 minutes the minimum tour length is 5 minutes due to the demand quantity and the service time. Due to its demand type, some routes include only 1-2 route nodes. The split deliveries and the detailed information about the routes such as coordinates and the amount delivered to each node can be found in the Appendix C.

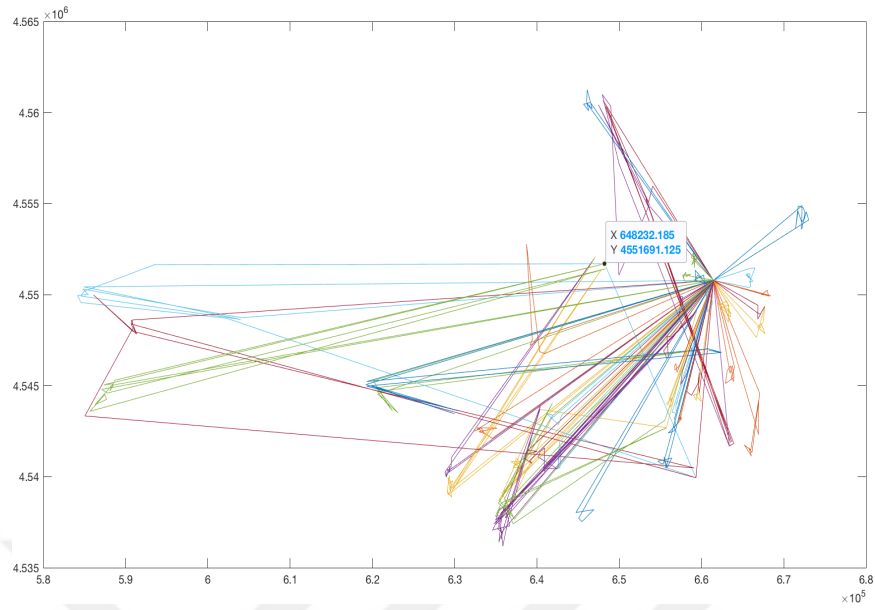


Figure 6.17: Routing results for 230,000 capacity HMPU in scenario 1.c

The merged cluster of 46 clusters and the 230,000 capacity Hot Meal Production Unit, which is currently stated at Alibeyköy district, is shown in Figure 6.17 and Figure 6.18 including the routes including the routes for delivery.

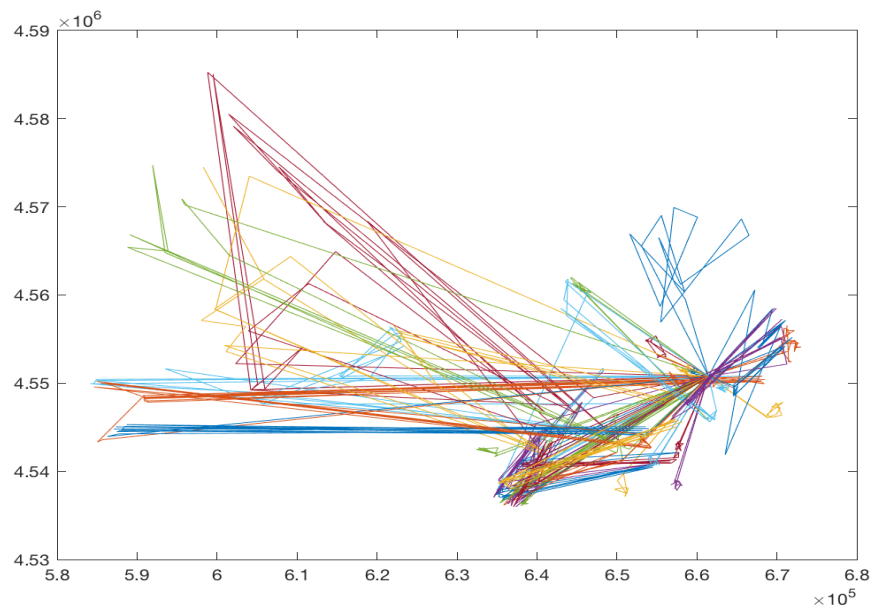


Figure 6.18: Routing results for 230,000 capacity HMPU in scenario 2.c

7. CONCLUSION

While disasters inevitably affecting the whole world, the international community simultaneously looks for better systems, better implications, and novel approaches to cope with. Regarding its complexity, while developing systems and models for disaster management, better understanding the legislative framework, the organizational structure, shared responsibilities and the systematic approach is crucial.

Turkish National Disaster Response Plan thrives the area in Turkey for better understanding and developing well-designed and applicable models. Food delivery and nutrition is one of the major components of this systematic approach. Inspiring from the real life problem, we proposed a Split Delivery Multi Depot Location Routing Problem with capacitated facility, capacitated vehicle and without facility plant cost. Due to its NP-hardness, a two phase heuristic including boundary based cluster approach in the first stage merging with a designed criteria which firstly finds out the weighted geographical average of the demand locations in a cluster, secondly combines the parameters of distance and demand location density in clusters. Applies GA for the tour improvement stage including in route and inter route operations for the so-called VRP sub problem.

The case study focuses on the European side of Istanbul where the demand locations are the assembly areas aftermath of an earthquake. The demand scenario data produced by using the district population of 2018 with the highest probability as inferred from the literature.

The improvements could concentrate on Multi-objective optimization, while minimizing the cost of travelling and fuel consumption in one objective, and minimizing the waiting time in other objective. Also, relaxing some constraints like allowing the vehicles returning another depot from their dispatching depot as further research development.

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APPENDICES

Appendix A:

Matlab Code Of MDSDLRP Genetic Algorithm

```
clc;
close all;
B=table2array(aaa);
BA=size(B,1);
Z=zeros(BA,1);
T=zeros(BA,1);
for i=1:BA
    T(i,1)=B(i,1);
    Z(i,1)=B(i,2);
end
BS=zeros(BA,2);
for i=1:BA
    BS(i,1)=B(i,2);
    BS(i,2)=B(i,1);
end
scnr=9;
CC=table2array(presentt);
CA=size(CC,1);
DA=zeros(CA,3);
for i=1:CA
    DA(i,1)=CC(i,1);
    DA(i,2)=CC(i,2);
```



```

DA(i,3)=CC(i,3);
end
SPEED=1000;
ST=10;
Talep=table2array(talepbuyuk);
CA=size(Talep,1);
Dem=zeros(CA,3);
for i=1:CA
    Dem(i,1)=Talep(i,1);
    Dem(i,2)=Talep(i,2);
    Dem(i,3)=Talep(i,3);
end
for i=1:CA
    Dem2(i,4)=T(i,1);
    Dem2(i,5)=Z(i,1);
    Dem2(i,6)=i;
    Dem2(i,7)=i;
end
AT=sum(Dem2(:,1));
modex= mod(AT,5000);
modturn=(sum(Dem2(:,1))-modex)/5000;
modturn2=modturn+1;
DD=zeros(BA,BA);
for i=1:BA
    for j=1:BA
        DD(i,j)= abs(BS(i,2)-BS(j,2))+abs(BS(i,1)-BS(j,1));
    end
end
DDnonzero=DD;
for i=1:BA
    DDnonzero(i,i)=DD(i,i)+500000000;
end

```

```

DD2=DD;
for i=1:BA
    DD2(i,i)=DD(i,i)+500000000;
end
ClusterAll=cell([500,1]);
cntcluster=1;
while size(Z,1)>0
    mmbas = boundary(Z,T);
    hold on;
    plot(Z,T,'!');
    plot(Z(mmbas),T(mmbas));
    mmbas(end,:)=[];
    mmbasize=size(mmbas,1);
    mmbas2=mmbas;
    mstart =mmbas(1,1);
    Cluster=zeros(200,4);
    zfr=find(Dem2(:,7)==mstart);
    nyz=(Dem2(zfr,6));
    if Dem2(zfr,1) >=5000
        Dem2(zfr,1)=Dem2(zfr,1)-5000;
        Cluster(1,1)=nyz;
        Cluster(1,2)=5000;
        Cluster(1,3)=Dem2(zfr,4);
        Cluster(1,4)=Dem2(zfr,5);
    else
        Cluster(1,2)=Dem2(zfr,1);
        Cluster(1,1)=nyz;
        Cluster(1,3)=Dem2(zfr,4);
        Cluster(1,4)=Dem2(zfr,5);
        Dem2(zfr,1)=0;
        DDnonzero(:,nyz)=500000000;
    end
end

```

```

SUMCC=[];
while isempty(mmbas)==0
SUMC=sum(Cluster(:,2));
bbb=1;
while SUMC<5000
zfr=find(Dem2(:,7)==mstart);
nyzz=(Dem2(zfr,6));
Enyakin=min(DDnonzero(nyzz, :));
Enbuyuk=max(DDnonzero(nyzz, :));
[row,col]=find(DDnonzero==Enyakin);
Yeni=[row,col];
if Yeni(1)==nyzz
Yeninokta=Yeni(2);
else
Yeninokta=Yeni(1);
end
zfr=find(Dem2(:,6)==Yeninokta);
nyz=Yeninokta;
if Dem2(zfr,1)>5000
Cluster(bbb+1,1)=nyz;
trend=(5000-sum(Cluster(:,2)));
Cluster(bbb+1,2)=(5000-sum(Cluster(:,2)));
Dem2(zfr,1)=Dem2(zfr,1)-(trend);
Cluster(bbb+1,3)=Dem2(zfr,4);
Cluster(bbb+1,4)=Dem2(zfr,5);
else
if ((Dem2(zfr,1)+SUMC))==5000
Cluster(bbb+1,1)=nyz;
Cluster(bbb+1,2)=Dem2(zfr,1);
Cluster(bbb+1,3)=Dem2(zfr,4);
Cluster(bbb+1,4)=Dem2(zfr,5);
Dem2(zfr,1)=0;

```

```

DDnonzero(row,col)=500000000;
DDnonzero(col,row)=500000000;
DDnonzero(:,nyz)=500000000;
else
if ((Dem2(zfr,1)+SUMC))>5000
Cluster(bbb+1,1)=nyz;
trend=(5000-sum(Cluster(:,2)));
Cluster(bbb+1,2)=5000-(sum(Cluster(:,2)));
Dem2(zfr,1)=(Dem2(zfr,1)-(trend));
Cluster(bbb+1,3)=Dem2(zfr,4);
Cluster(bbb+1,4)=Dem2(zfr,5);
else
if ((Dem2(zfr,1)+SUMC))<5000
Cluster(bbb+1,1)=nyz;
Cluster(bbb+1,2)=(Dem2(zfr,1));
Dem2(zfr,1)=0;
DDnonzero(row,col)=500000000;
DDnonzero(col,row)=500000000;
DDnonzero(:,nyz)=500000000;
Cluster(bbb+1,3)=Dem2(zfr,4);
Cluster(bbb+1,4)=Dem2(zfr,5);
end
end
end
end
SUMC=sum(Cluster(:,2));
bbb=bbb+1;
if sum(Dem2(:,1))==0
break
end
end
Clusterf=Cluster;

```

```

gg=size(Cluster,1);
for h=1:gg
    if Cluster(h,1)==0
        Clusterf(end,:)=[];
    else
        Clusterf(h,:)=Cluster(h,:);
    end
end
mb=size(Clusterf);
for y=1:mb
    Clusterf(y,5)=cntcluster;
end
ClusterAll{cntcluster,1}=Clusterf;
cntcluster=cntcluster+1;
SCluster=size(Clusterf,1);
Smm=size(mmbas,1);
mm3=zeros(Smm,1);
mm4=zeros(Smm,1);
for f=1:Smm
    for j=1:SCluster
        zfr=find((mmbas(f,1)==Dem2(:,7)));
        nyz=(Dem2(zfr,6));
        if nyz==Clusterf(j,1)&&Dem2(zfr,1)==0
            mm3(f,1)=mmbas(f,1);
        else
            if nyz==Clusterf(j,1)&&(Dem2(zfr,1)>0)
                mm4(f,1)=mmbas(f,1);
            end
        end
    end
end
end
if isempty(mm3)==0

```

```

Cnt=find(mm3>0);
SCnt=size(Cnt,1);
mmm3=zeros(SCnt,1);
for c=1:SCnt
    mmm3(c)=mm3(Cnt(c));
end
end
if isempty(mmm4)==0
Cnt2=find(mm4>0);
SCnt2=size(Cnt2,1);
mmm4=zeros(SCnt2,1);
for ct=1:SCnt2
    mmm4(ct)=mm4(Cnt2(ct));
end
end
if SCnt>0
for t=1:SCnt
    ekxi=find((mmm3(t)==Dem2(:,7)));
    if Dem2(ekxi,1)==0
        mmbas(mmbas==mmm3(t))=[];
    end
end
end
minsize=size(mmbas,1);
minsize2=size(mmm3,1);
Minimum2=zeros(minsize2,minsize);
for j=1:minsize2
for p=1:minsize
    if isempty(mmbas)
        break
    end
    yedi=find((mmm3(j,1)==Dem2(:,7)));

```

```

    kac=(Dem2(yedi,6));
    yedim=find((mmbas(p,1)==Dem2(:,7)));
    kacma=(Dem2(yedim,6));
    Minimum2(j,p)=DDnonzero(kac,kacma);
end
end
if isempty(mmbas)==0
if isempty(mmm3)
    if isempty(mmm4)==0
        Minfind=mmm4(1,1);
    end
else
    Minimumfin1= min(Minimum2);
    Minimumfin=min(Minimumfin1);
    [row,col]=find(Minimum2==Minimumfin);
    Newmin=[row,col];
    Minfind=mmbas(Newmin(2));
end
end
Cluster=zeros(200,2);
mstart=Minfind;
zfr=find(mstart==Dem2(:,7));
nyz=(Dem2(zfr,6));
if Dem2(zfr,1) >=5000
    Dem2(zfr,1)=Dem2(zfr,1)-5000;
    Cluster(1,1)=nyz;
    Cluster(1,2)=5000;
    Cluster(1,3)=Dem2(zfr,4);
    Cluster(1,4)=Dem2(zfr,5);
else
    Cluster(1,2)=Dem2(zfr,1);
    Cluster(1,1)=nyz;

```

```

Dem2(zfr,1)=0;
DDnonzero(:,nyz)=500000000;
Cluster(1,3)=Dem2(zfr,4);
Cluster(1,4)=Dem2(zfr,5);
end
mmbassize=size(mmbas,1);
end
demsiz=size(Dem2,1);
G=zeros(demsiz,1);
for j=1:demsiz
if Dem2(j,1)==0
Dem2(j,7)=0;
G(j,1)=1;
else
Dem2(j,7)=Dem2(j,6)-(sum(G,1));
end
end
T=[];
Z=[];
demsiz=size(Dem2,1);
for i=1:demsiz
if Dem2(i,1)>0
T(end+1,1)=Dem2(i,4);
Z(end+1,1)=Dem2(i,5);
end
end
size(Z,1)
A=1;
end
ABC=cell2mat(ClusterAll);
SABC= size(ABC,1);
T=[];

```



```

Z=[];
SS=table2array(SSUretim);
tscnr=sum(SS(scnr+1,:));
CCC=zeros(1,tscnr);
CENT= zeros(modturn,2);
NODES=zeros(modturn,1);
for gt=1:modturn
    MNG=find(ABC(:,5)==gt);
    SMNG=size(MNG,1);
    NODES(gt,1)=SMNG;
    for gf=1:SMNG
        T(end+1,1)=ABC(MNG(gf),3);
        Z(end+1,1)=ABC(MNG(gf),4);
    end
    BND=boundary(Z,T);
    hold on;
    plot(Z,T,'!');
    plot(Z(BND),T(BND));
    TM=mean(T);
    ZM=mean(Z);
    CENT(gt,1)=TM;
    CENT(gt,2)=ZM;
    plot(ZM,TM,'o');
T=[];
Z=[];
end
figure()
PPP=zeros(100,modturn2);
GTT=(1:1:modturn);
for i=1:100
    GT2=GTT(randperm(length(GTT)));
    PPP(i,1:modturn)=GT2(:);

```

```

    PPP(i,modturn2)=0;
end
PPP(:,end)=[];
for k=1:100
    BUL=zeros(1,modturn);
    BUL(1,:)=PPP(k,1:modturn);
    NODE=zeros(1,(SS(1,1)));
    for i=1:SS(1,1)
        NODE(1,i)=NODES(BUL(i),1);
    end
    SUMNODES=sum(NODE);
    CENTT=zeros((SS(1,1)*SS((scnr+1),1)),2);
    for i=1:(SS(1,1)*SS((scnr+1),1))
        CENTT(i,1)=CENT(BUL(i),1);
        CENTT(i,2)=CENT(BUL(i),2);
    end
    CENT2=zeros(1,2);
    CENT2(1,1)=(sum(CENTT(:,1)))/(SS(1,1)*SS((scnr+1),1));
    CENT2(1,2)=(sum(CENTT(:,2)))/(SS(1,1)*SS((scnr+1),1));
    DSTCENT=zeros(1,(SS(1,1)*SS((scnr+1),1)));
    for i=1:(SS(1,1)*SS((scnr+1),1))
        DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
    end
    DSTCENT2=(sum(DSTCENT))/(SS(1,1)*SS((scnr+1),1));
    DSTCENT3=round(DSTCENT2);
    ORBIT= abs(DA(SS((scnr+1),1),1)-CENT2(1,1))+abs(DA(SS((scnr+1),1),2)-
    CENT2(1,2));
    ORBIT2=round(ORBIT);
    CCC(1,SS((scnr+1),1)) =round((((SUMNODES*ST) /((SS(1,1)*SS((scnr+1),1))) +
    (DSTCENT3/SPEED) + (ORBIT2/SPEED)));
    for j=1:SS(scnr+1,2)
        NODE=zeros(1,SS(1,2));

```

```

for i=1:SS(1,2)
    NODE(1,i)=NODES(BUL(i+((j-1)*SS(1,2))+SS(1,1)*SS((scnr+1),1))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,2),2);
for i=1:SS(1,2)
    CENTT(i,1)=CENT(BUL(i+((j-1)*SS(1,2))+SS(1,1)*SS((scnr+1),1))),1);
    CENTT(i,2)=CENT(BUL(i+((j-1)*SS(1,2))+SS(1,1)*SS((scnr+1),1))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,2);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,2);
DSTCENT=zeros(1,SS(1,2));
for i=1:SS(1,2)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,2);
DSTCENT3=round(DSTCENT2);
ORBIT=abs((DA(j+SS((scnr+1),1),1))-CENT2(1,1))+abs((DA(j+SS((scnr+1),1),2))-
CENT2(1,2));
ORBIT2=round(ORBIT);
CCC(1,(j+SS((scnr+1),1))) =round (((SUMNODES*ST) /SS(1,2))+
(DSTCENT3/SPEED) + (ORBIT2/SPEED));
end
NODE=zeros(1,SS(1,3));
for i=1:SS(1,3)
    NODE(1,i)=NODES(BUL(i+((SS(1,1)*SS((scnr+1),1))+SS(1,2)*SS((scnr+1),2))),1);
end
SUMNODES=sum(NODE);
%-----%
CENTT=zeros(SS(1,3),2);
for i=1:SS(1,3)

```

```

CENTT(i,1)=CENT(BUL(i+((SS(1,1)*SS((scnr+1),1))+SS(1,2)*SS((scnr+1),2))),1);
CENTT(i,2)=CENT(BUL(i+((SS(1,1)*SS((scnr+1),1))+SS(1,2)*SS((scnr+1),2))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,3);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,3);
DSTCENT=zeros(1,SS(1,3));
for i=1:SS(1,3)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,3);
DSTCENT3=round(DSTCENT2);
ORBIT=abs((DA(SS((scnr+1),1)+SS((scnr+1),2),1)-
CENT2(1,1)))+abs((DA(SS((scnr+1),1)+SS((scnr+1),2),2)-CENT2(1,2)));
ORBIT2=round(ORBIT);
CCC(1,SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3))=round(((SUMNODES*ST)/SS
(1,3))+(DSTCENT3/SPEED)+(ORBIT2/SPEED));
NODE=zeros(1,SS(1,4));
for i=1:SS(1,4) NODE(1,i)=NODES(BUL (i+((SS(1,1) *SS((scnr+1),1)) +(SS(1,2)*
SS((scnr+1),2))) + (SS(1,3)*SS((scnr+1),3))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,4),2);
for i=1:SS(1,4)
CENTT(i,1)=CENT (BUL(i+((SS(1,1)*SS((scnr+1),1)) +(SS(1,2)*SS((scnr+1),2)))
+(SS(1,3)*SS((scnr+1),3))),1);
CENTT(i,2)=CENT(BUL(i+((SS(1,1) *SS((scnr+1),1))+SS(1,2)*SS((scnr+1),2)))
+(SS(1,3)*SS((scnr+1),3))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,4);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,4);

```

```

DSTCENT=zeros(1,SS(1,4));
for i=1:SS(1,4)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,4);
DSTCENT3=round(DSTCENT2);
ORBIT=abs(DA(SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3),1)-
CENT2(1,1))+abs(DA(SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3),2)-CENT2(1,2)));
ORBIT2=round(ORBIT);
CCC(1,SS((scnr+1),1) +SS((scnr+1),2)+SS((scnr+1),3) +SS((scnr+1),4))=
round(((SUMNODES*ST)/SS(1,4)) +(DSTCENT3/SPEED)+(ORBIT2/SPEED));
for j=1:SS(scnr+1,5)
    NODE=zeros(1,SS(1,5));
    for i=1:SS(1,5)
        NODE(1,i) = NODES(BUL(i+((j-1) * SS(1,5)) + ((SS(1,1) * SS((scnr+1),1)) + (SS(1,2)
* SS((scnr+1),2))) + (SS(1,3) * SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))),1);
    end
    SUMNODES=sum(NODE);
    CENTT=zeros(SS(1,5),2);
    for i=1:SS(1,5)
        CENTT(i,1)=CENT(BUL(i+((j-1)* SS(1,5))+((SS(1,1) *SS((scnr+1),1)) +(SS(1,2)*
SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))),1);
        CENTT(i,2)=CENT(BUL(i+((j-1)*SS(1,5)) +((SS(1,1) *SS((scnr+1),1)) +(SS(1,2)
*SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))),2);
    end
    CENT2=zeros(1,2);
    CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,5);
    CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,5);
    DSTCENT=zeros(1,SS(1,5));
    for i=1:4
        DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
    end
end

```

```

DSTCENT2=(sum(DSTCENT))/SS(1,5);
DSTCENT3=round(DSTCENT2);
CCC(1, (j+SS ((scnr+1),1) +SS((scnr+1),2) +SS((scnr+1),3) +SS ((scnr+1),4))) = round
(((SUMNODES *ST) /SS(1,5))+(DSTCENT3/SPEED));
end
for j=1:SS(scnr+1,6)
NODE=zeros(1,SS(1,6));
for i=1:SS(1,6)
NODE(1,i)=NODES(BUL(i+(j-1) *SS (1,6) +((SS(1,1) *SS((scnr+1) ,1))+SS(1,2)
*SS((scnr+1),2))) +(SS(1,3) *SS((scnr+1),3)) +(SS(1,4) *SS((scnr+1),4)) +(SS(1,5)
*SS((scnr+1),5))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,6),2);
for i=1:SS(1,6)
CENTT(i,1)=CENT(BUL(i+(j-1) *SS(1,6) +((SS(1,1) *SS((scnr+1),1)) +(SS(1,2)*
SS((scnr+1),2))) +(SS(1,3) *SS((scnr+1),3)) +(SS(1,4)*SS((scnr+1),4))
+(SS(1,5)*SS((scnr+1),5))),1);
CENTT(i,2)=CENT(BUL(i+(j-1) *SS(1,6) +((SS(1,1) *SS((scnr+1),1)) +(SS(1,2)
*SS((scnr+1),2))) +(SS(1,3)*SS ((scnr+1),3)) +(SS(1,4) *SS((scnr+1),4)) +(SS(1,5)*
SS((scnr+1),5))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,6);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,6);
DSTCENT=zeros(1,SS(1,6));
for i=1:SS(1,6) DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-
CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,6);
DSTCENT3=round(DSTCENT2);
CCC(1,(j+SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3)+SS((scnr+1),4)+SS((scnr+1),

```

```

5))) = round(((SUMNODES*ST)/SS(1,6))+(DSTCENT3/SPEED));
end
for j=1:SS(scnr+1,7)
NODE=zeros(1,SS(1,7));
for i=1:SS(1,7)
    NODE(1,i)=NODES(BUL(i+((j-1) * SS(1,7)) + ((SS(1,1) * SS((scnr+1),1)) +
(SS(1,2) * SS((scnr+1),2))) + (SS(1,3) * SS((scnr+1),3)) + (SS(1,4) * SS((scnr+1),4)) +
(SS(1,5)*SS((scnr+1),5)) + (SS(1,6)*SS((scnr+1),6))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,7),2);
for i=1:SS(1,7)
CENTT(i,1)=CENT(BUL(i+((j-1) * SS(1,7)) + ((SS(1,1) * SS((scnr+1),1)) + (SS(1,2) *
SS((scnr+1),2))) + (SS(1,3)*SS((scnr+1),3)) + (SS(1,4)*SS((scnr+1),4)) + (SS(1,5) *
SS((scnr+1),5)) + (SS(1,6)*SS((scnr+1),6))),1);
CENTT(i,2)=CENT(BUL(i+((j-1) * SS(1,7)) + ((SS(1,1) * SS((scnr+1),1)) + (SS(1,2) *
SS((scnr+1),2))) + (SS(1,3) * SS((scnr+1),3)) + (SS(1,4) * SS((scnr+1),4)) + (SS(1,5) *
SS((scnr+1),5)) + (SS(1,6)*SS((scnr+1),6))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,7);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,7);
DSTCENT=zeros(1,SS(1,7));
for i=1:SS(1,7)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,7);
DSTCENT3=round(DSTCENT2);
CCC(1,(j+SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3)+SS((scnr+1),4)+SS((scnr+1),
5)+SS((scnr+1),6)))=round(((SUMNODES*ST)/SS(1,7))+(DSTCENT3/SPEED));
end
CCC2=max(CCC);

```

```

CCC3=find(CCC==CCC2);
if size(CCC3,2)>1
    PPP(k,(modturn+2))=CCC3(1,1);
else
    PPP(k,(modturn+2))=CCC3;
end
CCC4=min(CCC);
CCC5=find(CCC==CCC4);
if size(CCC5,2)>1
    PPP(k,(modturn+3))=CCC5(1,1);
else
    PPP(k,(modturn+3))=CCC5;
end
PPP(k,(modturn+1))=CCC2;
end
for ga=1:10000
    PAR1= zeros(1,modturn);
    PAR2= zeros(1,modturn);
    TOURNAMENT1= zeros(5,modturn+4);
    while PAR1==PAR2
        for i=1:5
            pt1=rand;
            p1=10000*pt1;
            p1=round(p1);
            p11=mod(p1,100);
            while p11==0
                pt1=rand;
                p1=10000*pt1;
                p1=round(p1);
                p11=mod(p1,100);
            end
            TOURNAMENT1(i,1:modturn+3)=PPP(p11,:);

```



```

TOURNAMENT1(i,modturn+4)=p11;
end
TOURNAMENT1=sortrows(TOURNAMENT1,(modturn+1),'ascend');
PAR1(1,:)=TOURNAMENT1(1,1:modturn);
TOURNAMENT2= zeros(5,modturn+4);
for i=1:5
pt2=rand;
p1=10000*pt2;
p1=round(p1);
p11=mod(p1,100);
while p11==0
pt2=rand;
p1=10000*pt2;
p1=round(p1);
p11=mod(p1,100);
end
TOURNAMENT2(i,1:modturn+3)=PPP(p11,:);
TOURNAMENT2(i,modturn+4)=p11;
end
TOURNAMENT2=sortrows(TOURNAMENT2,(modturn+1),'ascend');
PAR2(1,:)=TOURNAMENT2(1,1:modturn);
end
pq=10000*rand;
pq=round(pq);
pq1=mod(pq,modturn);
CH1=zeros(1,modturn);
CH2=zeros(1,modturn);
for g=1:pq1
    CH1(1,g)=PAR1(1,g);
    CH2(1,g)=PAR2(1,g);
end
MidCh=zeros(1,(modturn-pq1));

```

```

cc=1;
for h=1:modturn
    hh=0;
    for b=1:modturn
        if PAR2(h)==CH1(b)
            hh=hh+1;
        end
    end
    if hh<1
        MidCh(1,cc)=PAR2(h);
        cc=cc+1;
    end
    end
    for kk=1:(modturn-pq1)
        CH1(1,pq1+kk)=(MidCh(1,kk));
    end
    end
    pq=10000*rand;
    pq=round(pq);
    pq2=mod(pq,modturn);
    while pq2==0
        pq=10000*rand;
        pq=round(pq);
        pq2=mod(pq,modturn);
    end
    pq=10000*rand;
    pq=round(pq);
    pq3=mod(pq,modturn);
    while pq3==0
        pq=10000*rand;
        pq=round(pq);
        pq3=mod(pq,modturn);
    end
    end
end

```

```

mt1=CH1(1,pq2);
mt2=CH1(1,pq3);
if pq2==~pq3
    CH1(1,pq2)=mt2;
    CH1(1,pq3)=mt1;
end
MidCh=zeros(1,(modturn-pq1));
cc=1;
for h=1:modturn
    hh=0;
    for b=1:modturn
        if PAR1(h)==CH2(b)
            hh=hh+1;
        end
    end
    if hh<1
        MidCh(1,cc)=PAR1(h);
        cc=cc+1;
    end
end
for kk=1:(modturn-pq1)
    CH2(1,pq1+kk)=(MidCh(1,kk));
end
PPP=sortrows(PPP,(modturn+1),'ascend');
pq=10000*rand;
pq=round(pq);
pq2=mod(pq,modturn);
while pq2==0
    pq=10000*rand;
    pq=round(pq);
    pq2=mod(pq,modturn);
end

```

```

pq=10000*rand;
pq=round(pq);
pq3=mod(pq,modturn);
while pq3==0
pq=10000*rand;
pq=round(pq);
pq3=mod(pq,modturn);
end
mt1=CH2(1,pq2);
mt2=CH2(1,pq3);
if pq2==~pq3
    CH2(1,pq2)=mt2;
    CH2(1,pq3)=mt1;
end
for z=1:100
    if PPP(z,1:modturn)==PAR1(1,:)
        vv=z;
    end
end
for r=1:100
    if PPP(r,1:modturn)==PAR2(1,:)
        yy=r;
    end
end
if vv>5
    PPP(vv,1:modturn)=CH1(1,:);
else
    PPP(100,1:modturn)=CH1(1,:);
end
if yy>5
    PPP(yy,1:modturn)=CH2(1,:);
else

```

```

    PPP(99,1:modturn)=CH2(1,:);
end
for k=1:100
    BUL=zeros(1,modturn);
    BUL(1,:)=PPP(k,1:modturn);
    NODE=zeros(1,(SS(1,1)));
    for i=1:SS(1,1)
        NODE(1,i)=NODES(BUL(i),1);
    end
    SUMNODES=sum(NODE);
    CENTT=zeros((SS(1,1)*SS((scnr+1),1)),2);
    for i=1:(SS(1,1)*SS((scnr+1),1))
        CENTT(i,1)=CENT(BUL(i),1);
        CENTT(i,2)=CENT(BUL(i),2);
    end
    CENT2=zeros(1,2);
    CENT2(1,1)=(sum(CENTT(:,1)))/(SS(1,1)*SS((scnr+1),1));
    CENT2(1,2)=(sum(CENTT(:,2)))/(SS(1,1)*SS((scnr+1),1));
    DSTCENT=zeros(1,(SS(1,1)*SS((scnr+1),1)));
    for i=1:(SS(1,1)*SS((scnr+1),1)) 2-
        DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
    end
    DSTCENT2=(sum(DSTCENT))/(SS(1,1)*SS((scnr+1),1));
    DSTCENT3=round(DSTCENT2);
    ORBIT=abs(DA(SS((scnr+1),1),1)-CENT2(1,1))+abs(DA(SS((scnr+1),1),2)-
    CENT2(1,2));
    ORBIT2=round(ORBIT);
    CCC(1,SS((scnr+1),1))= round((((SUMNODES*ST)/(SS(1,1) *SS((scnr+1),1))) +
    (DSTCENT3/SPEED) + (ORBIT2/SPEED));
    for j=1:SS(scnr+1,2)
        NODE=zeros(1,SS(1,2));
        for i=1:SS(1,2)

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```

    NODE(1,i)=NODES(BUL(i+((j-1)*SS(1,2))+((SS(1,1)*SS((scnr+1),1))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,2),2);
for i=1:SS(1,2)
    CENTT(i,1)=CENT(BUL(i+((j-1)*SS(1,2))+((SS(1,1)*SS((scnr+1),1))),1);
    CENTT(i,2)=CENT(BUL(i+((j-1)*SS(1,2))+((SS(1,1)*SS((scnr+1),1))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,2);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,2);
DSTCENT=zeros(1,SS(1,2));
for i=1:SS(1,2) DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-
CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,2);
DSTCENT3=round(DSTCENT2);
ORBIT=abs((DA(j+SS((scnr+1),1),1)) - CENT2(1,1)) +abs ((DA(j+SS((scnr+1),1),2))-
CENT2(1,2));
ORBIT2=round(ORBIT);
CCC(1, (j+SS((scnr+1),1))) = round (((SUMNODES*ST) / SS(1,2)) + (DSTCENT3 /
SPEED) + (ORBIT2/SPEED));
end
NODE=zeros(1,SS(1,3));
for i=1:SS(1,3)
    NODE(1,i)=NODES(BUL(i+((SS(1,1)*SS((scnr+1),1))+((SS(1,2)*SS((scnr+1),2))))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,3),2);
for i=1:SS(1,3)
    CENTT(i,1)=CENT(BUL(i+((SS(1,1)*SS((scnr+1),1))+((SS(1,2)*SS((scnr+1),2))))),1);
    CENTT(i,2)=CENT(BUL(i+((SS(1,1)*SS((scnr+1),1))+((SS(1,2)*SS((scnr+1),2))))),2);

```

```

end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,3);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,3);
DSTCENT=zeros(1,SS(1,3));
for i=1:SS(1,3) DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-
CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,3);
DSTCENT3=round(DSTCENT2);
ORBIT=abs((DA(SS((scnr+1),1)+SS((scnr+1),2),1)-
CENT2(1,1)))+abs((DA(SS((scnr+1),1)+SS((scnr+1),2),2)-CENT2(1,2)));
ORBIT2=round(ORBIT);
CCC(1,SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3))=round(((SUMNODES*ST)/SS
(1,3))+(DSTCENT3/SPEED)+(ORBIT2/SPEED));
NODE=zeros(1,SS(1,4));
for i=1:SS(1,4)
NODE(1,i)=NODES(BUL(i+((SS(1,1)*SS((scnr+1),1))+(SS(1,2)*SS((scnr+1),2)))+(SS
(1,3)*SS((scnr+1),3))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,4),2);
for i=1:SS(1,4)
CENTT(i,1)=CENT(BUL(i+((SS(1,1)*SS((scnr+1),1))+(SS(1,2)*SS((scnr+1),2)))+(SS(
1,3)*SS((scnr+1),3))),1);
CENTT(i,2)=CENT (BUL(i+((SS(1,1)* SS((scnr+1),1)) +(SS(1,2) *SS((scnr+1),2)))
+(SS(1,3) * SS((scnr+1),3))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,4);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,4);
DSTCENT=zeros(1,SS(1,4));

```

```

for i=1:SS(1,4)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,4);
DSTCENT3=round(DSTCENT2);
ORBIT=abs(DA(SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3),1)-
CENT2(1,1))+abs(DA(SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3),2)-
CENT2(1,2)));
ORBIT2=round(ORBIT);
CCC(1,SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3)+SS((scnr+1),4))=
round(((SUMNODES * ST)/SS(1,4))+(DSTCENT3/SPEED)+(ORBIT2/SPEED));
for j=1:SS(scnr+1,5)
    NODE=zeros(1,SS(1,5));
    for i=1:SS(1,5)
        NODE(1,i)=NODES(BUL(i+(j-1)*SS(1,5))+((SS(1,1)*SS((scnr+1),1))
+(SS(1,2)*SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))),1);
    end
    SUMNODES=sum(NODE);
    CENTT=zeros(SS(1,5),2);
    for i=1:SS(1,5)
        CENTT(i,1)=CENT(BUL(i+(j-1)*SS(1,5))+((SS(1,1)*SS((scnr+1),1))+(SS(1,2)
*SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))),1);
        CENTT(i,2)=CENT(BUL(i+(j-1)*SS(1,5))+((SS(1,1)*SS((scnr+1),1))
+(SS(1,2)*SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))),2);
    end
    CENT2=zeros(1,2);
    CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,5);
    CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,5);
    DSTCENT=zeros(1,SS(1,5));
    for i=1:4
        DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
    end
end

```



```

DSTCENT2=(sum(DSTCENT))/SS(1,5);
DSTCENT3=round(DSTCENT2);
CCC(1,(j+SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3)+SS((scnr+1),4)))=round(((S
UMNODES*ST)/SS(1,5))+(DSTCENT3/SPEED));
end
for j=1:SS(scnr+1,6)
NODE=zeros(1,SS(1,6));
for i=1:SS(1,6)
    NODE(1,i)=NODES(BUL(i+((j-1)*SS(1,6))+((SS(1,1)*SS((scnr+1),1))
+(SS(1,2)*SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))
+(SS(1,5)*SS((scnr+1),5))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,6),2);
for i=1:SS(1,6)
CENTT(i,1)=CENT(BUL(i+((j-1)*SS(1,6))+((SS(1,1)*SS((scnr+1),1))+(SS(1,2)
*SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))+(SS(1,5)
*SS((scnr+1),5))),1);
CENTT(i,2)=CENT(BUL(i+((j-1)*SS(1,6))+((SS(1,1)*SS((scnr+1),1))+(SS(1,2)*
SS((scnr+1),2)))+(SS(1,3)*SS((scnr+1),3))+(SS(1,4)*SS((scnr+1),4))+(SS(1,5)
*SS((scnr+1),5))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,6);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,6);
DSTCENT=zeros(1,SS(1,6));
for i=1:SS(1,6)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,6);
DSTCENT3=round(DSTCENT2);
CCC(1,(j+SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3)+SS((scnr+1),4)+

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```

SS((scnr+1,5))) = round(((SUMNODES*ST)/SS(1,6))+(DSTCENT3/SPEED));
end
for j=1:SS(scnr+1,7)
NODE=zeros(1,SS(1,7));
for i=1:SS(1,7)
    NODE(1,i)=NODES(BUL(i+((j-1) * SS(1,7)) + ((SS(1,1) * SS((scnr+1),1)) +
(SS(1,2) * SS((scnr+1),2))) + (SS(1,3) * SS((scnr+1),3)) + (SS(1,4) * SS((scnr+1),4)) +
(SS(1,5) * SS((scnr+1),5)) + (SS(1,6)*SS((scnr+1),6))),1);
end
SUMNODES=sum(NODE);
CENTT=zeros(SS(1,7),2);
for i=1:SS(1,7)
CENTT(i,1)=CENT(BUL(i+((j-1) * SS(1,7)) + ((SS(1,1) * SS((scnr+1),1)) +
(SS(1,2)*SS((scnr+1),2))) + (SS(1,3) * SS((scnr+1),3)) + (SS(1,4)*SS((scnr+1),4)) +
(SS(1,5) * SS((scnr+1),5)) + (SS(1,6)*SS((scnr+1),6))),1);
CENTT(i,2)=CENT(BUL(i+((j-1)*SS(1,7)) + ((SS(1,1) * SS((scnr+1),1)) + (SS(1,2) *
SS((scnr+1),2))) + (SS(1,3)*SS((scnr+1),3)) + (SS(1,4)*SS((scnr+1),4)) +
(SS(1,5)*SS((scnr+1),5)) + (SS(1,6)*SS((scnr+1),6))),2);
end
CENT2=zeros(1,2);
CENT2(1,1)=(sum(CENTT(:,1)))/SS(1,7);
CENT2(1,2)=(sum(CENTT(:,2)))/SS(1,7);
DSTCENT=zeros(1,SS(1,7));
for i=1:SS(1,7)
    DSTCENT(1,i)=abs((CENTT(i,1)-CENT2(1,1)))+abs((CENTT(i,2)-CENT2(1,2)));
end
DSTCENT2=(sum(DSTCENT))/SS(1,7);
DSTCENT3=round(DSTCENT2);
CCC(1,(j+SS((scnr+1),1)+SS((scnr+1),2)+SS((scnr+1),3)+SS((scnr+1),4)+SS((scnr+1),
5)+SS((scnr+1),6)))=round(((SUMNODES*ST)/SS(1,7))+(DSTCENT3/SPEED));
end
CCC2=max(CCC);

```

```

CCC3=find(CCC==CCC2);
if size(CCC3,2)>1
    PPP(k,(modturn+2))=CCC3(1,1);
else
    PPP(k,(modturn+2))=CCC3;
end
CCC4=min(CCC);
CCC5=find(CCC==CCC4);
if size(CCC5,2)>1
    PPP(k,(modturn+3))=CCC5(1,1);
else
    PPP(k,(modturn+3))=CCC5;
end
PPP(k,(modturn+1))=CCC2;
end
PPP=sortrows(PPP,(modturn+1),'ascend');
RESULT=PPP(1,:);
end
for gh=1:SS(1,1)
    for th=1:SABC
        if ABC(th,5)==RESULT(1,gh)
            ABC(th,6)=SS(scnr+1,1);
        end
    end
end
for fg=1:SS(scnr+1,2)
    for gh=1:SS(1,2)
        for th=1:SABC
            if ABC(th,5)==RESULT(1,(SS(1,1)*SS(scnr+1,1)+((fg-1)*SS(1,2))+gh))
                ABC(th,6)=SS(scnr+1,1)+fg;
            end
        end
    end
end

```

```

end
end
for gh=1:SS(1,3)
  for th=1:SABC
    if ABC(th,5)==RESULT(1,(SS(1,1)*SS(scnr+1,1)+(SS(1,2)*SS(scnr+1,2)))+gh)
      ABC(th,6)=SS(scnr+1,1)+SS(scnr+1,2)+SS(scnr+1,3);
    end
  end
end
for gh=1:SS(1,4)
  for th=1:SABC
    if
ABC(th,5)==RESULT(1,(SS(1,1)*SS(scnr+1,1)+(SS(1,2)*SS(scnr+1,2)))+(SS(1,3)*SS
(scnr+1,3))+gh)
      ABC(th,6)=SS(scnr+1,1)+SS(scnr+1,2)+SS(scnr+1,3)+SS(scnr+1,4);
    end
  end
end
for fg=1:SS(scnr+1,5)
for gh=1:SS(1,5)
  for th=1:SABC
    if
ABC(th,5)==RESULT(1,(SS(1,1)*SS(scnr+1,1)+(SS(1,2)*SS(scnr+1,2)))+(SS(1,3)*SS
(scnr+1,3)+(SS(1,4)*SS(scnr+1,4)+((fg-1)*SS(1,5))+gh)))
      ABC(th,6)=SS(scnr+1,1)+SS(scnr+1,2)+SS(scnr+1,3)+SS(scnr+1,4)+fg;
    end
  end
end
end
for fg=1:SS(scnr+1,6)
for gh=1:SS(1,6)
  for th=1:SABC

```

```

    if
ABC(th,5)==RESULT(1,(SS(1,1)*SS(scnr+1,1)+(SS(1,2)*SS(scnr+1,2)))+(SS(1,3)*SS
(scnr+1,3)+(SS(1,4)*SS(scnr+1,4)+(SS(1,5)*SS(scnr+1,5))+((fg-1)*SS(1,6))+gh))

ABC(th,6)=SS(scnr+1,1)+SS(scnr+1,2)+SS(scnr+1,3)+SS(scnr+1,4)+SS(scnr+1,5)+fg;
    end
    end
end
end
for fg=1:SS(scnr+1,7)
for gh=1:SS(1,7)
    for th=1:SABC
        if
ABC(th,5)==RESULT(1,(SS(1,1)*SS(scnr+1,1)+(SS(1,2)*SS(scnr+1,2)))+(SS(1,3)*SS
(scnr+1,3)+(SS(1,4)*SS(scnr+1,4)+(SS(1,5)*SS(scnr+1,5)+(SS(1,6)*SS(scnr+1,6))+((
fg-1)*SS(1,7))+gh))
            ABC(th,6) = SS(scnr+1,1) +SS(scnr+1,2) +SS(scnr+1,3)+ SS(scnr+1,4) +
SS(scnr+1,5) + SS(scnr+1,6) + fg;
        end
        end
    end
end
    for th=1:SABC
        if ABC(th,5)==modturn+1
            ABC(th,6)=tscnr+1;
        end
    end
ABC=sortrows(ABC,6,'ascend');
PP=[];
TT=[];
for kl=1:tscnr+1
    for km=1:SABC

```

```

    if ABC(km,6)==kl
PP(end+1,1)=ABC(km,3);
TT(end+1,1)=ABC(km,4);
    end
end
BND=boundary(TT,PP,0.9);
hold on;
plot(TT,PP,'!');
plot(TT(BND),PP(BND));
PP=[];
TT=[];
end
for gn=1:modturn
    for sn=1:SABC
        if ABC(sn,5)==gn
            ABC(sn,7)=NODES(gn,1);
        end
    end
end
end
writematrix(RESULT, 'SONUC6.txt');
writematrix(ABC, 'ABC6.xls');
NN=table2array(ABC66);
SABIT=table2array(presentt);
NNS=size(ABC66,1);
clustnum=293;
mclustnum=86;
ST=5;
AVGF=zeros(mclustnum-5,2);
NN(4,3);

AVG=[];
for i=6:mclustnum

```

```

for j=1:NNS
    if NN(j,6)==i
AVG(end+1,1)=NN(j,3);
        AVG(end,2)=NN(j,4);
    end
    b=2;
end
    AVGV=mean(AVG);
    AVGF((i-5),1)=AVGV(1,1);
    AVGF((i-5),2)=AVGV(1,2);
AVG=[];
end
D3CNTR=[];
DCNTR=[];
CNTR=[];
for i=6:mclustnum
    for j=1:NNS
        if NN(j,6)==i
CNTR(end+1,1)=NN(j,3);
            CNTR(end,2)=NN(j,4);
            CNTR(end,3)=j;
            CNTR(end,4)=abs(CNTR(end,1) - AVGF((i-5),1)) + abs(CNTR(end,2)-
AVGF((i-5),2));
            CNTR(end,5)=i;
            CNTR(end,6)=NN(j,5);
            DCNTR(end+1,1)=NN(j,3);
            DCNTR(end,2)=NN(j,4);
            DCNTR(end,3)=j;
            DCNTR(end,4)=abs(CNTR(end,1)-AVGF((i-5),1))+abs(CNTR(end,2)-
AVGF((i-5),2));
            DCNTR(end,5)=i;
            DCNTR(end,6)=NN(j,5);

```

```

        D2CNTR=sortrows(DCNTR,4,'ascend');
    end
end
D3CNTR(end+1,1)=D2CNTR(1,1);
    D3CNTR(end,2)=D2CNTR(1,2);
    D3CNTR(end,3)=D2CNTR(1,3);
    D3CNTR(end,4)=D2CNTR(1,4);
    D3CNTR(end,5)=D2CNTR(1,5);
    D3CNTR(end,6)=D2CNTR(1,6);
    DCNTR=[];
    D2CNTR=[];
end
NODES=zeros(clustnum,2);
for gt=1:clustnum
    MNG=find(NN(:,5)==gt);
    SMNG=size(MNG,1);
    NODES(gt,1)=SMNG;
    NODES(gt,2)=NODES(gt,1)*ST;
end
D4CNTR=zeros(mclustnum,2);
for i=1:5
    D4CNTR(i,1)=SABIT(i,1);
    D4CNTR(i,2)=SABIT(i,2);
end
for i=1:(mclustnum-5)
    D4CNTR(i+5,1)=D3CNTR(i,1);
    D4CNTR(i+5,2)=D3CNTR(i,2);
end
ROUTEF=readmatrix('ROUTING11.xls');
for g=1:5
    NN(end+1,3)=SABIT(g,1);
    NN(end,4)=SABIT(g,2);

```



```

end
MN=zeros(size(ROUTEF,1),1);
mn=0;
for i=1:size(ROUTEF,1)
    for j=1:size(ROUTEF,2)
        if ROUTEF(i,j)>0
            mn=mn+1;
        end
    end
    MN(i,1)=mn;
    mn=0;
end
for i=1:size(ROUTEF,1)
    MN(i,2)=MN(i,1)-1;
end
for i=1:size(ROUTEF,1)
    TMN=zeros(1,MN(i,2));
    for j=1:(MN(i,1)-1)
        TMN(1,j)= (abs(NN(ROUTEF(i,j),3) - NN(ROUTEF(i,j+1),3)) + abs
(NN(ROUTEF(i,j),4) - NN(ROUTEF(i,j+1),4)))/SPEED;
    end
    MN(i,3)= (MN(i,2)*ST)+ sum(TMN);
end
for i=1:size(ROUTEF,1)
    CRD=zeros(MN(i,1),2);
    for j=1:(MN(i,1))
        CRD(j,1)= NN(ROUTEF(i,j),3);
        CRD(j,2)=NN(ROUTEF(i,j),4);
    end
    plot(CRD(:,2),CRD(:,1));
    hold on;
end

```

```
writematrix(MN,'route11sonuc.xls');  
for i=1:clustnum  
    plot(NN(ROUTEF(i,1),4),NN(ROUTEF(i,1),3),'-o');  
    hold on;  
end  
plot(Z,T,'!');  
for i=1:size(ROUTEF,1)  
    CRD=zeros(MN(i,1),2);  
    for j=1:MN(i,1)  
        CRD(j,1)= NN(ROUTEF(i,j),3);  
        CRD(j,2)=NN(ROUTEF(i,j),4);  
        plot(CRD(j,2),CRD(j,1));  
    end  
    plot(CRD(:,2),CRD(:,1));  
    hold on;  
end  
for i=1:clustnum  
    plot(NN(ROUTEF(i,1),4),NN(ROUTEF(i,1),3),'!');  
    hold on;  
end
```

Appendix: B

Table B.1: Split delivery nodes information

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
2	135	4560555,933	646488,768	75	1
	479	4560555,933	646488,768	76	22
	274	4560555,933	646488,768	77	1
20	569	4562291,127	648223,946	76	22
	130	4562291,127	648223,946	156	23
40	103	4559465,686	643357,884	25	33
	111	4559465,686	643357,884	154	1
110	243	4560421,285	647477,821	44	31
	570	4560421,285	647477,821	76	22
112	270	4537244,651	644219,816	15	26
	493	4537244,651	644219,816	16	20
116	567	4537712,753	643905,313	31	8
	196	4537712,753	643905,313	39	8
117	259	4539212,014	643864,096	65	39
	309	4539212,014	643864,096	84	32
155	296	4537890,791	644833,937	39	8
	157	4537890,791	644833,937	65	39
157	1406	4540514,539	643564,67	50	32
	385	4540514,539	643564,67	84	32
	524	4540514,539	643564,67	98	28
159	967	4547461,607	644038,103	23	1
	1048	4547461,607	644038,103	71	5
	730	4547461,607	644038,103	78	1
160	1648	4546490,256	645044,251	72	1
	1097	4546490,256	645044,251	78	1
165	2728	4543381,249	643012,034	105	19
	818	4543381,249	643012,034	127	36
166	1108	4543949,241	643459,075	55	19
	1274	4543949,241	643459,075	78	1
	1164	4543949,241	643459,075	105	19
177	390	4543959,582	652863,528	22	1
	441	4543959,582	652863,528	167	1
198	353	4545583,174	655025,886	184	11
	747	4545583,174	655025,886	195	48
200	961	4545729,385	654687,601	183	21
	139	4545729,385	654687,601	184	11
203	762	4546036,099	654842,179	21	11
	2094	4546036,099	654842,179	165	47
	1546	4546036,099	654842,179	184	11

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
212	49	4546690,875	654177,399	137	10
	706	4546690,875	654177,399	165	47
214	237	4544382,816	654054,165	166	1
	746	4544382,816	654054,165	183	21
216	660	4544194,54	653393,189	22	1
	323	4544194,54	653393,189	166	1
234	1065	4545740,93	655640,069	4	48
	640	4545740,93	655640,069	195	48
237	322	4544139,943	654370,887	182	42
	347	4544139,943	654370,887	183	21
242	470	4543893,861	654300,573	178	39
	199	4543893,861	654300,573	182	42
256	222	4544564,08	656002,927	181	19
	99	4544564,08	656002,927	196	49
257	112	4544684,88	655822,981	195	48
	209	4544684,88	655822,981	196	49
270	732	4543315,717	656088,922	169	3
	1197	4543315,717	656088,922	181	19
274	405	4541025,349	656397,469	123	29
	60	4541025,349	656397,469	139	13
279	25	4540991,613	656655,216	122	1
	440	4540991,613	656655,216	139	13
290	250	4542398,977	655963,872	157	33
	1684	4542398,977	655963,872	158	46
291	137	4542690,188	655738,618	168	36
	415	4542690,188	655738,618	169	3
297	834	4539838,174	654288,259	14	13
	459	4539838,174	654288,259	61	18
298	330	4540857,516	654729,06	40	1
	1921	4540857,516	654729,06	124	1
	129	4540857,516	654729,06	138	1
303	138	4542148,223	655073,347	139	13
	460	4542148,223	655073,347	168	36
312	32	4542722,285	654002,546	159	26
	566	4542722,285	654002,546	167	1
313	243	4542691,658	654311,892	167	1
	355	4542691,658	654311,892	168	36
315	1100	4540505,46	655829,651	87	30
	954	4540505,46	655829,651	123	29
318	996	4539962,565	655901,342	18	27
	1522	4539962,565	655901,342	36	27
	532	4539962,565	655901,342	87	30

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
327	1	4540691,739	655346,048	138	1
	656	4540691,739	655346,048	139	13
332	18	4542750,633	652635,637	160	46
	188	4542750,633	652635,637	167	1
346	62	4540621,734	654364,09	62	11
	875	4540621,734	654364,09	124	1
416	987	4552714,524	652025,577	109	15
	145	4552714,524	652025,577	110	40
417	3109	4551691,125	648232,185	74	38
	62	4551691,125	648232,185	77	1
418	1189	4551067,441	649961,29	1	9
	1982	4551067,441	649961,29	108	9
419	758	4551075,209	647329,05	73	14
	1234	4551075,209	647329,05	111	14
420	1757	4548355,304	647093,75	77	1
	235	4548355,304	647093,75	78	1
423	1016	4552061,002	647092,519	73	14
	1891	4552061,002	647092,519	74	38
424	794	4551411,8	648321,18	40	1
	2113	4551411,8	648321,18	77	1
425	640	4547851,829	645620,221	17	1
	2712	4547851,829	645620,221	72	1
427	3084	4548554,966	650158,407	107	42
	934	4548554,966	650158,407	182	42
431	364	4544539,006	659463,197	141	7
	106	4544539,006	659463,197	142	26
459	214	4545707,777	660396,425	142	26
	902	4545707,777	660396,425	172	37
470	2	4544191,939	660333,073	121	35
	952	4544191,939	660333,073	142	26
474	427	4548186,601	658620,482	176	32
	53	4548186,601	658620,482	194	1
475	317	4547476,128	658849,768	190	29
	163	4547476,128	658849,768	194	1
476	33	4547386,959	658874,236	187	21
	447	4547386,959	658874,236	190	29
500	240	4550854,868	670693,728	6	10
	147	4550854,868	670693,728	141	7
540	52	4539701,255	636009,511	67	45
	436	4539701,255	636009,511	68	2
542	433	4540212,539	637641,093	68	2
	55	4540212,539	637641,093	122	1

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
552	420	4538875,896	636714,268	40	1
	68	4538875,896	636714,268	67	45
563	402	4541036,55	638778,222	83	7
	124	4541036,55	638778,222	122	1
690	159	4537800,474	639806,759	16	20
	51	4537800,474	639806,759	162	1
730	609	4544269,354	665814,106	54	20
	3	4544269,354	665814,106	105	19
731	120	4546455,474	664296,957	119	16
	1337	4546455,474	664296,957	146	12
742	316	4545645,617	665186,747	1	9
	620	4545645,617	665186,747	118	9
762	11	4545693,049	665374,231	55	19
	729	4545693,049	665374,231	118	9
770	720	4545470,218	666169,425	20	20
	724	4545470,218	666169,425	54	20
783	23	4541912,084	635087,784	41	1
	272	4541912,084	635087,784	68	2
846	318	4543620,278	630395,567	19	13
	196	4543620,278	630395,567	20	20
903	2094	4545079,311	656892,872	179	11
	134	4545079,311	656892,872	180	2
	2195	4545079,311	656892,872	189	18
905	1000	4545151,247	658383,318	88	6
	106	4545151,247	658383,318	171	6
912	950	4544810,737	658108,124	170	17
	659	4544810,737	658108,124	171	6
913	44	4545055,298	657461,21	188	1
	1565	4545055,298	657461,21	189	18
915	376	4543891,872	659504,134	30	7
	832	4543891,872	659504,134	141	7
916	2006	4544161,32	657876,66	155	10
	98	4544161,32	657876,66	170	17
918	1416	4547674,479	656153,393	42	1
	47	4547674,479	656153,393	149	1
920	142	4548857,228	657252,502	149	1
	352	4548857,228	657252,502	150	1
	969	4548857,228	657252,502	176	32
921	541	4545860,065	656771,381	189	18
	158	4545860,065	656771,381	194	1
	115	4545860,065	656771,381	196	49

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
924	427	4546556,513	655966,656	164	14
	387	4546556,513	655966,656	185	41
925	1450	4546988,87	656655,45	121	35
	2443	4546988,87	656655,45	185	41
	668	4546988,87	656655,45	186	35
929	624	4548670,375	637111,314	27	6
	1445	4548670,375	637111,314	43	6
930	305	4542301,688	640891,818	127	36
	838	4542301,688	640891,818	128	1
935	90	4546870,481	640320,453	70	9
	607	4546870,481	640320,453	79	20
941	900	4544023,967	639488,587	3	2
	1529	4544023,967	639488,587	102	2
942	745	4541987,971	638680,668	81	5
	218	4541987,971	638680,668	83	7
944	292	4541966,905	639113,424	83	7
	671	4541966,905	639113,424	101	47
945	620	4544499,317	640229,011	40	1
	2252	4544499,317	640229,011	103	1
946	2196	4543457,981	641204,38	120	25
	305	4543457,981	641204,38	130	17
	1280	4543457,981	641204,38	162	1
	1500	4543457,981	641204,38	163	25
949	240	4541081,704	640138,901	66	1
	444	4541081,704	640138,901	100	4
951	2527	4543408,909	638422,184	80	29
	932	4543408,909	638422,184	102	2
952	883	4543374,966	641948,017	17	1
	1418	4543374,966	641948,017	131	31
	1547	4543374,966	641948,017	162	1
953	1625	4544265,372	638747,103	69	43
	983	4544265,372	638747,103	80	29
954	1144	4542046,395	640465,283	100	4
	1239	4542046,395	640465,283	128	1
957	1322	4542469,285	639720,967	101	47
	722	4542469,285	639720,967	128	1
960	415	4549366,295	637945,225	43	6
	44	4549366,295	637945,225	70	9
966	1806	4545333,723	640550,715	16	20
	92	4545333,723	640550,715	79	20
967	786	4543694,37	640360,839	17	1
	2351	4543694,37	640360,839	129	1
	700	4543694,37	640360,839	130	17

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
968	1798	4545407,783	639846,977	79	20
	632	4545407,783	639846,977	103	1
971	546	4544325,663	641668,775	104	36
	95	4544325,663	641668,775	131	31
974	310	4544938,292	641147,857	103	1
	298	4544938,292	641147,857	104	36
978	103	4540472,013	642558,224	98	28
	1475	4540472,013	642558,224	99	43
984	168	4542671,942	639683,843	102	2
	730	4542671,942	639683,843	128	1
	573	4542671,942	639683,843	129	1
986	587	4542708,697	640186,317	23	1
	884	4542708,697	640186,317	128	1
988	933	4542038,44	642000,893	99	43
	582	4542038,44	642000,893	127	36
1066	403	4549548,195	661395,159	112	24
	229	4549548,195	661395,159	143	37
1082	359	4543573,968	663498,862	56	16
	87	4543573,968	663498,862	163	25
1114	135	4542453,691	661948,135	57	8
	27	4542453,691	661948,135	120	25
	126	4542453,691	661948,135	121	35
1141	1278	4540660,664	661601,373	10	41
	910	4540660,664	661601,373	58	21
1142	590	4541809,018	662597,916	32	24
	150	4541809,018	662597,916	57	8
1153	710	4542338,759	664328,995	8	12
	101	4542338,759	664328,995	9	25
1158	1158	4549085,367	659385,548	18	27
	1112	4549085,367	659385,548	151	1
	180	4549085,367	659385,548	175	27
1159	1014	4548944,849	659164,793	17	1
	1436	4548944,849	659164,793	151	1
1161	390	4548220,441	660757,639	191	13
	129	4548220,441	660757,639	193	34
1163	118	4548367,902	660818,505	174	34
	401	4548367,902	660818,505	193	34
1166	395	4548364,911	659201,37	193	34
	785	4548364,911	659201,37	194	1
1169	385	4549610,036	657797,353	148	1
	334	4549610,036	657797,353	150	1
1170	687	4550008,515	658532,015	29	1
	32	4550008,515	658532,015	150	1

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
1178	841	4548848,479	660581,538	143	37
	682	4548848,479	660581,538	174	34
1190	458	4547020,579	660815,32	173	22
	2020	4547020,579	660815,32	191	13
1196	1560	4547765,142	662129,078	46	22
	148	4547765,142	662129,078	173	22
1197	1669	4548033,62	661730,742	119	16
	39	4548033,62	661730,742	192	16
1210	112	4543384,618	657627,206	140	1
	387	4543384,618	657627,206	156	23
1215	877	4543199,25	656734,723	26	23
	371	4543199,25	656734,723	156	23
1216	61	4542930,594	656825,005	156	23
	1187	4542930,594	656825,005	157	33
1221	1362	4541346,658	657464,112	60	3
	355	4541346,658	657464,112	88	6
	871	4541346,658	657464,112	122	1
1222	2558	4542521,461	656715,609	25	33
	1005	4542521,461	656715,609	157	33
1241	278	4542598,714	659693,771	89	18
	342	4542598,714	659693,771	186	35
1252	796	4549934,782	668416,74	93	28
	19	4549934,782	668416,74	94	1
1254	488	4549616,849	667541,631	8	12
	871	4549616,849	667541,631	115	12
1261	259	4548679,264	666067,34	116	35
	164	4548679,264	666067,34	145	10
1276	108	4549885,798	667241,757	114	12
	432	4549885,798	667241,757	115	12
1280	502	4546643,535	664794,025	117	3
	122	4546643,535	664794,025	146	12
1290	207	4549509,252	665707,041	144	1
	33	4549509,252	665707,041	145	10
1299	1769	4549297,533	668298,157	47	28
	2248	4549297,533	668298,157	93	28
1301	155	4550982,118	666833,777	50	32
	163	4550982,118	666833,777	95	8
1307	872	4550793,606	668171,558	22	1
	349	4550793,606	668171,558	52	4
	559	4550793,606	668171,558	94	1
1308	1098	4550592,609	667904,212	94	1
	682	4550592,609	667904,212	115	12

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
1315	800	4547638,455	664900,765	145	10
	282	4547638,455	664900,765	146	12
1322	385	4546484,145	649563,091	17	1
	2803	4546484,145	649563,091	106	1
1324	1812	4546473,358	650309,914	106	1
	982	4546473,358	650309,914	107	42
	394	4546473,358	650309,914	135	3
1326	12	4546834,423	651191,97	135	3
	1394	4546834,423	651191,97	136	38
1330	675	4539995,146	649913,065	64	17
	321	4539995,146	649913,065	85	4
1332	1373	4540378,674	649262,594	85	4
	1307	4540378,674	649262,594	126	38
1335	348	4541331,926	650724,334	17	1
	1049	4541331,926	650724,334	125	1
1337	620	4539773,007	650821,894	37	1
	1029	4539773,007	650821,894	63	31
1341	31	4544524,133	650767,288	161	33
	1263	4544524,133	650767,288	177	44
1342	105	4543823,193	650531,502	132	34
	1189	4543823,193	650531,502	163	25
1343	115	4543630,846	650990,918	163	25
	1149	4543630,846	650990,918	177	44
	30	4543630,846	650990,918	178	39
1346	451	4542497,204	651518,24	134	1
	1360	4542497,204	651518,24	160	46
1347	753	4542819,828	651075,595	23	1
	1058	4542819,828	651075,595	134	1
1350	1013	4542166,417	649736,3	126	38
	5000	4542166,417	649736,3	133	44
	778	4542166,417	649736,3	134	1
1353	1312	4540510,582	651067,828	63	31
	395	4540510,582	651067,828	86	24
1354	3606	4546683,166	651651,828	136	38
	1620	4546683,166	651651,828	137	10
1356	1314	4542202,078	650082,704	125	1
	323	4542202,078	650082,704	134	1
1358	18	4541735,273	651218,321	86	24
	892	4541735,273	651218,321	125	1

NODE NUMBER	SERVED PEOPLE	X COORDINATE	Y COORDINATE	SERVER ROUTE NUMBER	SERVER HOT MEAL PRODUCTION UNIT NUMBER
1474	244	4547633,454	605658,321	21	11
	295	4547633,454	605658,321	22	1
	280	4547633,454	605658,321	42	1
	66	4547633,454	605658,321	43	6
1506	49	4554112,153	610757,41	23	1
	81	4554112,153	610757,41	109	15
1555	253	4545896,788	614485,13	20	20
	139	4545896,788	614485,13	21	11
1566	143	4547254,002	667340,902	53	30
	154	4547254,002	667340,902	92	7
1598	1709	4548468,683	667484,951	92	7
	436	4548468,683	667484,951	115	12
	1088	4548468,683	667484,951	116	35
1620	258	4550728,25	657280,14	111	14
	100	4550728,25	657280,14	147	37
	88	4550728,25	657280,14	148	1
1654	238	4552597,744	656673,443	46	22
	22	4552597,744	656673,443	97	15
1656	163	4553004,602	656153,3	45	1
	97	4553004,602	656153,3	97	15
1675	476	4551657,678	657500,487	73	14
	7	4551657,678	657500,487	96	1
1692	247	4552283,452	658889,38	47	28
	98	4552283,452	658889,38	96	1
1710	348	4551317,374	656543,086	110	40
	31	4551317,374	656543,086	148	1
1743	92	4540703,588	661365,032	34	15
	3546	4540703,588	661365,032	58	21
1752	544	4541479,506	661145,194	58	21
	49	4541479,506	661145,194	89	18
1753	2041	4538901,399	659529,64	11	30
	3	4538901,399	659529,64	12	19

Appendix: C

Table C.1: Routing results for scenario 1

	ROUTE	12	16	1	8	6	4	15	5	14	13	2	7	3	11	9	10	12	NA	NA
1	X COORD	4562028,01	4551067,441	4578566,964	4562901,674	4561013,032	4565110,54	4545645,617	4555046,785	4548615,214	4564437,826	4577966,996	4571286,185	4569952,236	4563365,504	4563697,895	4572522,768	4562028,01	NA	NA
	Y COORD	644022,142	649961,29	640691,615	643829,795	640694,686	642788,496	665186,747	669921,167	639938,361	646454,979	641171,709	651596,46	641533,563	645221,831	645508,996	627026,212	644022,142	NA	NA
	SERVED PEOPLE	67	1189	81	406	109	454	316	236	112	565	81	149	770	224	224	17	67	NA	NA
2	ROUTE	2008	21	18	26	22	29	19	17	30	25	28	24	20	23	27	2008	NA	NA	NA
	X COORD	4550781,801	4565592,484	4569027,09	4560316,436	4566936,537	4558705,519	4568832,533	4569926,638	4556920,521	4568621,593	4566771,241	4561207,261	4566523,139	4561325,503	4559488,505	4550781,801	NA	NA	NA
	Y COORD	661454,658	653074,827	655553,577	658479,26	651602,992	655411,827	660068,484	657112,199	655479,552	665568,837	666515,247	657952,164	655235,383	657215,82	658554,136	661454,658	NA	NA	NA
	SERVED P.	NA	55	34	959	19	349	121	34	106	35	391	959	20	959	NA	NA	NA	NA	NA
3	ROUTE	2009	32	37	33	35	43	42	36	38	34	40	44	31	41	39	2009	NA	NA	NA
	X COORD	4551500,371	4564269,725	4566659,906	4562652,543	4563419,222	4559458,283	4560136,492	4563185,596	4560705,587	4562234,971	4559626,55	4544023,967	4564986,901	4560461,423	4560814,606	4551500,371	NA	NA	NA
	Y COORD	667363,209	669619,949	676746,509	670157,243	668763,095	670483,245	671711,727	668995,049	671218,686	671692,87	670865,781	639488,587	669621,959	671740,866	671763,021	667363,209	NA	NA	NA
	SERVED P.	NA	212	521	468	468	4	265	468	265	468	219	900	212	265	265	NA	NA	NA	NA
4	ROUTE	55	53	50	54	52	45	51	49	56	48	47	46	55	NA	NA	NA	NA	NA	NA
	X COORD	4558476,168	4558245,999	4558742,877	4556560,788	4556628,789	4559862,377	4559534,606	4559458,283	4545740,93	4559545,605	4559996,84	4559874,738	4558476,168	NA	NA	NA	NA	NA	NA
	Y COORD	669931,041	670340,381	671101,777	671889,991	672013,658	672722,618	670044,314	670483,245	655640,069	671796,587	672226,88	672473,48	669931,041	NA	NA	NA	NA	NA	NA
	SERVED P.	185	491	872	349	349	314	267	215	1065	314	265	314	185	NA	NA	NA	NA	NA	NA
5	ROUTE	2008	70	69	66	59	68	64	58	57	61	60	63	62	65	67	2008	NA	NA	NA
	X COORD	4550781,801	4549482,363	4554773,005	4554867,485	4554543,875	4554465,858	4554890,401	4554101,443	4554098,987	4553992,984	4554491,266	4553573,464	4554770,437	4554580,732	4553643,292	4550781,801	NA	NA	NA
	Y COORD	661454,658	664528,159	671067,547	671753,757	672730,127	671046,845	672221,186	672460,416	673027,215	672164,474	672589,334	672171,321	672362,159	671728,708	671438,519	661454,658	NA	NA	NA
	SERVED P.	NA	659	368	187	304	236	304	392	304	392	304	392	304	187	667	NA	NA	NA	NA
6	ROUTE	1494	82	78	81	80	77	74	71	75	83	84	79	76	73	72	1494	NA	NA	NA
	X COORD	4547638,455	4548916,389	4551172,3	4548616,075	4549931,942	4551457,415	4551114,564	4550005,68	4549652,498	4549020,837	4550854,868	4551048,877	4551425,281	4549812,402	4550941,211	4547638,455	NA	NA	NA
	Y COORD	664900,765	671164,416	671702,708	671616,872	670498,276	672297,94	671931,686	672177,855	671048,31	671030,844	670693,728	671541,067	672302,652	671214,805	672103,791	664900,765	NA	NA	NA
	SERVED P.	800	118	389	380	1518	128	128	562	387	118	240	389	128	387	128	800	NA	NA	NA
7	ROUTE	2008	93	95	87	91	85	89	92	90	96	88	86	94	2008	NA	NA	NA	NA	NA
	X COORD	4550781,801	4546218,382	4547778,343	4547066,193	4547519,603	4546371,496	4546112,557	4546431,278	4547830,317	4547307,03	4547217,21	4546482,879	4546080,376	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	668719,976	669907,099	670394,36	670045,034	670609,358	669338,543	668760,267	670761,318	669341,995	670434,883	669951,591	668822,021	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	127	301	314	699	314	1113	267	150	219	314	1055	127	NA	NA	NA	NA	NA	NA
8	ROUTE	1498	105	98	102	104	97	106	103	100	101	99	1498	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547037,483	4542338,759	4541580,011	4543713,287	4543717,714	4544190,019	4549616,849	4542247,893	4541738,663	4544579,734	4541127,38	4547037,483	NA	NA	NA	NA	NA	NA	NA
	Y COORD	665120,696	664328,995	665752,685	665816,46	665711,783	666939,046	667541,631	664465,653	665205,953	667077,075	666078,169	665120,696	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	245	710	163	555	112	1284	488	177	14	297	1200	245	NA	NA	NA	NA	NA	NA	NA
9	ROUTE	109	116	112	108	110	114	113	107	115	111	109	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542896,129	4541678,449	4542338,759	4541963,398	4542188,345	4541432,615	4542719,765	4540962,696	4541914,708	4541795,708	4542896,129	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661665,267	663377,441	664328,995	664345,642	664230,134	663379,052	664709,841	665233,514	663679,802	663814,537	661665,267	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	164	1166	101	559	885	663	302	472	344	344	164	NA	NA	NA	NA	NA	NA	NA	NA
10	ROUTE	121	119	120	122	117	118	121	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542203,785	4540415,132	4539925,08	4540660,664	4539867,859	4539863,816	4542203,785	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	662190,502	661849,314	661010,841	661601,373	661831,98	661724,138	662190,502	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	740	750	732	1278	750	750	740	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	ROUTE	620	130	125	129	124	126	127	123	128	620	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546419,191	4538901,399	4546927,426	4546800,923	4546908,474	4547521,834	4546963,178	4546823,564	4547760,977	4546419,191	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667492,565	659529,64	667933,908	667448,5	668446,276	668524,525	667843,105	668737,474	668414,086	667492,565	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	572	2041	435	947	161	357	435	267	357	572	NA	NA	NA	NA	NA	NA	NA	NA	NA
12	ROUTE	1863	132	133	131	1863	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4543270,667	4539941,239	4539462,344	4538901,399	4543270,667	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	656195,778	659327,952	658666,248	659529,64	656195,778	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1125	4859	138	3	1125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13	ROUTE	2008	140	144	143	142	139	134	136	138	146	145	141	137	135	2008	NA	NA	NA	NA
	X COORD	4550781,801	4538666,49	4538462,442	4538938,679	4538608,82	4538484,643	4537834,351	4538214,958	4538795,705	4539025,376	4539027,055	4538390,111	4538498,957	4538028,799	4550781,801	NA	NA	NA	NA
	Y COORD	661454,658	657155,84	656734,797	657711,869	657967,123	657962,761	657491,554	657283,606	657370	657192,881	657272,419	658177,066	657487,832	657232,095	661454,658	NA	NA	NA	NA
	SERVED P.	NA	308	807	234	234	234	983	262	308	67	308	685	308	262	NA	NA	NA	NA	NA

29	ROUTE	2008	345	347	344	348	340	349	346	342	336	339	337	343	341	338	335	2008	NA	NA
	X COORD	4550781,801	4553686,303	4552442,124	4552403,201	4552421,677	4555371,7	4550008,515	4553413,88	4556251,414	4556033,55	4555795,674	4555687,648	4555291,118	4556541,149	4555925,491	4555970,972	4550781,801	NA	NA
	Y COORD	661454,658	670541,969	671642,647	671838,009	671465,243	671341,305	658532,015	670787,327	670889,882	671459,179	671217,121	671661,736	671137,162	671285,863	671186,237	672211,474	661454,658	NA	NA
	SERVED P.	NA	562	358	358	358	187	687	562	295	295	187	187	187	295	187	295	NA	NA	NA
30	ROUTE	1449	356	355	361	352	354	360	357	362	350	359	364	353	363	358	351	1449	NA	NA
	X COORD	4544539,006	4548827,41	4548660,955	4548645,784	4548400,176	4547829,911	4547818,128	4548299,801	4547766,256	4548307,06	4547307,03	4543891,872	4548904,583	4549113,485	4547999,883	4548944,041	4544539,006	NA	NA
	Y COORD	659463,197	669574,029	669511,079	668558,611	670254,362	669665,010	668806,107	668722,011	668601,443	671012,133	669341,995	659504,134	670653,449	668733,245	668857,024	670805,014	659463,197	NA	NA
	SERVED P.	364	404	404	464	404	301	357	464	357	150	156	376	118	464	464	364	NA	NA	NA
31	ROUTE	666	376	369	372	377	366	371	369	375	378	373	370	365	374	367	666	NA	NA	NA
	X COORD	4542453,691	4546800,414	4545026,805	4544862,357	4546908,474	4545976,588	4546544,635	4545582,522	4546488,486	4537712,753	4545286,938	4546450,304	4545386,899	4546611,5	4546263,647	4542453,691	NA	NA	NA
	Y COORD	661948,135	668332,979	667658,417	667594,673	668446,276	668147,773	668429,138	667568,019	668036,629	643905,313	667061,093	668263,398	668391,575	668620,283	668332,03	661948,135	NA	NA	NA
	SERVED P.	135	267	220	392	106	608	267	308	572	567	308	267	243	267	608	135	NA	NA	NA
32	ROUTE	928	382	379	385	381	384	383	380	928	NA	NA	NA	NA	NA	928	NA	NA	NA	NA
	X COORD	4541902,843	4542784,596	4541831,321	4541809,018	4542120,547	4542328,068	4542422,161	4541678,449	4541902,843	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	652713,011	663931,784	663925,885	662597,916	663446,268	663204,699	663358,982	663377,441	652713,011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	206	1289	885	590	344	344	931	617	206	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
33	ROUTE	1255	392	388	396	394	397	387	390	389	393	391	386	395	1255	NA	NA	NA	NA	NA
	X COORD	4544462,708	4541632,867	4540975,808	4540936,481	4541469,324	4541223,517	4541129,673	4541243,888	4541227,887	4541374,266	4541463,795	4541029,671	4541629,033	4544462,708	NA	NA	NA	NA	NA
	Y COORD	663376,467	662430,702	662322,315	661786,791	662626,087	661851,518	662476,892	662667,223	662550,556	662133,72	662354,189	662427,171	662553,812	663376,467	NA	NA	NA	NA	NA
	SERVED P.	287	305	438	438	397	397	663	305	663	305	305	438	305	287	NA	NA	NA	NA	NA
34	ROUTE	1150	401	398	403	399	405	404	400	402	1150	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4564701,248	4540745,25	4539852,829	4540424,699	4540062,741	4540703,588	4540793,508	4540054,158	4540965,835	4564701,248	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	627751,532	660704,586	660824,883	660203,667	660908,947	661365,032	660394,466	660111,327	660881,54	627751,532	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	159	732	732	660	732	92	660	660	732	159	NA	NA	NA	NA	NA	NA	NA	NA	NA
35	ROUTE	417	413	419	416	418	409	412	411	417	414	410	408	407	406	415	417	NA	NA	NA
	X COORD	4540011,537	4539025,376	4551443,18	4539727,499	4540127,271	4539057,293	4539329,347	4539361,623	4540011,537	4539462,344	4539225,498	4539164,429	4539214,258	4539040,471	4539545,585	4540011,537	NA	NA	NA
	Y COORD	658489,871	657192,881	655938,008	657319,45	657604,329	657777,519	657915,343	658094,363	658489,871	658666,248	658177,644	658124,104	658033,381	658029,6	657161,005	658489,871	NA	NA	NA
	SERVED P.	479	241	1671	234	88	234	234	234	479	341	234	234	234	234	308	479	NA	NA	NA
36	ROUTE	197	420	432	426	422	427	431	433	424	421	425	423	430	429	428	197	NA	NA	NA
	X COORD	4541170,334	4539344,88	4539125,85	4538512,062	4539025,778	4538758,675	4538964,999	4539962,565	4539162,603	4539015,005	4539278,486	4539291,972	4538921,811	4539023,734	4538761,584	4541170,334	NA	NA	NA
	Y COORD	629755,525	629606,691	665394,026	655971,01	629195,156	655844,217	655337,403	655901,342	629099,067	629265,281	629092,243	629344,401	655428,264	655890,367	655714,218	629755,525	NA	NA	NA
	SERVED P.	606	166	251	1915	166	251	251	1522	166	166	166	166	251	308	606	NA	NA	NA	NA
37	ROUTE	2008	442	437	435	434	439	438	440	436	441	2008	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4539773,007	4537605,914	4537357,701	4537145,072	4538108,409	4538143,95	4537969,162	4537532,679	4538942,416	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	650821,894	651270,985	651153,506	650995,877	651412,031	650906,34	649708,9	651162,509	650057,84	661454,658	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	620	468	468	468	468	468	468	576	468	996	NA	NA	NA	NA	NA	NA	NA	NA
38	ROUTE	708	443	447	445	444	446	708	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539911,102	4537427,675	4538157,886	4538102,269	4537935,015	4537531,111	4539911,102	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	649386,671	646218,624	646416,901	646055,197	646544,205	645474,124	649386,671	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	755	1149	648	1027	1027	1149	755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
39	ROUTE	666	455	449	454	450	448	458	457	451	452	456	459	453	666	NA	NA	NA	NA	NA
	X COORD	4542453,691	4537894,791	4545580,737	4538206,185	4545863,869	4545342,637	4538119,019	4538125,087	4537629,924	4537712,753	4538058,088	4537890,791	4537912,126	4542453,691	NA	NA	NA	NA	NA
	Y COORD	661948,135	644773,5	668026,688	643970,374	668806,541	668133,543	643800,527	643829,693	644199,566	643905,313	643788,068	644833,937	644709,563	661948,135	NA	NA	NA	NA	NA
	SERVED P.	135	453	220	568	127	220	568	568	763	196	568	296	453	135	NA	NA	NA	NA	NA
40	ROUTE	2008	463	471	467	461	465	469	462	464	470	466	468	460	2008	NA	NA	NA	NA	NA
	X COORD	4550781,801	4538310,302	4540857,516	4538875,896	4538880,511	4539163,338	4551411,8	4538949,183	4539190,811	4544499,317	4539258,348	4545770,319	4539181,541	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	636918,347	654729,06	636714,268	635251,769	636241,317	648321,18	635192,655	635299,702	640229,011	636212,473	657672,284	635905,379	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	30	330	420	88	488	794	88	88	620	488	1078	488	NA	NA	NA	NA	NA	NA
41	ROUTE	2008	482	483	476	475	477	480	474	478	481	478	479	2008	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4541677,562	4541912,084	4542374,126	4542677,851	4542102,905	4542065,681	4542476,417	4542681,715	4542080,719	4542674,054	4542496,782	4542019,663	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	634681,328	635087,784	633596,841	633232,952	634553,624	634852,537	632943,7011	632724,223	634798,128	635146,396	632418,05	634768,643	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	612	23	656	413	656	295	413	343	295	656	343	295	NA	NA	NA	NA	NA	NA
42	ROUTE	2008	486	487	495	497	484	498	491	493	494	496	492	488	486	490	489	499	500	2008
	X COORD	4550781,801	4550824,222	4550780,65	4556253,408	4556564,317	4550575,652	4548189,271	455477,86	4550588,933	4556357,572	4556571,923	4555629,036	4550868,437	4550625,943	4554204,157	4553437,489	4547633,454	4547674,479	4550781,801
	Y COORD	661454,658	619174,416	615523,806	621795,601	623184,068	619074,9	605176,678	623030,938	622872,202	621614,077	623040,805	622305,511	615250,19	615746,749	623329,05	621787,866	605658,321	656153,393	661454,658
	SERVED P.	NA	179	131	130	302	179	403	302	302	302	302	130	131	302	131	250	280	1416	NA
43	ROUTE	1781	511	506	501	512	507	508	509	504	503	502	505	510	1781	NA	NA	NA	NA	NA
	X COORD	4545618,936	4547206,95	4548801,669	4558184,51	4549366,295	4545961,432	4548670,375	4548840,374	4547633,454	4557741,664	4557759,538	4548830,115	4547510,368	4545618,936	NA	NA	NA	NA	NA
	Y COORD	658187,026	639154,647	635836,483	661611,697	637945,225	636329,081	637111,314	638166,164	605658,321	661300,544	661556,688	635390,89	639440,219	658187,026	NA	NA	NA	NA	NA
	SERVED P.	1082	459	262	208	415														

44	ROUTE	515	519	522	518	520	516	521	514	517	513	523	515	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4553517.735	4555961.775	4555070.538	4555233.48	4560655.38	4560322.52	4554171.79	4560341.593	4555286.819	4557175.721	4560421.285	4553517.735	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	649252.455	654070.978	653550.177	653239.985	648052.894	648441.842	647345.917	648981.231	653246.322	649987.631	647477.821	649252.455	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	2907	398	107	107	250	250	131	250	107	250	243	2907	NA	NA	NA	NA	NA	NA	NA	NA
45	ROUTE	2008	535	531	529	525	526	536	534	533	532	537	524	527	530	528	2008	NA	NA	NA	NA
	X COORD	4550781.801	4552922.885	4553222.106	4554835.845	4555239.479	4554566.938	4553280.146	4553273.009	4552865.019	4553145.624	4553004.602	4555386.163	4554729.028	4554777.064	4554948.608	4550781.801	NA	NA	NA	NA
	Y COORD	661454.658	655723.722	655018.625	653729.373	654337.718	654340.467	656127.883	655801.974	655036.491	655175.247	656153.3	654854.326	654155.789	653590.096	653666.15	661454.658	NA	NA	NA	NA
	SERVED P.	NA	1786	442	107	335	107	260	260	442	242	163	335	107	107	107	NA	NA	NA	NA	NA
46	ROUTE	542	538	549	539	543	540	548	546	544	546	547	550	542	NA	NA	NA	NA	NA	NA	NA
	X COORD	4553105.396	4553077.586	4552597.744	4552681.428	4552706.303	4552634.219	4552389.093	4552928.021	4552014.036	4552532.601	4552808.5	4551704.535	4547765.142	4553105.396	NA	NA	NA	NA	NA	NA
	Y COORD	656445.151	656794.222	656673.443	657176.385	656774.113	657195.2	656940.106	656504.474	657464.651	657291.453	656657.397	657628.585	662129.078	656445.151	NA	NA	NA	NA	NA	NA
	SERVED P.	260	260	238	260	260	260	260	260	379	260	260	483	1560	260	NA	NA	NA	NA	NA	NA
47	ROUTE	557	558	551	559	553	554	555	560	556	552	557	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4552055.457	4551639.449	4551710.678	4552283.452	4552258.486	4551873.789	4552297.689	4549297.533	4552335.955	4551825.308	4552055.457	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658753.581	659804.308	659624.502	658889.38	658985.402	659007.607	658998.754	668298.157	658991.466	659215.859	658753.581	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	345	457	457	247	345	345	345	1769	345	345	345	NA	NA	NA	NA	NA	NA	NA	NA	NA
48	ROUTE	2008	562	570	566	571	563	564	567	565	568	561	572	569	2008	NA	NA	NA	NA	NA	NA
	X COORD	4550781.801	4551507.206	4551335.119	4550900.955	4551622.388	4551145.924	4551330.386	4551076.085	4551195.071	4551470.4	4551731.117	4551375.761	4551071.224	4550781.801	NA	NA	NA	NA	NA	NA
	Y COORD	661454.658	660197.556	659219.831	660044.201	658800.968	659874.209	659650.401	660255.998	660214.057	659137.013	659986.755	658891.564	659510.173	661454.658	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	449	367	457	449	367	457	457	367	449	367	449	367	NA	NA	NA	NA	NA	NA	NA
49	ROUTE	2008	575	576	581	580	573	578	577	579	574	2008	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781.801	4550265.342	4550008.548	4550589.692	4549567.558	4550518.176	4550206.018	4550299.617	4549523.084	4550478.288	4550781.801	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454.658	661354.053	661526.877	660660.322	661611.571	661880.433	661068.17	662683.434	662021.343	662103.216	661454.658	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	575	575	398	575	520	868	339	575	575	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
50	ROUTE	1829	590	594	585	588	584	586	593	587	589	592	583	591	582	1829	NA	NA	NA	NA	NA
	X COORD	4548074.034	4550085.445	4540514.539	4550891.076	4550433.265	4551152.321	4551411.195	4550982.118	4550665.233	4549858.009	4551472.395	4551154.997	4549859.889	4551083.728	4548074.034	NA	NA	NA	NA	NA
	Y COORD	658159.613	665090.12	643564.67	665816.438	665983.058	665867.779	665712.301	666833.777	665813.454	665450.525	666510.201	665473.327	665238.206	665400.758	658159.613	NA	NA	NA	NA	NA
	SERVED P.	379	240	1406	343	343	343	343	155	343	240	318	343	240	343	379	NA	NA	NA	NA	NA
51	ROUTE	417	599	598	595	600	601	604	596	602	605	597	603	417	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540011.537	4554388.458	4553849.467	4553488.277	4551477.365	4551357.475	4552561.174	4553584.651	4551148.141	4551772.933	4553928.662	4551380.454	4540011.537	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658489.871	668178.753	668187.356	667803.579	667530.713	667598.486	669486.517	667977.776	667968.616	666871.926	668075.091	667346.447	658489.871	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	479	492	492	297	318	318	358	492	1169	59	492	318	479	NA	NA	NA	NA	NA	NA	NA
52	ROUTE	2011	617	610	606	611	608	607	609	612	615	614	613	616	2011	NA	NA	NA	NA	NA	NA
	X COORD	4545061.715	4550793.806	4550979.517	4552160.124	4550500.115	4551319.561	4552090.31	4551369.783	4550821.133	4550592.414	4550454.339	4550388.119	4549801.75	4545061.715	NA	NA	NA	NA	NA	NA
	Y COORD	654298.926	668171.558	669275.063	671252.332	669557.575	671119.757	671319.135	670647.103	668900.456	668917.53	669127.528	669211.442	669217.062	654298.926	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	349	303	333	61	343	1949	389	303	303	303	303	61	NA	NA	NA	NA	NA	NA	NA
53	ROUTE	620	623	618	618	619	621	622	620	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546419.191	4547254.002	4538901.399	4547148.653	4547177.941	4547385.365	4547229.213	4546419.191	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667492.565	667340.902	659529.64	667571.131	667448.549	667622.174	667319.658	667492.565	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	572	143	2959	297	297	435	297	572	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
54	ROUTE	865	627	634	637	633	632	625	628	630	629	626	636	631	635	865	NA	NA	NA	NA	NA
	X COORD	4545407.783	4544670.994	4544771.12	4544269.354	4545470.218	4545222.006	4544404.773	4544853.534	4545275.151	4544881.138	4544542.673	4545434.553	4544943.537	4546144.32	4545407.783	NA	NA	NA	NA	NA
	Y COORD	639846.977	620617.524	665742.938	665814.106	666169.425	665938.428	621281.239	620510.382	620126.299	620394.852	620633.004	665810.916	667000.809	667260.746	639846.977	NA	NA	NA	NA	NA
	SERVED P.	1798	120	832	609	724	755	120	120	120	120	120	755	297	308	1798	NA	NA	NA	NA	NA
55	ROUTE	1863	639	643	638	642	644	640	641	1863	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4543270.667	4544778.133	4545693.049	4544371.224	4545490.997	4543949.241	4543762.693	4543422.323	4543270.667	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	656195.778	664917.426	665374.231	665064.012	665310.771	643459.075	664221.417	664339.026	656195.778	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1125	468	11	1427	936	1108	525	525	1125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
56	ROUTE	1255	647	649	650	648	652	645	651	646	1255	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4544462.708	4543265.21	4543428.69	4542948.416	4543476.7	4543573.968	4543047.789	4543271.208	4543255.73	4544462.708	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	663376.467	663760.73	663820.271	663445.081	663937.31	663498.862	664101.523	663466.442	664251.352	663376.467	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	287	741	446	931	446	359	811	741	525	287	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
57	ROUTE	666	660	663	658	661	655	662	666	653	659	665	654	664	657	666	NA	NA	NA	NA	NA
	X COORD	4542453.691	4541307.285	4541223.517	4541416.994	4542385.178	4541809.018	4541768.4	4541771.419	4541582.816	4541891.921	4542685.429	4541723.694	4542100.53	4541677.138	4542453.691	NA	NA	NA	NA	NA
	Y COORD	661948.135	661846.849	661851.518	662012.483	663031.236	662597.916	661703.859	662396.485	662677.53	661929.734	662249.935	662671.931	661693.121	662035.916	661948.135	NA	NA	NA	NA	NA
	SERVED P.	135	288	41	305	344	350	288	740	305	288	1218	305	288	305	135	NA	NA	NA	NA	NA
58	ROUTE	1885	668	667	669	1885	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4544663.811	4540703.588	4540660.664	4541479.506	4544663.811	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655645.492	661365.032	661601.373	661145.194	655645.492	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	402	3546	910	544	402	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

74	ROUTE	1398	799	798	1398	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546834,423	4551691,125	4552061,002	4546834,423	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651191,97	648232,185	647092,519	651191,97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1394	3109	1891	1394	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
75	ROUTE	2008	812	810	805	815	804	806	811	808	800	802	807	801	809	814	813	803	2008	NA
	X COORD	4550781,801	4561248,327	4561418,738	4560461,315	4545613,018	4561897,039	4562001,68	4560616,969	4560474,072	4561386,662	4560831,366	4560095,297	4560511,478	4560474,845	4560555,933	4560211,436	4561196,456	4550781,801	NA
	Y COORD	661454,658	645461,04	645224,485	645662,689	661627,66	644220,514	644343,43	646033,398	645972,653	644413,004	645068,542	646285,518	645338,162	646124,375	646488,768	646720,301	644710,741	661454,658	NA
	SERVED P.	NA	336	336	273	587	67	68	273	273	336	273	273	273	135	888	336	336	NA	NA
76	ROUTE	542	821	816	822	819	820	818	817	542	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4553105,396	4560797,863	4562291,127	4560555,933	4560421,285	4560938,286	4560990,595	4561308,231	4553105,396	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	656445,151	647054,862	648223,946	646488,768	647477,821	646935,977	647935,328	647866,794	656445,151	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	260	888	569	479	570	888	813	793	260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
77	ROUTE	2008	824	826	837	828	829	831	834	823	825	833	835	836	827	832	830	2008	NA	NA
	X COORD	4550781,801	4538546,99	4538101,689	4548355,304	4537867,109	4538169,817	4538564,378	4560555,933	4537815,567	4538020,882	4538795,076	4551691,125	4551411,8	4537961,007	4538667,111	4538530,636	4550781,801	NA	NA
	Y COORD	661454,658	635678,259	635222,022	647093,75	634949,224	636348,826	635373,34	646488,768	635003,776	635142,713	635564,664	648232,185	648321,18	635080,16	635466,313	636061,833	661454,658	NA	NA
	SERVED P.	NA	30	88	1757	88	30	88	274	88	88	88	82	2113	88	88	30	NA	NA	NA
78	ROUTE	2008	841	840	839	851	845	849	843	844	850	842	838	853	848	846	847	852	2008	NA
	X COORD	4550781,801	4552219,848	4561959,335	4564929,795	4546762,734	4568354,311	4547461,607	4579145,956	4574083,289	4546490,256	4561297,631	4555927,163	4543949,241	4574524,789	4567909,558	4580517,666	4548355,304	4550781,801	NA
	Y COORD	661454,658	602333,356	611927,109	614820,796	640955,844	613292,382	644038,103	602046,936	607526,721	645044,251	611446,268	603922,786	643459,075	607727,161	613816,749	601446,223	647093,75	661454,658	NA
	SERVED P.	NA	128	65	172	697	82	730	6	44	1097	65	75	1274	44	82	204	235	NA	NA
79	ROUTE	865	854	855	859	862	856	863	857	858	861	864	865	860	865	NA	NA	NA	NA	NA
	X COORD	4545407,783	4537440,923	4537831,182	4538316,708	4546870,481	4538329,364	4546478,179	4537378,237	4538353,638	4538560,255	4545333,723	4545407,783	4537844,342	4545407,783	NA	NA	NA	NA	NA
	Y COORD	639846,977	641533,448	640704,647	640909,166	640320,453	641192,168	640723,99	640168,744	641087,343	641079,664	640550,715	639846,977	640374,121	639846,977	NA	NA	NA	NA	NA
	SERVED P.	1798	210	210	210	607	252	697	210	252	92	1798	210	1798	NA	NA	NA	NA	NA	NA
80	ROUTE	1297	867	868	866	1297	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540456,688	4544265,372	4543408,909	4544625,403	4540456,688	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655686,597	638747,103	638422,184	638451,461	655686,597	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	657	983	2527	1490	657	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
81	ROUTE	2012	872	873	871	870	869	874	875	2012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550580,53	4541928,881	4541004,566	4542096,618	4542077,634	4542095,245	4541287,907	4541987,971	4550580,53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658324,12	638228,506	637487,083	636595,307	636454,671	636271,665	637843,963	638680,668	658324,12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	2872	249	295	249	295	249	745	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
82	ROUTE	2008	878	876	882	880	879	881	890	887	885	888	889	883	877	886	884	2008	NA	NA
	X COORD	4550781,801	4540526,545	4540615,65	4541089,979	4540534,419	4540682,487	4540250,345	4542141,76	4541246,471	4541118,191	4541385,838	4540744,27	4540822,465	4540790,201	4541015,812	4541213,372	4550781,801	NA	NA
	Y COORD	661454,658	637941,208	637390,203	638085,339	638264,269	638261,313	638165,548	657749,029	638332,409	638245,477	638309,225	639060,18	638365,393	637656,285	638410,589	638142,929	661454,658	NA	NA
	SERVED P.	NA	249	488	249	258	258	258	924	258	258	258	526	258	249	258	249	NA	NA	NA
83	ROUTE	1449	894	897	896	898	898	891	892	900	899	895	901	1449	NA	NA	NA	NA	NA	NA
	X COORD	4544539,006	4541036,55	4540734,015	4541237,093	4541436,01	4540158,744	4539641,545	4539804,176	4541778,488	4541987,971	4540877,425	4541966,905	4544539,006	NA	NA	NA	NA	NA	NA
	Y COORD	659463,197	638778,222	639400,595	638795,941	638864,755	639002,025	638344,391	638739,993	638894,537	638680,668	639106,165	639113,424	659463,197	NA	NA	NA	NA	NA	NA
	SERVED P.	364	402	526	526	699	526	526	60	699	218	526	292	364	NA	NA	NA	NA	NA	NA
84	ROUTE	1829	905	903	911	909	906	914	912	910	904	907	913	908	902	1829	NA	NA	NA	NA
	X COORD	4548074,034	4550741,49	4550390,396	4539798,612	4539596,493	4550718,051	4540514,539	4539456,25	4539493,731	4550163,25	4539212,014	4540454,934	4539582,168	4550318,227	4548074,034	NA	NA	NA	NA
	Y COORD	658159,613	666159,771	665749,733	643973,272	643922,791	666267,556	643564,67	643407,12	644029,352	665536,411	643864,096	644039,27	643839,789	665486,065	658159,613	NA	NA	NA	NA
	SERVED P.	379	343	240	543	543	343	385	568	543	240	309	160	543	240	379	NA	NA	NA	NA
85	ROUTE	2011	916	917	915	2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4545061,715	4540143,73	4540378,674	4539995,146	4545061,715	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654298,926	650187,823	649262,594	649913,065	654298,926	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	3306	1373	321	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
86	ROUTE	928	923	918	929	925	920	921	924	919	927	926	928	928	928	NA	NA	NA	NA	NA
	X COORD	4541902,843	4541247,262	4541118,226	4540490,501	4541735,273	4541217,65	4541307,4	4541354,645	4541727,884	4540510,582	4542060,997	4541480,474	4541902,843	NA	NA	NA	NA	NA	NA
	Y COORD	652713,011	652989,977	653087,472	652102,653	651218,321	653170,157	651582,175	651454,938	651578,78	651067,828	652431,169	652983,719	652713,011	NA	NA	NA	NA	NA	NA
	SERVED P.	206	206	206	621	18	206	206	910	206	395	206	206	206	206	206	206	206	206	NA
87	ROUTE	620	931	933	932	934	930	620	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546419,191	4540125,501	4540163,986	4540298,167	4540505,46	4539962,565	4546419,191	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667492,565	655690,61	655556,484	655817,83	655829,651	655901,342	667492,565	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	572	657	2054	532	1100	572	572	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
88	ROUTE	1781	936	946	938	943	948	935	941	944	947	940	945	937	942	939	1781	NA	NA	NA
	X COORD	4545618,936	4540885,014	4541715,64	4541369,246	4541143,645	4545151,247	4540825,326	4541457,4	4541839,593	4541346,658	4541634,646	4542014,184	4541243,53	4541441,977	4541124,5	4545618,936	NA	NA	NA
	Y COORD	658187,026	658841,949	658084,575	659051,977	657842,683	658383,318	658705,547	659123,757	658431,463	657464,112	658593,99	658966,134	658349,432	659201,867	658085,8	658187,026	NA	NA	NA
	SERVED P.	1082	250	465	250	465	1000	250	250	250	355	250	250	250	250	465	1082	NA	NA	NA

89	ROUTE	955	949	954	952	953	950	956	957	951	955	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542078,741	4541217,591	4542493,878	4541741,849	4542222,991	4541426,383	4542313,247	4542598,714	4541479,506	4542078,741	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659282,629	660620,235	661499,666	661095,99	659808,009	660622,734	659473,461	659693,771	661145,194	659282,629	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	620	292	1192	1192	164	593	620	278	49	620	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
90	ROUTE	1173	965	961	959	960	963	958	962	964	1173	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550728,25	4543731,047	4543182,035	4543156,261	4543333,535	4543228,522	4542737,862	4543722,972	4543658,183	4550728,25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657280,14	663069,136	662716,742	663049,841	663048,829	662615,574	663162,592	663161,206	663011,727	657280,14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	258	243	391	1263	1263	391	931	259	259	258	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91	ROUTE	1841	969	971	968	967	972	970	966	1841	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4543418,569	4546279,383	4546332,997	4546156,181	4546244,107	4546428,414	4546439,396	4546143,588	4543418,569	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	653835,898	666412,041	666094,565	666142,753	666264,204	666107,159	666263,049	666320,45	653835,898	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	503	932	571	932	932	130	571	932	503	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
92	ROUTE	1449	976	977	975	973	980	978	974	979	1449	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4544539,006	4547864,696	4547648,066	4546888,318	4547254,002	4546945,238	4548175,809	4547400,65	4548383,015	4544539,006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659463,197	667705,46	666676,327	666841,256	667340,902	666423,179	667141,124	666999,004	667283,744	667484,951	659463,197	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	364	435	467	373	154	373	511	467	511	1709	364	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
93	ROUTE	557	982	988	989	985	990	984	986	983	557	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4552055,457	4552078,739	4549364,606	4549918,359	4551710,794	4549934,782	4551812,782	4551699,323	4552167,567	4549297,533	4552055,457	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658753,581	659478,771	667693,27	668194,928	659408,431	668416,74	659319,942	659391,753	659206,778	668298,157	658753,581	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	345	345	1141	815	367	796	345	367	345	2248	345	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
94	ROUTE	2008	1001	1003	993	1000	996	997	1002	999	1006	995	1004	998	1005	994	992	991	2008	NA	NA	NA	NA	NA
	X COORD	4550781,801	4549934,782	4550177,937	4547977,95	4548605,33	4547937,991	4547831,915	4550408,474	4548596,414	4550592,609	4548333,956	4550244,894	4548241,983	4550793,606	4548399,607	4543336,146	4543589,89	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	668416,74	667985,322	590908,545	590842,57	591211,864	591357,483	668503,867	590699,285	667904,212	590812,308	668025,471	591007,79	668171,558	590653,2	585062,509	585665,547	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	19	815	80	105	105	105	822	80	1098	80	815	105	559	80	66	66	NA	NA	NA	NA	NA	NA
95	ROUTE	666	1017	1007	1015	1011	1009	1010	1014	1016	1008	1018	1012	1013	666	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542453,691	4550062,024	4551772,933	4550261,144	4550904,406	4551318,348	4550982,118	4550423,84	4550264,579	4551439,562	4550324,097	4550505,711	4550490,603	4542453,691	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661948,135	666575,805	666871,926	667125,1	667250,32	667158,506	666833,777	666635,821	666579,915	667047,219	666348,556	666974,36	666666,765	661948,135	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	135	444	743	532	532	318	163	444	444	318	86	532	444	135	NA	NA	NA	NA	NA	NA	NA	NA	NA
96	ROUTE	2008	1029	1027	1024	1021	1031	1032	1020	1028	1025	1019	1030	1033	1022	2008	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4550798,092	4551191,884	4550993,665	4551480,79	4551244,523	4552286,317	4551375,761	4551446,463	4551648,369	4551111,32	4552283,452	4550849,115	4551657,678	4551256,305	4551663,313	4550781,801	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	659137,43	658422,077	658867,018	658754,032	658084,258	656891,373	658891,564	658147,876	658131,512	658683,844	658889,38	659294,293	657500,487	658773,539	658482,081	661454,658	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	367	483	367	483	260	18	483	483	367	98	367	7	483	NA	NA	NA	NA	NA	NA	NA	NA	NA
97	ROUTE	1150	1037	1039	1042	1036	1040	1038	1035	1034	1041	1043	1150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4564701,248	4553004,602	4552421,808	4552297,512	4576808,597	4552065,259	4552597,744	4583116,145	4583428,356	4552356,269	4551613,719	4564701,248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	627751,532	656153,3	655769,327	655460,57	621257,386	656323,036	656673,443	621455,859	621604,472	656627,619	656053,112	627751,532	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	159	97	1452	1786	228	260	22	53	53	260	789	159	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
98	ROUTE	557	1046	1048	1044	1045	1047	1050	1049	557	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4552055,457	4541038,617	4540489,285	4540514,539	4540535,729	4541176,046	4540472,013	4541291,226	4552055,457	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658753,581	643764,96	642800,584	643564,67	643107,358	643634,183	642558,224	643740,311	658753,581	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	345	160	1578	524	2315	160	103	160	345	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
99	ROUTE	1056	1051	1052	1055	1054	1053	1056	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542038,44	4540426,408	4540472,013	4541420,774	4541901,36	4541686,463	4542038,44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	642000,893	642490,525	642558,224	643367,512	642738,387	642909,609	642000,893	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	933	1578	1475	160	694	160	933	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
100	ROUTE	2011	1059	1061	1060	1058	1057	2011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4545061,715	4541362,157	4542046,395	4542111,444	4541402,077	4541081,704	4545061,715	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654298,926	640378,222	640465,283	639954,574	640031,87	640138,901	654298,926	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	684	1144	2044	684	444	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
101	ROUTE	1065	1062	1064	1063	1065	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542469,285	4541966,905	4542504,111	4541994,37	4542469,285	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	639720,967	639113,424	639664,16	639163,108	639720,967	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1322	671	2044	963	1322	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
102	ROUTE	2009	1072	1069	1074	1070	1077	1067	1076	1075	1071	1068	1066	1073	2009	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551500,371	4564684,671	4567878,914	4543408,909	4567897,13	4542671,942	4568114,9	4544023,967	4543169,234	4566921,452	4567975,256	4568381,867	4566741,154	4551500,371	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667363,209	670868,686	671213,034	638422,184	670330,571	639683,843	670692,305	639488,587	639808,438	672383,333	670711,76	670865,876	668766,984	667363,209	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	212	69	932	69	168	69	1529	1471	131	69	69	212	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
103	ROUTE	2008	1082	1092	1080	1087	1090	1083	1081	1084	1085	1086	1091											

119	ROUTE	1255	1249	1251	1252	1256	1258	1248	1253	1257	1254	1250	1255	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4544462.708	4545464.27	4544751.715	4544974.208	4546006.109	4548033.62	4545229	4545440.775	4546455.474	4544390.122	4544606.408	4544462.708	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	663976.467	663970.387	663353.25	663149.251	664028.318	661730.742	663938.144	663595.706	664296.957	663507.222	663532.836	663376.467	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	287	514	287	92	429	1669	514	514	120	287	287	287	NA	NA	NA	NA	NA	NA	NA	NA
120	ROUTE	109	1261	1262	1260	1267	1263	1266	1264	1265	1259	109	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542896.129	4545121.623	4545677.706	4544909.575	4543457.981	4544940.813	4542453.691	4546085.35	4545800.607	4544549.393	4542896.129	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661665.267	662916.836	663468.8	662712.14	641204.38	662541.941	661948.135	663509.265	663117.897	662413.981	661665.267	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	164	92	429	92	2196	1582	27	245	245	92	164	NA	NA	NA	NA	NA	NA	NA	NA	NA
121	ROUTE	1274	1273	1272	1276	1268	1275	1270	1269	1271	1278	1277	1279	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4545289.061	4544283.464	4545073.743	4544750.781	4542453.691	4545287.398	4542376.914	4542506.754	4544618.303	4544191.939	4544453.314	4546988.87	4545289.061	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661767.759	660783.937	661609.694	661051.077	661948.135	661636.806	661796.694	661864.878	661164.025	660333.073	660658.177	656655.45	661767.759	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	98	374	98	902	126	98	288	288	902	2	374	1450	98	NA	NA	NA	NA	NA	NA	NA
122	ROUTE	2008	1287	1290	1286	1289	1282	1288	1280	1285	1291	1283	1292	1281	2008	NA	NA	NA	NA	NA	NA
	X COORD	4550781.801	4541436.292	4542141.76	4541583.127	4541520.386	4540546.582	4541201.666	4540212.539	4541346.658	4540922.973	4540825.733	4541036.55	4540991.613	4540684.689	4550781.801	NA	NA	NA	NA	NA
	Y COORD	661454.658	657063.297	657749.029	657678.811	656616.495	638184.438	656706.098	637641.093	657464.112	656786.433	638063.134	638778.222	656655.216	638177.152	661454.658	NA	NA	NA	NA	NA
	SERVED P.	NA	465	198	1122	465	249	465	55	871	465	249	124	25	249	NA	NA	NA	NA	NA	NA
123	ROUTE	1297	1294	1293	1298	1296	1295	1297	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540456.688	4540570.382	4540238.258	4541025.349	4540505.46	4540596.817	4540456.688	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655686.597	656045.902	656291.372	656397.469	655629.651	656568.596	655686.597	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	657	2054	465	405	465	465	657	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
124	ROUTE	2008	1303	1306	1308	1307	1305	1310	1299	1300	1312	1301	1311	1309	1304	1302	1313	2008	NA	NA	NA
	X COORD	4550781.801	4537255.032	4537439.237	4537383.934	4538029.029	4537686.354	4540481.309	4536811.98	4536988.804	4540688.019	4537169.079	4540621.734	4537909.73	4537136.502	4537042.658	4540857.516	4550781.801	NA	NA	NA
	Y COORD	661454.658	635994.798	635340.053	634992.333	635663.895	635691.812	654521.742	635735.944	635781.306	654627.23	635643.548	654364.09	635501.934	635211.761	635496.076	654729.06	661454.658	NA	NA	NA
	SERVED P.	NA	30	30	30	30	30	937	30	30	937	30	875	30	30	30	1921	NA	NA	NA	NA
125	ROUTE	2008	1317	1319	1315	1321	1316	1314	1318	1320	2008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781.801	4538678.18	4541331.926	4537769.87	4542202.078	4536181.52	4538517.664	4541020.661	4541735.273	4550781.801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454.658	639923.123	650724.334	637129.624	650082.704	635854.984	637879.412	650454.975	651218.321	661454.658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	106	1049	106	1314	30	106	1397	892	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
126	ROUTE	1398	1323	1324	1322	1398	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546834.423	4540526.841	4542166.417	4540378.674	4546834.423	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651191.97	649136.209	649736.3	649262.594	651191.97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1394	2680	1013	1307	1394	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
127	ROUTE	1332	1327	1333	1336	1330	1329	1335	1334	1326	1328	1331	1325	1332	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542758.153	4541662.738	4542038.44	4542301.688	4542412.033	4542114.042	4543381.249	4542860.062	4541500.334	4542021.679	4542630.943	4541521.938	4542758.153	NA	NA	NA	NA	NA	NA	NA
	Y COORD	643312.7	643363.704	642000.893	640891.818	643338.293	643128.852	643012.034	642621.861	643635.578	643434.671	643273.673	643707.393	643312.7	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	160	160	582	305	160	160	818	2015	160	160	160	160	160	NA	NA	NA	NA	NA	NA	NA
128	ROUTE	2008	1345	1339	1351	1352	1349	1338	1343	1348	1347	1346	1337	1341	1340	1342	1350	1344	2008	NA	NA
	X COORD	4550781.801	4573472.856	4558372.614	4542469.285	4542671.942	4542301.688	4558397.774	4564362.064	4542046.395	4553601.049	4556422.929	4557120.238	4561860.193	4574498.427	4561764.85	4542708.697	4554274.04	4550781.801	NA	NA
	Y COORD	661454.658	604039.061	599817.155	639720.967	639683.843	640891.818	599680.429	609183.173	640465.283	601132.797	603574.885	598031.541	605854.549	598282.008	605905.782	640186.317	600914.829	661454.658	NA	NA
	SERVED P.	NA	109	58	722	730	838	58	20	1239	16	75	102	27	79	27	884	16	NA	NA	NA
129	ROUTE	2008	1360	1355	1365	1359	1366	1353	1357	1361	1366	1364	1358	1363	1354	1362	2008	NA	NA	NA	NA
	X COORD	4550781.801	4537847.109	4537911.381	4543067.035	4538313.298	4543694.37	4536085.347	4537073.138	4537988.095	4538136.194	4542671.942	4538650.55	4536991.24	4536349.152	4536448.216	4550781.801	NA	NA	NA	NA
	Y COORD	661454.658	637715.403	638006.623	640980.029	639675.807	640360.839	636774.171	636982.062	637854.64	639821.174	639683.843	639323.993	636775.082	636463.948	636246.61	661454.658	NA	NA	NA	NA
	SERVED P.	NA	106	106	1290	106	2351	30	30	106	106	573	106	30	30	30	NA	NA	NA	NA	NA
130	ROUTE	708	1369	1370	1371	1367	1368	708	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539911.102	4544196.638	4544509.676	4543457.981	4543911.076	4543694.37	4539911.102	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	649386.671	640682.449	641046.885	641204.38	640430.72	640360.839	649386.671	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	755	1456	1083	305	1456	700	755	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
131	ROUTE	515	1374	1373	1372	1375	515	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4553517.735	4544041.752	4544079.719	4544325.663	4543374.966	4553517.735	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	649252.455	641881.23	641809.891	641668.775	641948.017	649252.455	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	2907	2846	641	95	1418	2907	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
132	ROUTE	1977	1378	1376	1379	1377	1977	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4548364.911	4543506.301	4544054.012	4543823.193	4543644.861	4548364.911	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659201.37	649329.362	648404.138	650531.502	648485.141	659201.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	395	3909	493	105	493	395	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
133	ROUTE	1835	1380	1835	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4543630.846	4542166.417	4543630.846	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	650990.918	649736.3	650990.918	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1149	5000	1149	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	ROUTE	2008	1393	1383	1387	1384	1381	1392	1382	1389	1390	1391	1388	1386	1385	2008	NA	NA	NA	NA
134	X COORD	4550781,801	4542497,204	4564799,58	4574708,141	4564974,731	4565414,179	4542819,828	4566821,795	4542166,417	4542202,078	4543122,898	4564535,041	4570902,735	4570220,202	4550781,801	NA	NA	NA	NA
	Y COORD	661454,658	651518,24	593501,742	591945,866	593869,589	588809,324	651075,595	589149,023	649736,3	650082,704	650143,74	601504,464	595591,042	595969,057	661454,658	NA	NA	NA	NA
	SERVED P.	NA	451	69	145	69	165	1058	165	778	323	1637	18	61	61	NA	NA	NA	NA	NA
	ROUTE	2010	1395	1396	1394	1397	2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
135	X COORD	4550549,243	4545685,234	4546121,447	4546473,358	4546834,423	4550549,243	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668379,781	650256,953	651170,204	650309,914	651191,97	668379,781	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	3188	1406	394	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1398	1398	1399	1398	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
136	X COORD	4546834,423	4546834,423	4546683,166	4546834,423	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651191,97	651191,97	651651,828	651191,97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1394	1394	3606	1394	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1494	1400	1403	1401	1404	1402	1406	1405	1494	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
137	X COORD	4547638,455	4547123,637	4547164,453	4546891,658	4546683,166	4546858,035	4546690,875	4546950,955	4547638,455	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	664900,765	652819,559	654325,677	653002,065	651651,828	653590,849	654177,399	654319,758	664900,765	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	800	607	755	607	1620	607	49	755	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2008	1409	1411	1407	1412	1410	1408	1414	1415	1413	2008	NA	NA	NA	NA	NA	NA	NA	NA
138	X COORD	4550781,801	4541638,86	4540733,626	4540827,926	4541875,698	4541332,754	4540857,516	4541181,597	4540691,739	4541215,392	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	654259,269	655024,431	654208,762	654180,888	653834,762	654729,06	655008,961	655346,048	654918,249	661454,658	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	937	657	937	206	129	598	1	598	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1421	1418	1425	1416	1424	1423	1419	1417	1422	1420	1421	NA	NA	NA	NA	NA	NA	NA	NA
139	X COORD	4541424,349	4541089,665	4542148,223	4540528,162	4540991,613	4541898,86	4541431,04	4540691,739	4541025,349	4541542,416	4541424,349	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654942,882	655441,354	655073,347	655290,298	656655,216	655005,13	655153,026	655346,048	656397,469	655137,363	654942,882	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	598	657	138	657	440	598	598	656	60	598	598	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2008	1432	1434	1426	1433	1429	1430	1428	1436	1427	1435	1431	2008	NA	NA	NA	NA	NA	NA
140	X COORD	4550781,801	4543517,328	4543049,297	4542309,918	4543215,384	4543108,764	4543157,916	4542443,894	4543384,618	4542752,505	4543243,435	4543359,19	4550781,801	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	657931,043	657339,59	658027,776	657612,166	657794,809	658295,347	657326,353	657627,206	658019,529	657529,706	657905,802	661454,658	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	499	514	435	514	514	435	514	112	435	514	514	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1449	1444	1448	1447	1438	1445	1439	1440	1446	1437	1441	1443	1442	1449	NA	NA	NA	NA	NA
141	X COORD	4544539,006	4544080,371	4544376,416	4544177,612	4550854,868	4544131,486	4549936,095	4549741,833	4543907,422	4549251,201	4551319,561	4543891,872	4543439,978	4544539,006	NA	NA	NA	NA	NA
	Y COORD	659463,197	659604,223	659444,866	659365,143	670693,728	659605,633	669653,233	669427,3	659102,778	669359,595	671119,757	659504,134	659507,884	659463,197	NA	NA	NA	NA	NA
	SERVED P.	364	390	1208	390	147	390	61	61	525	61	46	832	525	364	NA	NA	NA	NA	NA
	ROUTE	1660	1455	1453	1450	1457	1452	1451	1459	1456	1458	1454	1460	NA	NA	NA	NA	NA	NA	NA
142	X COORD	4541946,567	4545073,186	4545150,91	4544191,939	4544432,561	4544843,811	4544135,129	4545016,224	4544539,006	4545380,064	4544601,882	4545707,777	4541946,567	NA	NA	NA	NA	NA	NA
	Y COORD	653892,888	660143,846	660367,929	660333,073	659333,082	660278,031	659991,77	659645,946	659463,197	660429,179	659727,125	660396,425	653892,888	NA	NA	NA	NA	NA	NA
	SERVED P.	206	486	486	952	470	470	390	470	106	486	470	214	206	NA	NA	NA	NA	NA	NA
	ROUTE	1469	1468	1462	1463	1465	1464	1461	1466	1467	1469	NA	NA	NA	NA	NA	NA	NA	NA	NA
143	X COORD	4548848,479	4549255,838	4549425,427	4549110,214	4549225,756	4549004,09	4549548,195	4548634,902	4549480,144	4548848,479	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	660581,538	662381,462	661676,599	661096,3	662005,663	661681,369	661395,159	661320,544	662329,643	660581,538	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	841	694	632	632	694	632	229	632	14	841	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2008	1476	1478	1477	1474	1479	1470	1475	1471	1473	1480	1481	1472	2008	NA	NA	NA	NA	NA
144	X COORD	4550781,801	4549529,538	4548718,339	4548914,568	4549681,774	4548642,277	4554200,049	4549482,363	4555207,664	4549888,525	4548552,26	4549509,252	4554106,464	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	665051,6	664528,152	664886,222	664577,947	664741,295	671041,472	664528,159	671920,468	664637,039	664561,694	665707,041	670723,133	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	508	508	508	751	508	236	92	187	751	508	207	236	NA	NA	NA	NA	NA	NA
	ROUTE	1494	1485	1489	1483	1487	1492	1484	1493	1491	1488	1490	1486	1482	1494	NA	NA	NA	NA	NA
145	X COORD	4547638,455	4549009,23	4548679,264	4549255,909	4548508,077	4547663,169	4549017,939	4547539,375	4548034,53	4548924,605	4548293,442	4548716,825	4549509,252	4547638,455	NA	NA	NA	NA	NA
	Y COORD	664900,765	665590,944	666067,34	665600,867	665664,54	665740,104	665819,627	665599,595	665312,191	665207,685	666031,727	665801,68	665707,041	664900,765	NA	NA	NA	NA	NA
	SERVED P.	800	423	164	240	423	163	423	163	102	240	423	423	33	800	NA	NA	NA	NA	NA
	ROUTE	1498	1500	1495	1495	1503	1505	1499	1506	1502	1501	1497	1504	1498	NA	NA	NA	NA	NA	NA
146	X COORD	4547037,483	4546258,434	4546102,942	4546065,097	4546603,864	4546410,722	4546455,474	4547517,744	4546643,006	4546687,358	4546643,535	4547638,455	4547037,483	NA	NA	NA	NA	NA	NA
	Y COORD	665120,696	665019,482	663747,315	665014,017	664011,966	663663,753	664296,957	664741,289	664233,33	664282,158	664794,025	664900,765	665120,696	NA	NA	NA	NA	NA	NA
	SERVED P.	245	928	429	9	207	245	1337	782	207	207	122	285	245	NA	NA	NA	NA	NA	NA
	ROUTE	1469	1518	1510	1508	1512	1513	1514	1516	1509	1511	1515	1507	1517	1469	NA	NA	NA	NA	NA
147	X COORD	4548848,479	4550728,25	4551108,177	4550923,224	4550825,515	4550696,908	4551053,437	4550628,199	4550699,629	4550942,3	4550644,047	4550986,591	4550306,316	4548848,479	NA	NA	NA	NA	NA
	Y COORD	660581,538	657280,14	657864,628	657858,467	657870,497	657982,463	657683,902	657502,273	658050,767	657769,983	657717,208	658129,368	657759,71	660581,538	NA	NA	NA	NA	NA
	SERVED P.	841	100	483	483	446	446	446	446	446	446	446	446	841	NA	NA	NA	NA	NA	NA
	ROUTE	2008	1528	1532	1524	1520	1523	1527	1529	1522	1526	1519	1530	1525	1531	2008	NA	NA	NA	NA
148	X COORD	4550781,801	4549838,616	4549610,036	4550295,868	4550924,309	4550728,25	4550199,307	4549908,21	4550444,842	4550319,203	4551317,374	4549743,8	4550519,752	4549710,602	4550594,442	4550781,801	NA	NA	NA
	Y COORD	661454,658	665299,074	657797,353	657132,557	656612,862	657280,14	657403,512	657653,413	656908,071	657481,581	656543,086	657520,511	657402,228	657728,374	656961,564	661454,658	NA	NA	NA
	SERVED P.	NA	292	385	446	379	88	292	292	446	446	31	292	446	719	446	NA	NA	NA	NA

149	ROUTE	2008	1544	1545	1533	1542	1541	1535	1539	1536	1537	1534	1538	1546	1540	1543	2008	NA	NA	NA
	X COORD	4550781.801	4547674.479	4547710.555	4555410.499	4548064.393	4548168.326	4555679.813	4549891.07	4556008.635	4556653.707	4555096.079	4555941.646	4548857.228	4548416.858	4547873.172	4550781.801	NA	NA	NA
	Y COORD	661454.658	656153.393	655808.024	622661.86	655890.761	656217.344	622914.71	627419.736	622598.832	621997.681	623353.259	622718.83	657252.502	656130.123	655937.523	661454.658	NA	NA	NA
	SERVED P.	NA	47	679	302	679	679	302	120	130	130	302	130	142	679	679	NA	NA	NA	NA
150	ROUTE	2008	1547	1549	1551	1557	1559	1554	1553	1548	1555	1558	1560	1556	1550	1552	2008	NA	NA	NA
	X COORD	4550781.801	4556463.311	4554773.005	4555159.591	4548932.738	4550008.515	4549281.003	4549610.036	4555148.604	4549149.472	4549813.948	4548857.228	4549535.326	4555010.112	4552160.124	4550781.801	NA	NA	NA
	Y COORD	661454.658	670536.158	671067.547	670327.06	658026.057	658532.015	658082.269	657797.353	670702.966	657988.585	658668.9	657252.502	658483.017	670533.435	671252.332	661454.658	NA	NA	NA
	SERVED P.	NA	44	24	198	32	719	334	198	198	719	352	719	198	25	NA	NA	NA	NA	NA
151	ROUTE	2008	1565	1572	1573	1571	1566	1568	1562	1561	1567	1569	1563	1570	1574	1575	1564	2008	NA	NA
	X COORD	4550781.801	4538203.02	4550138.542	4549829.921	4537304.371	4538422.896	4537659.695	4537408.028	4536720.506	4538446.436	4538412.341	4538399.173	4538381.855	4548944.849	4549085.367	4538364.256	4550781.801	NA	NA
	Y COORD	661454.658	637873.732	659137.342	659035.009	636696.632	639814.123	637233.815	637114.387	636478.611	638056.376	639994.543	638094.041	640082.666	659164.793	659385.548	638053.382	661454.658	NA	NA
	SERVED P.	NA	106	719	719	30	106	106	106	30	106	106	106	106	1436	1112	106	NA	NA	NA
152	ROUTE	1629	1576	1582	1586	1590	1585	1589	1579	1584	1581	1578	1583	1580	1577	1588	1629	NA	NA	NA
	X COORD	4562291.127	4561900.149	4548772.867	4548192.574	4547556.813	4548229.131	4547548.246	4561239.39	4548407.55	4562238.406	4562260.665	4548480.109	4562290.868	4562697.151	4548476.26	4548805.873	4562291.127	NA	NA
	Y COORD	648223.946	645755.818	663577.587	663013.221	663352.969	663949.182	663698.423	646107.018	664087.479	644926.784	645160.25	663282.655	644977.019	648071.494	662564.971	662306.546	648223.946	NA	NA
	SERVED P.	130	120	200	62	725	482	207	282	482	120	120	500	120	192	694	694	130	NA	NA
153	ROUTE	746	1601	1595	1597	1598	1592	1599	1600	1594	1596	1591	1593	1746	NA	NA	NA	NA	NA	NA
	X COORD	4540486.523	4546638.632	4546830.074	4547517.744	4546305.711	4546770.673	4547556.813	4546908.665	4547615.424	4547314.603	4546909.113	4547597.541	4540486.523	NA	NA	NA	NA	NA	NA
	Y COORD	637108.971	662818.642	663135.685	664741.289	663432.049	663719.289	663352.969	662676.49	663914.134	663333.78	664105.335	664202.603	637108.971	NA	NA	NA	NA	NA	NA
	SERVED P.	488	200	277	300	245	245	205	2177	240	277	207	624	488	NA	NA	NA	NA	NA	NA
154	ROUTE	2008	1615	1612	1603	1610	1613	1614	1609	1606	1608	1605	1602	1611	1616	1604	1607	2008	NA	NA
	X COORD	4550781.801	4546819.929	4545613.018	4558498.638	4545988.626	4546019.075	4546818.746	4545817.925	4561495.961	4561804.871	4560597.91	4557643.876	4546017.866	4545986.695	4559465.696	4561534.815	4550781.801	NA	NA
	Y COORD	661454.658	662461.105	661627.66	642956.468	662120.822	661288.202	662358.24	662195.326	643548.591	643877.26	643812.349	643708.003	661946.832	660987.982	643357.884	643851.851	661454.658	NA	NA
	SERVED P.	NA	277	1190	31	391	725	391	391	67	67	213	31	391	657	111	67	NA	NA	NA
155	ROUTE	1494	1620	1623	1619	1621	1618	1617	1622	1494	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547638.455	4543821.517	4544161.32	4544080.96	4544010.689	4543940.613	4543822.222	4543757.438	4547638.455	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	664900.765	657739.239	657876.66	658129.966	657915.953	658159.735	658210.264	657630.607	664900.765	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	800	499	2006	499	499	499	499	499	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
156	ROUTE	1629	1636	1634	1635	1625	1632	1627	1637	1633	1630	1629	1624	1631	1626	1628	1629	NA	NA	NA
	X COORD	4562291.127	4543479.209	4542952.261	4543199.25	4562098.467	4543140.404	4562123.249	4542930.594	4543384.613	4543221.108	4562291.127	4561469.598	4543334.422	4562333.063	4561186.671	4562291.127	NA	NA	NA
	Y COORD	648223.946	656937.949	657160.125	656734.723	645001.495	657222.434	647989.025	656825.005	657627.206	657453.947	648223.946	645636.528	657525.592	644714.007	645839.851	648223.946	NA	NA	NA
	SERVED P.	130	1248	514	371	120	514	157	611	387	514	130	120	514	68	282	130	NA	NA	NA
157	ROUTE	1648	1649	1641	1644	1652	1642	1643	1651	1640	1639	1638	1645	1650	1646	1647	1648	NA	NA	NA
	X COORD	4557069.524	4560863.406	4556977.674	4557616.671	4542398.977	4557496.678	4557008.458	4542930.594	4558235.869	4557333.789	4558083.187	4554427.667	4542521.461	4560031.17	4560392.293	4557069.524	NA	NA	NA
	Y COORD	640335.804	643074.119	635796.826	636900.692	655963.872	636360.309	636040.891	656825.005	637040.407	636135.046	636632.759	634994.617	656715.609	642768.108	643217.789	640335.804	NA	NA	NA
	SERVED P.	111	214	171	224	250	224	171	1187	224	224	224	343	1005	214	214	111	NA	NA	NA
158	ROUTE	1674	1654	1653	1655	1674	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542750.633	4542398.977	4542044.221	4542690.188	4542750.633	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	652635.637	655963.872	655816.15	655738.618	652635.637	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	18	1684	1934	1382	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
159	ROUTE	1660	1662	1659	1668	1669	1666	1661	1663	1664	1666	1665	1668	1670	1667	1657	1660	NA	NA	NA
	X COORD	4541946.567	4542509.017	4542217.153	4541928.364	4543165.63	4543036.495	4541953.664	4542252.763	4542577.644	4541559.37	4542301.404	4541799.919	4542722.285	4542710.806	4541687.842	4541946.567	NA	NA	NA
	Y COORD	653892.888	653174.245	653580.739	654603.356	653264.796	653307.868	653960.285	653786.657	653583.797	653339.733	653972.85	653814.497	654002.546	653818.607	653161.286	653892.888	NA	NA	NA
	SERVED P.	206	206	206	937	321	321	937	206	206	206	206	206	32	598	206	206	NA	NA	NA
160	ROUTE	1674	1671	1672	1673	1674	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542750.633	4542497.204	4543224.378	4543422.788	4542750.633	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	652635.637	651518.24	651189.01	651266.591	652635.637	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	18	1360	1811	1811	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
161	ROUTE	1648	1679	1678	1675	1676	1680	1677	1648	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4557069.524	4544817.618	4545160.612	4545815.207	4544790.658	4544524.133	4545622.39	4557069.524	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	640335.804	652645.897	652689.295	651693.22	651350.391	650767.288	653141.157	640335.804	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	111	831	831	1406	1294	31	607	111	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
162	ROUTE	2008	1687	1691	1683	1690	1684	1692	1689	1681	1685	1694	1686	1688	1682	1693	2008	NA	NA	NA
	X COORD	4550781.801	4538272.967	4538332.73	4538097.732	4536619.924	4536863.218	4543374.966	4537800.474	4537814.745	4535963.992	4543457.981	4538424.706	4537679.774	4537315.559	4543091.193	4550781.801	NA	NA	NA
	Y COORD	661454.658	639283.397	638548.342	638659.752	636867.482	637235.16	641948.017	639806.759	638412.447	637060.271	641204.38	638748.641	637980.187	637889.903	641507.857	661454.658	NA	NA	NA
	SERVED P.	NA	106	106	106	30	1547	30	51	106	30	1280	106	106	106	1290	NA	NA	NA	NA
163	ROUTE	109	1698	1705	1699	1706	1707	1697	1702	1696	1700	1704	1701	1695	1703	109	NA	NA	NA	NA
	X COORD	4542896.129	4544003.586	4543457.981	4543870.286	4543823.193	4543630.846	4543731.047	4543308.985	4543789.332	4544034.949	4544474.367	4544284.303	4543573.968	4544472.743	4542896.129	NA	NA	NA	NA
	Y COORD	661665.267	663058.15	641204.38	662774.771	660531.162	650990.918	663068.136	662519.277											

194	ROUTE	2008	1989	1991	1979	1981	1983	1990	1978	1982	1980	1987	1984	1985	1986	1988	2008	NA	NA	NA	
	X COORD	4550781,801	4547309,349	4545860,065	4558476,168	4548364,911	4547970,578	4546212,747	4558519,154	4547813,475	4557253,127	4547476,128	4548186,601	4548091,542	4547880,676	4547554,709	4550781,801	NA	NA	NA	
	Y COORD	661454,658	659437,217	656771,381	669931,041	659201,37	658837,029	656895,366	669696,337	659031,607	670644,082	658849,768	658620,482	658675,091	658665,466	658720,923	661454,658	NA	NA	NA	
	SERVED P.	NA	480	158	82	785	480	340	267	480	272	163	53	480	480	480	NA	NA	NA	NA	
195	ROUTE	55	2000	2001	1992	1999	1996	1993	2002	1994	1995	1997	1998	55	NA	NA	NA	NA	NA	NA	
	X COORD	4558476,168	4545426,638	4545296,509	4564782,69	4545740,93	4545583,174	4561018,68	4544684,88	4560587,11	4560280,017	4545493,743	4545191,174	4558476,168	NA	NA	NA	NA	NA	NA	
	Y COORD	669931,041	655706,153	655980,208	676627,675	655640,069	655025,886	673867,92	655822,981	673083,384	672310,58	655597,606	655380,845	669931,041	NA	NA	NA	NA	NA	NA	
	SERVED P.	185	678	678	39	640	747	372	112	340	314	678	402	185	NA	NA	NA	NA	NA	NA	
196	ROUTE	2005	2004	2003	2005	2007	2006	2005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	X COORD	4544805,204	4544630,208	4544684,88	4544805,204	4545860,065	4544564,08	4544805,204	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655965,186	655881,701	655822,981	655965,186	656771,381	656002,927	655965,186	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	321	321	209	321	115	99	321	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix: D

Table D.1: Routing results for scenario 2

	ROUTE	2093	434	431	429	430	432	437	436	436	438	433	428	2093	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550549,243	4566939,038	4562901,674	4571286,185	4563221,813	4562981,655	4562749,209	4563842,618	4562136,581	4543408,909	4563262,18	4561013,032	4550549,243	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668379,781	633399,977	643829,795	651596,46	643928,642	643910,701	637197,163	645005,502	643608,11	638422,184	644247,477	640694,686	668379,781	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	SERVED P.	NA	84	609	224	101	101	34	101	609	2873	101	163	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1943	1936	1940	1937	1938	1941	1933	1934	1935	1939	1942	1943	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4559488,505	4566523,139	4561207,261	4565592,484	4566936,537	4568621,593	4569926,638	4569027,09	4568832,533	4561325,503	4560316,436	4559488,505	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658554,136	655235,383	657952,164	653074,827	651602,992	665568,837	657112,199	655553,577	660068,484	657215,82	658479,26	658554,136	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	SERVED P.	210	30	1438	82	28	53	51	51	181	1438	1438	210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1257	1254	1255	1253	1256	1258	1251	1252	1257	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4563185,569	4562652,543	4562234,971	4566771,241	4563419,222	4545015,589	4564986,901	4564269,725	4563185,569	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668995,049	670157,243	671692,87	666515,247	668763,095	640947,312	669621,959	669619,949	668995,049	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	SERVED P.	319	702	702	587	702	1352	318	318	319	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2092	391	399	392	395	393	397	398	396	394	2092	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551500,371	4566659,906	4539978,108	4564782,69	4560280,017	4561018,68	4560814,606	4559874,738	4559862,377	4560587,11	4551500,371	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667363,209	676746,509	650570,912	676627,675	672310,58	673867,92	671763,021	672473,48	672722,618	673083,384	667363,209	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	SERVED P.	NA	781	1282	58	471	558	398	471	471	510	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	1	3	2	5	9	11	10	6	7	8	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4554098,987	4554543,875	4554101,443	4553992,984	4554580,732	4553643,292	4554867,485	4554770,437	4554491,266	4553573,464	4554890,401	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	673027,215	672730,127	672460,416	672164,474	671728,708	671438,519	671753,757	672362,159	672589,334	672171,321	672221,186	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	SERVED P.	NA	457	457	588	588	281	389	281	457	457	588	457	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2092	405	409	401	403	408	400	404	402	406	407	2092	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551500,371	4551425,281	4549931,942	4550941,211	4551114,564	4551048,877	4550005,68	4549652,498	4549812,402	4551457,415	4551172,3	4551500,371	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667363,209	672302,652	670498,276	672103,791	671931,686	671541,067	672177,655	671048,31	671214,805	672297,94	671702,708	667363,209	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6	SERVED P.	NA	192	1062	192	182	583	842	581	581	192	583	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	553	541	542	545	539	540	544	553	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4545222,006	4548660,955	4548827,41	4544524,133	4548400,176	4547830,317	4547778,343	4545222,006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	665938,428	669511,079	669574,029	650767,288	670254,362	670761,318	669907,099	665938,428	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	SERVED P.	771	606	606	1503	606	225	239	771	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1652	1642	1639	1641	1643	1640	1638	1652	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540660,664	4546112,557	4546482,879	4547217,21	4547519,603	4547066,193	4546371,496	4540660,664	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661601,373	669338,543	669951,591	670434,883	670045,034	670394,36	670609,358	661601,373	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	SERVED P.	3282	1670	1583	470	337	470	470	3282	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	12	16	15	19	18	17	14	13	20	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4542315,523	4544190,019	4541464,483	4541738,663	4541127,38	4541580,011	4541316,358	4541479,581	4544579,734	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	666932,142	666939,046	665982,932	665205,953	666078,169	665752,685	666134,911	666179,057	667077,075	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	SERVED P.	NA	306	1926	141	21	1799	245	141	141	280	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1583	1574	1573	1578	1577	1579	1576	1575	1583	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4538945,26	4541963,398	4540962,696	4541795,708	4542188,345	4542338,759	4542896,129	4542247,893	4538945,26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654735,045	664345,642	665233,514	663814,537	664230,134	664328,995	661665,267	664465,653	654735,045	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	SERVED P.	254	839	708	515	1327	1100	246	265	254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1564	1560	1561	1562	1563	1564	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542203,785	4539867,859	4539863,816	4540415,132	4539925,08	4542203,785	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	662190,502	661831,98	661724,138	661849,314	661010,841	662190,502	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	SERVED P.	524	1126	1126	1098	524	1098	524	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	596	586	589	590	587	588	585	591	596	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4548670,375	4548997,356	4549260,963	4549920,286	4548923,839	4549223,908	4548726,531	4538901,399	4548670,375	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	637111,314	604074,647	604334,158	605060,13	604276,194	604279,505	604104,52	659529,64	637111,314	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12	SERVED P.	33	695	695	695	695	47	422	1751	33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2016	2013	2016	2016	2016	2016	2016	2016	2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551613,719	4539941,239	4538901,399	4551613,719	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	656053,112	659327,952	659529,64	656053,112	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13	SERVED P.	343	2495	2505	343	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	ROUTE	1652	1645	1646	1649	1648	1647	1644	1650	1651	1652	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	X COORD	4540660,664	4538028,799	4538214,958	4538484,643	4538795,705	4538498,957	4537834,351	4538666,49	4538390,111	4540660,664	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661601,373	657232,095	657283,606	657962,761	657370	657487,832	657491,554	657155,84	658177,066	661601,373	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	3282	393	393	351	462	462	1475	462	1002	3282	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1583	1580	1581	1582	1583	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15	X COORD	4538945,26	4536332,016	4536136,184	4536027,701	4538945,26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654735,045	654252,356	653332,125	653128,092	654735,045	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	254	1582	1582	1582	254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1205	1201	1202	1200	1199	1205	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16	X COORD	4549193,862	4537418,37	4537719,156	4537452,746	4537075,321	4549193,862	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	663705,709	645169,583	645065,986	645005,204	644968,779	663705,709	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	300	1723	410	1723	1144	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2078	2071	2075	2074	2073	2066	2068	2070	2067	2069	2072	2065	2078	NA	NA	NA	NA	NA	NA	NA
17	X COORD	4539321,591	4538353,638	4541741,849	4538560,255	4537844,342	4537223,629	4537831,182	4537378,237	4537440,923	4538329,364	4538316,708	4536991,314	4539321,591	NA	NA	NA	NA	NA	NA	NA
	Y COORD	641883,885	641087,343	661095,99	641079,664	640374,121	641921,402	640704,647	640168,744	641533,448	641192,168	640909,166	641801,961	641883,885	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	378	378	1598	378	315	378	315	315	315	378	315	315	378	NA	NA	NA	NA	NA	NA	NA
	ROUTE	697	671	660	665	661	677	674	670	669	675	664	676	666	662	663	672	667	668	673	697
18	X COORD	4538313,298	4535968,533	4536392,31	4537622,002	4537388,717	4543381,249	4538097,732	4537712,807	4536215,889	4544191,939	4537365,375	4546992,008	4537407,84	4537452,438	4536957,306	4537814,745	4537690,89	4536653,939	4537315,559	4538313,298
	Y COORD	639675,807	637355,167	637759,885	638753,332	639129,874	643012,034	638659,752	639514,728	637229,113	660333,073	639295,606	642161,563	639364,43	638809,083	638274,126	638412,447	638595,726	637508,758	637889,903	639675,807
	SERVED P.	158	46	158	46	46	1508	158	158	27	46	729	46	1177	46	158	158	158	158	158	158
	ROUTE	2091	25	29	26	29	23	21	27	24	22	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA
19	X COORD	4550781,801	4539181,541	4543694,37	4542690,188	4549085,367	4539107,849	4538325,86	4543374,966	4538680,244	4538883,887	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	635905,379	640360,839	655738,618	659385,548	635743,527	636616,205	641948,017	635309,557	635608,9	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	318	598	1165	942	731	46	936	132	132	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	31	35	32	37	39	38	30	34	36	33	2091	NA	NA	NA	NA	NA	NA	NA	NA
20	X COORD	4550781,801	4540243,003	4540567,554	4539972,831	4540252,7	4552061,002	4541089,779	4540425,418	4540064,576	4540413,612	4540343,876	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	629302,423	629451,006	628972,476	628821,977	647092,519	629655,325	629537,039	628969,612	629147,846	629314,041	661454,658	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	185	185	185	185	2796	724	185	185	185	185	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	878	871	863	869	868	867	870	864	866	865	878	NA	NA	NA	NA	NA	NA	NA	NA	NA
21	X COORD	4557643,876	4548929,877	4540889,372	4541089,779	4541877,246	4541690,025	4541170,334	4541846,861	4541588,503	4541343,755	4557643,876	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	643708,003	659675,521	629085,404	629665,325	628648,762	628816,723	629775,525	628232,312	628688,224	628746,173	643708,003	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	47	1623	185	186	484	484	586	484	484	484	47	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	47	42	40	40	48	46	45	41	43	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA
22	X COORD	4550781,801	4545275,151	4544404,773	4543623,342	4544670,994	4547020,579	4544881,138	4544853,534	4543501,731	4544542,673	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	620126,299	621281,239	622437,172	620617,524	660815,82	620394,852	620510,382	623115,472	620633,004	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	180	180	963	180	1994	180	180	963	180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1483	1475	1477	1474	1479	1473	1482	1476	1472	1478	1481	1484	1480	1483	NA	NA	NA	NA	NA	NA
23	X COORD	4550575,652	4545969,618	4550275,612	4545896,788	4547247,31	4545815,326	4554529,792	4546432,695	4545740,577	4547171,718	4546790,238	4542784,596	4547090,307	4550575,652	NA	NA	NA	NA	NA	NA
	Y COORD	619074,9	614156,724	612264,048	614485,13	607733,545	614799,755	614630,243	611634,132	614775,059	608418,813	606955,182	663931,784	607332,469	619074,9	NA	NA	NA	NA	NA	NA
	SERVED P.	105	588	135	588	145	588	226	588	588	145	145	1014	145	105	NA	NA	NA	NA	NA	NA
	ROUTE	1741	1725	1724	1727	1726	1723	1722	1721	1741	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24	X COORD	4546945,332	4548092,168	4547633,454	4548204,523	4547388,261	4547470,425	4547238,079	4547227,305	4546945,332	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659280,407	605446,277	605658,321	605386,705	606179,057	605795,485	605759,776	605340,174	659280,407	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	594	832	1328	187	145	1328	145	1035	594	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	59	53	49	55	50	57	60	61	56	51	52	58	54	2091	NA	NA	NA	NA	NA
25	X COORD	4550781,801	4548726,531	4550303,541	4550008,528	4549950,897	4549560,805	4548708,49	4539941,239	4551691,125	4551641,99	4550181,584	4549919,758	4548635,521	4550424,53	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	604104,52	584822,714	585479,734	584162,101	584601,733	602224,936	659327,952	648232,185	593515,904	584970,961	584562,295	603977,66	584939,987	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	21	90	90	158	158	695	1459	1089	207	90	158	695	90	NA	NA	NA	NA	NA	NA
	ROUTE	778	779	780	775	776	778	778	779	781	777	782	783	785	784	786	789	778	NA	NA	NA
26	X COORD	4561297,631	4571945,956	4585257,191	4564929,795	4561959,335	4574083,269	4549223,908	4545607,917	4568354,311	4552219,848	4567909,558	4580517,666	4549241,132	4574524,789	4585058,086	4537427,675	4561297,631	NA	NA	NA
	Y COORD	611446,268	602046,936	598830,017	614820,796	611927,109	607526,721	604279,505	654956,449	613292,382	602333,356	613816,749	601446,223	604208,717	607727,161	599496,642	646218,624	611446,268	NA	NA	NA
	SERVED P.	98	9	99	259	98	66	648	1368	123	191	123	306	695	66	99	752	98	NA	NA	NA
	ROUTE	1594	1596	1597	1591	1596	1598	1599	1592	1590	1593	1594	NA	NA	NA	NA	NA	NA	NA	NA	NA
27	X COORD	4565451,4	4548996,275	4553517,735	4563996,332	4547789,062	4552655,161	4554112,153	4564687,333	4564664,668	4564345,633	4565451,4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	625226,094	606519,142	649252,455	621992,986	607586,232	651872,592	610757,41	623691,883	622414,701	623869,525	625226,094	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	737	832	436	308	347	1482	194	178	308	178	737	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1710	1700	1701	1698	1702	1694	1695	1697	1704	1696	1703	1699	1710	NA	NA	NA	NA	NA	NA	NA
28	X COORD	4557616,671	4557197,231	4562741,58	4562221,069	4556977,674	4557333,789	4557464,35	4561816,39	4540143,73	4557008,458	4557506,956	4562155,22	4557616,671	NA	NA	NA	NA	NA	NA	NA
	Y COORD	636900,692	635629,838	644332,673	643739,007	635796,826	636136,046	635655,95	643318,084	650187,823	636040,891	635181,871	643705,181	636900,692	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	336	257	101	101	257	336	257	101	3057	257	175	101	336	NA	NA	NA	NA	NA	NA	NA
	ROUTE	742	733	723	729	730	732</														

	ROUTE	1534	1533	1531	1527	1530	1528	1529	1532	1526	1535	1534	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
30	X COORD	4552283.452	4553435.271	4556920.521	4558705.519	4557759.538	4558184.51	4557741.664	4554083.885	4559488.505	4552335.955	4552283.452	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658889.38	659537.209	655479.552	655411.827	661556.688	661611.697	661300.544	657724.612	658554.136	658991.466	658889.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	518	390	597	524	313	313	313	390	1228	414	518	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
31	ROUTE	1378	1352	1351	1355	1357	1360	1356	1354	1358	1350	1353	1362	1361	1359	1378	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547400.65	4560291.61	4560204.642	4559534.606	4558426.422	4559626.55	4560705.587	4559119.026	4559458.283	4560571.204	4560281.394	4560136.492	4558476.168	4559519.154	4547400.65	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	666999.004	667407.869	667253.228	670044.314	669445.15	670865.781	671218.686	666919.97	670483.245	667240.56	667000.408	671171.727	669931.041	669696.337	666999.004	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	701	257	257	400	801	329	398	344	329	257	566	262	400	701	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32	ROUTE	2092	410	416	413	419	411	414	412	418	417	415	2092	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551500.371	4560136.492	4556628.789	4558245.999	4556033.55	4559545.605	4557143.721	4558742.877	4556541.149	4557253.127	4556560.788	4551500.371	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667363.209	671711.727	672013.658	670340.314	671459.179	671796.587	671096.529	671101.777	671285.863	670644.082	671889.991	667363.209	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	36	524	736	142	471	408	1308	443	408	524	400	400	701	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
33	ROUTE	1138	1124	1131	1130	1129	1128	1127	1126	1125	1123	1138	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547999.883	4556251.414	4548848.479	4556806.764	4554773.005	4555148.604	4556485.631	4556463.311	4555291.118	4555371.7	4547999.883	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668857.024	670889.882	660581.538	670579.177	671067.547	670702.966	670475.245	670536.158	671137.162	671341.305	668857.024	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	696	443	1868	355	588	298	443	281	281	696	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
34	ROUTE	1427	1416	1418	1415	1419	1417	1427	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539027.055	4552442.124	4552160.124	4552403.201	4552090.31	4552421.677	4539027.055	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657272.419	671642.647	671252.332	671838.009	671319.135	671465.243	657272.419	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	462	537	537	537	2852	537	462	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
35	ROUTE	1138	1139	1134	1137	1138	1141	1140	1132	1133	1136	1135	1138	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547999.883	4547766.256	4547829.911	4547818.128	4547999.883	4546823.564	4547760.977	4547519.603	4547778.343	4547521.834	4547307.03	4547999.883	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668857.024	668601.443	669665.01	668806.107	668857.024	668737.474	668414.086	670045.034	669907.099	668524.525	669341.995	668857.024	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	696	535	451	535	696	230	535	711	212	535	696	696	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
36	ROUTE	922	901	899	903	905	902	906	900	904	922	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4541143.645	4545026.805	4546263.647	4546218.382	4546544.635	4546080.376	4540514.539	4545582.522	4546450.304	4541143.645	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657842.683	667658.417	668332.03	668719.976	668429.138	668822.021	643564.67	667568.019	668263.398	657842.683	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	698	330	911	191	388	191	2127	461	401	698	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
37	ROUTE	553	550	549	552	546	551	547	548	553	553	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4545222.006	4546144.32	4545286.938	4544771.12	4544862.357	4546419.191	4544943.537	4544579.734	4545222.006	4545222.006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	665938.428	667280.746	667061.093	665742.938	667594.673	667492.565	667000.809	667077.075	665938.428	665938.428	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	771	461	461	1248	589	858	448	166	771	771	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
38	ROUTE	2091	65	67	62	69	64	70	63	71	66	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781.801	4556961.775	4555070.538	4560322.52	4541914.708	4555233.48	4541876.134	4555286.819	4541678.449	4541831.321	4560655.394	4550781.801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454.658	654070.978	653350.177	648441.842	663679.802	653239.985	663532.437	653246.322	663377.441	663925.885	648052.894	661454.658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	597	161	375	515	161	519	161	813	1327	375	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
39	ROUTE	1378	1370	1366	1368	1365	1369	1367	1364	1363	1378	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547400.65	4542422.161	4541469.324	4541243.888	4542120.547	4541723.694	4541582.816	4541678.449	4541432.615	4547400.65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	666999.004	663358.982	662626.087	662667.223	663446.268	662671.931	662677.53	663377.441	663379.052	666999.004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	701	1092	458	994	515	458	548	341	994	701	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
40	ROUTE	1521	1509	1510	1507	1508	1511	1521	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4544497.266	4540054.158	4540745.25	4539852.829	4540062.741	4540965.835	4544497.266	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	656691.292	660111.327	660704.586	660824.883	660908.947	660881.54	656691.292	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	780	990	1098	1098	1098	716	780	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
41	ROUTE	1427	1429	1421	1423	1428	1424	1422	1425	1420	1426	1427	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539027.055	4541987.971	4539214.258	4539361.623	4539462.344	4539057.293	4538938.679	4539329.437	4539225.498	4538462.442	4539027.055	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657272.419	638680.668	658033.381	658094.363	658666.248	657777.519	657711.869	657915.343	658177.644	656734.797	657272.419	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	462	1079	351	351	143	351	351	351	351	1210	462	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
42	ROUTE	1045	1033	1031	1036	1035	1030	1034	1032	1045	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4538988.151	4537605.914	4537357.701	4537969.162	4538108.409	4537145.072	4538143.95	4537532.679	4538988.151	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	640843.377	651270.985	651153.506	649708.9	651412.031	650995.877	650906.34	651162.505	640843.377	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	378	702	702	788	702	702	702	702	378	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
43	ROUTE	778	793	803	794	791	800	798	802	799	796	792	795	797	801	804	778	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4561297.631	4561860.193	4538102.269	4561764.85	4558372.614	4555927.163	4556422.929	4537935.015	4553601.049	4554274.04	4574498.427	4564362.064	4573472.856	4537427.675	4537531.111	4561297.631	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	611446.268	605854.549	646055.197	605905.782	599817.155	603922.786	603574.885	646544.205	601132.797	600914.829	598282.008	609183.173	604039.061	646218.624	645474.124	611446.268	NA							

	ROUTE	1045	1043	1041	1047	1054	1050	1053	1046	1042	1040	1052	1049	1037	1039	1051	1038	1044	1048	1045	NA
45	X COORD	4538988,151	4539031,969	4538422,896	4539709,245	4538364,256	4540537,367	4538399,173	4539455,824	4538925,775	4538412,541	4539896,983	4540288,67	4538123,364	4538381,855	4540132,867	4538470,144	4538678,18	4539869,054	4538988,151	NA
	Y COORD	640843,377	640280,552	639814,123	640736	638053,362	640277,339	638094,041	640787,482	640265,945	639994,547	641031,447	640513,019	640312,347	640082,666	640779,77	640447,534	639923,123	640727,366	640843,377	NA
	SERVED P.	378	378	158	378	12	378	158	378	378	158	378	378	40	158	378	378	158	378	378	NA
46	ROUTE	1045	1063	1057	1059	1060	1062	1061	1058	1056	1055	1045	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4538988,151	4540480,414	4538951,554	4539875,862	4539479,977	4538958,513	4539641,545	4538975,896	4538985,241	4538310,302	4538988,151	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	640843,377	659104,975	637072,775	637670,041	637265,754	636717,197	638344,391	636714,268	638261,697	636918,347	640843,377	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	378	620	731	731	731	463	789	731	158	46	378	NA	NA	NA	NA	NA	NA	NA	NA	NA
47	ROUTE	523	509	511	513	510	514	512	523	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546834,423	4539181,541	4539163,338	4538958,513	4539896,452	4546683,166	4539258,348	4546834,423	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651191,97	635905,379	636241,317	636717,197	635251,276	651651,828	636212,473	651191,97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	2109	413	731	229	986	1910	731	2109	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
48	ROUTE	1257	1264	1263	1259	1260	1262	1261	1257	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4563185,569	4544083,95	4543620,278	4541170,334	4541455,726	4542726,68	4542728,757	4563185,569	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668995,049	630032,701	630395,567	629775,525	630830,981	630357,404	629572,166	668995,049	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	319	879	653	324	1333	772	1039	319	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
49	ROUTE	653	629	625	624	622	627	630	632	628	631	623	633	626	653	NA	NA	NA	NA	NA	NA
	X COORD	4549891,07	4556357,572	4554204,157	4553437,489	4550575,652	4555629,036	4555679,813	4548192,574	4555088,933	4555671,923	4550824,222	4547084,838	4554747,86	4549891,07	NA	NA	NA	NA	NA	NA
	Y COORD	627419,736	621614,077	623329,05	621787,866	619074,9	622305,511	622914,71	663013,221	622872,222	623040,805	619174,416	660557,024	623030,938	627419,736	NA	NA	NA	NA	NA	NA
	SERVED P.	180	195	453	375	164	195	453	1101	453	124	269	765	453	180	NA	NA	NA	NA	NA	NA
50	ROUTE	1241	1217	1224	1215	1223	1214	1220	1225	1216	1212	1221	1222	1219	1241	NA	NA	NA	NA	NA	NA
	X COORD	4554427,667	4560800,628	4561386,662	4562001,68	4562098,467	4561897,039	4560031,17	4545770,319	4562333,063	4562290,868	4560392,293	4562260,665	4562238,406	4554427,667	NA	NA	NA	NA	NA	NA
	Y COORD	634994,617	643467,729	644413,004	644343,43	645001,495	644220,514	642768,308	657672,284	644714,007	644977,019	643217,789	645160,25	644926,784	634994,617	NA	NA	NA	NA	NA	NA
	SERVED P.	515	101	371	101	181	101	321	2859	101	181	321	181	515	NA	NA	NA	NA	NA	NA	NA
51	ROUTE	771	753	750	748	749	755	752	747	751	754	771	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551691,125	4548189,271	4547188,254	4547878,84	4547315,668	4548726,531	4548204,523	4547789,062	4548274,222	4549340,189	4551691,125	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	648232,185	605176,678	606698,849	607397,035	606828,587	604104,52	605386,705	607586,232	605566,265	605982,159	648232,185	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	2238	832	145	832	145	252	645	485	832	2238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
52	ROUTE	596	594	592	593	595	597	596	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4548670,375	4548830,115	4544083,95	4544146,302	4548801,669	4538901,399	4548670,375	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	637111,314	635390,89	630032,701	630253,562	635836,483	659529,64	637111,314	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	33	393	160	772	393	3249	33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
53	ROUTE	2091	75	76	78	72	77	79	74	73	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4560555,933	4560474,072	4560461,315	4560095,297	4560616,969	4561239,39	4560211,436	4560474,845	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	646488,768	645972,653	645662,689	646285,518	646033,398	646107,018	646720,301	646124,375	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	1332	409	409	409	409	291	1332	409	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
54	ROUTE	2095	486	491	487	492	488	483	484	485	490	496	489	493	494	495	2095	NA	NA	NA	NA
	X COORD	4550580,53	4561186,671	4561456,754	4561566,046	4561196,456	4561248,327	4561900,149	4561653,1	4561469,598	4561418,738	4544940,813	4561239,39	4561386,662	4562158,383	4560938,286	4550580,53	NA	NA	NA	NA
	Y COORD	658324,12	645839,851	646459,019	646249,684	644710,741	645461,04	645755,818	646019,022	645636,528	645224,485	662541,941	646107,018	644413,004	647368,459	646935,977	658324,12	NA	NA	NA	NA
	SERVED P.	NA	423	12	423	504	504	181	423	181	504	818	132	133	236	526	NA	NA	NA	NA	NA
55	ROUTE	878	872	880	875	879	873	877	881	876	874	878	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4557643,876	4560597,91	4560938,286	4560190,923	4560797,863	4560349,912	4558498,638	4560421,285	4559465,686	4560377,012	4557643,876	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	643708,003	643812,349	646935,977	643994,51	647054,862	643838,263	642956,468	647477,821	643357,884	643643,225	643708,003	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	47	319	806	319	1332	319	47	1171	321	319	47	NA	NA	NA	NA	NA	NA	NA	NA	NA
56	ROUTE	1016	1008	1005	1004	1006	1007	1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551639,449	4548615,214	4539975,108	4557069,524	4552471,82	4550310,611	4551639,449	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659804,308	639938,361	639356,556	640335,804	638069,344	638613,529	659804,308	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	289	1369	789	167	1017	1658	289	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
57	ROUTE	1335	1326	1327	1328	1324	1329	1323	1330	1335	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4546683,166	4540250,345	4540534,419	4540744,27	4540158,744	4541036,55	4539968,571	4539804,176	4539763,82	4546683,166	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651651,828	638165,548	638264,269	639060,18	639002,025	638778,222	639194,956	638739,993	637504,739	651651,828	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1138	387	387	789	789	789	789	789	281	1138	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
58	ROUTE	1197	1179	1175	1180	1174	1178	1181	1177	1176	1197	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4542038,44	4538958,513	4539782,866	4540473,803	4539701,255	4540084,447	4539763,82	4540000,201	4539498,757	4542038,44	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	642000,893	636717,197	637168,227	635236,198	636009,511	637068,289	637504,739	637112,121	637152,519	642000,893	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1561	39	731	986	731	320	731	1561	731	1561	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
59	ROUTE	2091	84	80	83	81	86	82	85	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4550781,801	4542496,782	4542677,851	4542374,126	4542476,417	4542674,054	4542681,715	4542102,905	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	632418,05	633232,952	633596,841	632943,701	635146,396	632724,23	634553,824	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	514	620	983	620	766	514	983	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

74	ROUTE	1766	1768	1767	1766	1763	1762	1764	1765	1766	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4553488,277	4554239,979	4553849,467	4553488,277	4553913,174	4554013,935	4554184,444	4553928,662	4553488,277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	667803,579	668151,27	668187,356	667803,579	667882,276	667575,053	667895,085	668075,091	667803,579	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	738	572	738	738	738	738	738	738	738	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
75	ROUTE	771	763	765	765	759	764	758	766	762	757	761	756	771	NA	NA	NA	NA	NA	NA	NA
	X COORD	4551691,125	4554200,049	4555159,591	4552561,174	4554106,464	4553686,303	4553584,651	4551148,141	4555010,112	4554239,979	4554466,858	4554388,458	4551691,125	NA	NA	NA	NA	NA	NA	NA
	Y COORD	648232,185	671041,472	670327,06	669486,517	670723,133	670541,969	667977,778	667968,616	670533,435	668151,27	671046,845	668178,753	648232,185	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	2238	353	298	537	353	844	738	322	298	166	353	738	2238	NA	NA	NA	NA	NA	NA	NA
76	ROUTE	1855	1854	1846	1855	1850	1851	1853	1848	1856	1845	1847	1849	1852	1855	NA	NA	NA	NA	NA	NA
	X COORD	4550821,133	4550500,115	4553413,88	4550821,133	4550854,868	4556806,764	4550979,517	4551319,561	4550388,119	4553643,292	4552090,31	4551369,783	4556784,39	4550821,133	NA	NA	NA	NA	NA	NA
	Y COORD	668900,456	669557,575	670787,327	668900,456	670693,728	670579,177	669275,063	671119,757	669211,442	671438,519	671319,135	670647,103	670497,653	668900,456	NA	NA	NA	NA	NA	NA
	SERVED P.	455	91	844	455	581	53	455	583	265	611	71	583	408	455	NA	NA	NA	NA	NA	NA
77	ROUTE	1635	1622	1623	1625	1627	1624	1626	1621	1620	1635	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539962,565	4549801,75	4549113,485	4549297,533	4548645,784	4549936,095	4550388,119	4549741,833	4549251,201	4539962,565	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655901,342	669217,062	668733,245	668298,157	668558,611	669653,233	669211,442	669427,3	669359,595	655901,342	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1347	91	696	3372	378	91	190	91	1347	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
78	ROUTE	1167	1159	1155	1158	1157	1156	1160	1161	1152	1153	1154	1167	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4543573,968	4546963,178	4546431,278	4546927,426	4546544,635	4546800,414	4546488,486	4546800,923	4546823,564	4546611,5	4546908,474	4543573,968	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	663498,862	667843,105	668760,26	667933,908	668429,138	668332,979	668036,629	667448,5	668737,474	668620,283	668446,276	663498,862	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	669	653	401	653	13	401	858	1048	171	401	401	669	NA	NA	NA	NA	NA	NA	NA	NA
79	ROUTE	2094	469	468	470	472	471	473	2094	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4545061,715	4543717,714	4543713,287	4543928,824	4544371,224	4544269,354	4543469,216	4545061,715	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654298,926	665711,783	665816,46	665611,284	665064,012	665814,106	664550,986	654298,926	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	168	832	2140	918	774	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
80	ROUTE	1483	1486	1487	1496	1492	1495	1491	1489	1493	1490	1485	1494	1488	1483	NA	NA	NA	NA	NA	NA
	X COORD	4550575,652	4550780,65	4550625,943	4543422,323	4542784,596	4543255,73	4542338,759	4549789,608	4543469,216	4542719,765	4550868,437	4543047,789	4549727,113	4550575,652	NA	NA	NA	NA	NA	NA
	Y COORD	619074,9	615523,806	615746,749	664339,026	663931,784	664251,352	664328,995	611897,744	664550,986	664709,841	615250,19	664101,523	612262,057	619074,9	NA	NA	NA	NA	NA	NA
	SERVED P.	105	196	196	481	1933	787	117	291	13	452	196	1217	135	105	NA	NA	NA	NA	NA	NA
81	ROUTE	1003	988	983	986	980	982	985	984	981	987	1003	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4547309,349	4540936,481	4541227,887	4541374,266	4541029,671	4540975,808	4541632,867	4541463,795	4541129,673	4541629,033	4547309,349	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659437,217	661786,791	662550,556	662133,72	662427,187	662322,315	662430,767	662354,189	662476,892	662553,612	659437,217	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	304	203	994	458	657	657	458	458	657	458	304	NA	NA	NA	NA	NA	NA	NA	NA	NA
82	ROUTE	1652	1653	1652	1652	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540660,664	4540703,588	4540660,664	4540660,664	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661601,373	661365,032	661601,373	661601,373	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	3282	1718	3282	3282	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
83	ROUTE	1299	1295	1294	1298	1296	1299	1297	1299	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540480,414	4540589,796	4540424,699	4541125,23	4540793,508	4540480,414	4540911,095	4540480,414	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	659104,975	660073,916	660203,667	660539,448	660394,466	659104,975	660407,486	659104,975	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	151	990	990	889	990	151	990	151	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
84	ROUTE	2091	143	141	134	136	138	132	144	133	142	137	139	135	140	2091	NA	NA	NA	NA	NA
	X COORD	4550781,801	4539941,239	4548329,465	4548399,607	4547937,991	4548241,983	4543336,146	4540480,414	4547977,95	4549976,493	4547831,915	4548596,414	4548333,956	4548605,33	4550781,801	NA	NA	NA	NA	NA
	Y COORD	661454,658	659327,952	591119,316	590653,2	591211,864	591007,79	585062,509	659104,975	590908,545	586119,695	591357,483	590699,285	590812,308	590842,57	661454,658	NA	NA	NA	NA	NA
	SERVED P.	NA	3334	158	120	158	158	99	207	120	198	120	120	158	158	NA	NA	NA	NA	NA	NA
85	ROUTE	1885	1866	1863	1869	1871	1870	1867	1864	1865	1873	1868	1872	1885	NA	NA	NA	NA	NA	NA	NA
	X COORD	4543308,985	4539462,344	4544974,208	4540011,537	4540825,326	4539631,623	4539672,958	4544549,393	4544909,575	4540480,414	4539921,761	4540309,754	4543308,985	NA	NA	NA	NA	NA	NA	NA
	Y COORD	662519,277	658666,248	663149,251	658489,871	658705,547	657524,453	658740,685	662413,981	662712,14	659104,975	658416,584	658071,475	662519,277	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	586	575	137	718	375	351	718	137	137	827	718	718	586	NA	NA	NA	NA	NA	NA	NA
86	ROUTE	1112	1107	1111	1114	1105	1108	1109	1110	1113	1106	1112	1112	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4540151,879	4539727,499	4540127,271	4538512,062	4539025,376	4539890,225	4539023,734	4540036,582	4538758,675	4539545,585	4540151,879	4540151,879	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657588,554	657319,45	657604,329	655971,01	657192,881	657398,837	655890,367	657501,889	655844,217	657161,005	657588,554	657588,554	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	351	351	351	1482	462	351	462	351	377	462	351	351	NA	NA	NA	NA	NA	NA	NA	NA
87	ROUTE	1635	1629	1628	1635	1632	1634	1633	1631	1630	1635	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539962,565	4538761,584	4538512,062	4539962,565	4538964,999	4538903,298	4539125,85	4538685,621	4538921,811	4539962,565	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655901,342	655714,218	655971,01	655901,342	655337,403	655100,01	655394,026	655111,717	655428,264	655901,342	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1347	377	1347	377	377	377	377	377	377	1347	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
88	ROUTE	1928	1925	1927	1926	1928	1928	1928	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	X COORD	4539838,174	4539093,709	4539840,911	4539278,541	4539838,174	4538945,26	4539838,174	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	654288,259	654635,812	654753,765	654894,729	654288,259	654735,045	654288,259	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	554	377	3569	377	554	123	554	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	ROUTE	2091	263	262	260	267	268	266	261	265	264	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
194	X COORD	4550781,801	4546006,109	4545440,775	4545229	4546085,35	4545800,607	4545121,623	4545464,27	4546102,942	4545677,706	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	664028,318	663595,706	663938,144	663509,265	663117,897	662916,835	663970,387	663747,315	663468,8	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	644	771	771	367	257	131	771	644	644	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	938	947	946	943	944	945	948	938	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
195	X COORD	4551191,884	4546634,85	4546948,334	4546085,502	4546065,097	4546258,434	4546664,535	4551191,884	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	658422,077	665802,885	665484,989	665327,211	665014,017	665019,482	664794,025	658422,077	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	724	407	368	822	1109	1391	903	724	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1397	1386	1392	1391	1388	1389	1390	1387	1393	1397	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
196	X COORD	4544148,528	4548226,46	4548716,825	4548508,077	4548293,442	4548651,915	4548679,264	4548394,703	4547537,074	4544148,528	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657116,675	666550,366	665801,68	665664,54	666031,727	666835,885	666067,34	666157,998	665999,619	657116,675	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	412	701	634	634	634	1003	634	634	126	412	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1992	1990	1986	1987	1989	1993	1988	1991	1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
197	X COORD	4549009,23	4549255,909	4549749,501	4549568,394	4549203,379	4549529,538	4549411,93	4549017,939	4549009,23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	665590,944	665600,867	666213,655	666235,856	666145,378	665051,6	666166,713	665819,627	665590,944	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	634	360	751	751	751	759	360	634	634	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1205	1203	1207	1204	1206	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
198	X COORD	4549193,862	4548718,339	4542166,417	4548552,26	4548034,53	4549193,862	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	663705,709	664528,152	649736,3	664561,694	665312,191	663705,709	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	300	763	2525	763	649	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	270	277	275	276	271	274	278	269	273	272	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA
199	X COORD	4550781,801	4549405,594	4548480,109	4549523,084	4548946,972	4549344,489	4549255,838	4548772,867	4549641,572	4549480,144	4549371,984	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	663292,069	663282,655	662021,343	663626,49	662896,375	662381,462	663577,587	663094,552	662329,643	663374,491	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	508	749	863	300	508	1041	149	74	508	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1855	1859	1862	1861	1858	1860	1857	1855	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
200	X COORD	4550821,133	4549004,09	4548634,902	4549110,214	4549425,427	4549225,756	4549557,558	4550821,133	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	668900,456	661681,369	661320,544	661096,3	661676,599	662005,663	661611,571	668900,456	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	455	947	255	947	863	947	1041	455	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	553	558	554	555	557	556	553	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
201	X COORD	4545222,006	4548944,849	4550138,542	4549829,921	4549813,948	4550008,515	4545222,006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	665938,428	659164,793	659137,342	659035,009	658668,9	658532,015	665938,428	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	771	688	1078	1078	1078	771	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1097	1084	1080	1081	1082	1087	1083	1086	1085	1097	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
202	X COORD	4549908,21	4550519,752	4550594,442	4550444,842	4550728,25	4550319,203	4550295,868	4550628,199	4550849,984	4549908,21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657653,413	657407,228	656961,564	656908,071	657280,14	657481,581	657132,557	657502,273	657275,246	657653,413	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	251	669	669	669	669	317	669	669	669	251	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1097	1095	1088	1092	1090	1093	1091	1089	1093	1094	1097	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
203	X COORD	4549908,21	4550306,316	4551286,233	4550644,047	4550942,3	4550199,307	4550825,915	4551008,318	4550696,908	4550319,203	4549908,21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	657653,413	657759,71	657571,533	657717,208	657769,983	657403,512	657870,497	657443,726	657982,463	657481,581	657653,413	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	251	438	241	669	604	438	669	669	669	352	251	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1335	1334	1332	1333	1331	1335	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
204	X COORD	4546683,166	4547164,453	4546891,658	4546858,035	4547123,637	4546683,166	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651651,828	654325,677	653002,065	653590,849	652819,559	651651,828	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1138	1132	910	910	1138	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	523	515	518	522	517	524	519	516	521	520	523	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
205	X COORD	4546834,423	4538711,812	4538949,183	4539617,098	4538880,511	4546683,166	4539190,811	4538746,942	4539469,176	4539055,071	4546834,423	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	651191,97	635210,124	635192,655	635151,97	635251,769	651651,828	635299,702	635331,86	635038,005	634884,925	651191,97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	2109	132	132	986	132	981	132	132	132	132	2109	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1635	1636	1637	1635	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
206	X COORD	4539962,565	4546473,358	4545685,234	4539962,565	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	655901,342	650309,914	650256,953	655901,342	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1347	352	4648	1347	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	1829	1832	1830	1833	1831	1829	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
207	X COORD	4548416,858	4547873,172	4548168,326	4547674,479	4548064,393	4548416,858	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	656130,123	655937,523	656217,344	656153,393	655890,761	656130,123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	1018	1018	1018	928	1018	1018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	ROUTE	2091	280	284	283	279	281	282	2091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
208	X COORD	4550781,801	4549743,8	4548857,228	4549610,036	4549838,616	4549908,21	4549710,602	4550781,801	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Y COORD	661454,658	667520,511	667252,502	667797,353	667299,074	667653,413	667728,374	661454,658	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	SERVED P.	NA	438	1781	1078	438	187	1078	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix E:

Table E.1: Tour lengths for scenario 1

Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length
1	242.745876	34	174.5663213	67	104.4460207	100	73.94609933	133	54.411292	166	37.998322
2	240.8773221	35	173.3067353	68	103.1970553	101	73.88799933	134	53.79511867	167	37.861082
3	236.342326	36	173.008023	69	100.65386	102	73.30875333	135	53.27808933	168	36.80991733
4	234.3045893	37	170.9816273	70	95.64337933	103	71.96676333	136	52.977812	169	36.56842867
5	232.9416233	38	167.6870533	71	94.48004533	104	71.859396	137	52.95378067	170	35.92650933
6	228.528764	39	164.4975753	72	94.14308133	105	71.74773733	138	52.890568	171	35.23241667
7	227.6962593	40	162.9969313	73	93.93654933	106	69.44722933	139	52.34415267	172	33.85761933
8	225.6154253	41	161.3652247	74	93.28722533	107	69.24828667	140	51.525462	173	33.83960667
9	222.5845042	42	159.3383767	75	91.33471067	108	69.142882	141	51.334316	174	33.23127933
10	222.0777073	43	158.65999	76	89.93837467	109	69.06194867	142	49.33545333	175	32.382342
11	221.7754755	44	155.307558	77	89.03220667	110	69.032094	143	48.71208867	176	31.08502
12	220.0168807	45	154.770694	78	89.00774733	111	68.90453267	144	46.49474	177	30.52012267
13	219.6717455	46	152.074428	79	87.16875867	112	68.68105733	145	46.439984	178	30.45022067
14	217.3539613	47	152.010408	80	86.98886333	113	67.89688	146	46.402574	179	28.94651933
15	215.0425747	48	147.1480927	81	86.86307067	114	67.65798333	147	46.35299333	180	28.645898
16	214.365658	49	142.55081	82	85.13494667	115	67.498674	148	46.14711733	181	28.06896133
17	208.0017127	50	139.2605873	83	84.504434	116	67.25939067	149	45.86655533	182	28.03993133
18	207.707536	51	132.4952153	84	83.85478733	117	67.180648	150	45.47704267	183	27.57452667
19	206.3137793	52	132.3402127	85	83.68000733	118	66.79408867	151	45.20884267	184	25.775884
20	205.7296627	53	130.7847507	86	83.580312	119	66.303852	152	44.66946867	185	23.576306
21	204.8297147	54	130.577666	87	83.362594	120	65.329708	153	43.91081933	186	22.489366
22	204.689454	55	128.738846	88	81.757966	121	65.23647933	154	43.86836267	187	22.48217333
23	198.4419193	56	125.0841527	89	80.387998	122	64.97705067	155	43.80057133	188	21.017692
24	197.4617113	57	124.8082133	90	80.03870067	123	64.59068067	156	43.05767133	189	19.70963667
25	193.6374753	58	122.0283767	91	79.99484533	124	63.311262	157	42.764776	190	18.27057867
26	188.7154793	59	121.8650233	92	78.213596	125	62.341618	158	42.608806	191	17.13910533
27	188.4833307	60	117.0702007	93	76.794876	126	61.42355067	159	41.84048333	192	16.80214733
28	186.42191	61	116.3887773	94	76.45936267	127	59.44898067	160	41.28484867	193	16.786796
29	186.36962	62	115.489982	95	75.710612	128	58.49999	161	40.960244	194	16.21735333
30	183.1684927	63	114.3109313	96	75.66742	129	57.49029667	162	40.95120533	195	10.40741
31	181.6039367	64	113.6344727	97	75.589558	130	56.98046133	163	38.45425733	196	5
32	180.594886	65	107.301904	98	75.33729467	131	54.69275533	164	38.37632933		
33	175.5003013	66	107.0370387	99	74.59982133	132	54.654838	165	38.346858		

Service T	5	Min:	5.00
Speed	60-90	Max:	242.75
		Avg:	96.60

Appendix F:

Table F.1: Tour lengths for scenario 2

Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length	Tour Number	Tour Length
1	5.00	40	22.34	79	30.25	118	39.09	157	48.17	196	60.24
2	5.00	41	22.80	80	30.45	119	39.55	158	48.43	197	60.32
3	9.58	42	22.92	81	31.62	120	39.82	159	48.62	198	60.37
4	10.09	43	22.95	82	31.72	121	40.24	160	49.50	199	60.41
5	10.37	44	22.97	83	31.80	122	40.95	161	49.71	200	61.07
6	10.43	45	23.21	84	31.91	123	40.97	162	49.72	201	61.35
7	10.60	46	23.67	85	32.00	124	41.08	163	49.89	202	62.37
8	11.02	47	23.82	86	32.04	125	41.09	164	49.90	203	62.40
9	11.41	48	24.01	87	32.05	126	41.46	165	50.06	204	62.46
10	11.72	49	24.27	88	32.44	127	41.86	166	50.08	205	62.55
11	13.22	50	24.35	89	32.58	128	42.13	167	50.20	206	62.93
12	14.18	51	24.62	90	32.58	129	42.73	168	50.57	207	63.45
13	14.19	52	24.64	91	32.59	130	42.91	169	50.62	208	63.64
14	14.38	53	25.21	92	32.93	131	42.92	170	50.76	209	63.89
15	14.96	54	25.45	93	33.56	132	43.50	171	51.33	210	64.21
16	16.06	55	25.49	94	33.69	133	43.55	172	51.45	211	64.84
17	16.15	56	26.00	95	33.74	134	43.63	173	51.56	212	66.32
18	16.24	57	26.17	96	33.74	135	43.77	174	52.69	213	66.99
19	16.95	58	26.31	97	34.00	136	44.51	175	52.77	214	67.13
20	17.05	59	26.36	98	34.07	137	44.65	176	53.16	215	70.69
21	17.46	60	26.38	99	34.15	138	44.71	177	53.25	216	71.30
22	18.02	61	26.41	100	34.59	139	44.77	178	53.34	217	72.05
23	18.63	62	26.49	101	34.64	140	45.16	179	53.34	218	73.89
24	19.16	63	26.67	102	34.85	141	45.16	180	53.34	219	74.51
25	19.66	64	27.03	103	35.42	142	45.40	181	53.79	220	74.72
26	19.71	65	27.24	104	35.86	143	45.44	182	54.80	221	75.10
27	20.08	66	27.40	105	35.90	144	45.52	183	54.95	222	77.80
28	20.37	67	27.58	106	36.19	145	45.71	184	55.27	223	78.29
29	20.37	68	27.83	107	36.34	146	46.41	185	55.63	224	79.63
30	20.79	69	27.84	108	36.83	147	46.66	186	55.73	225	80.28
31	21.23	70	28.23	109	37.37	148	46.82	187	55.90	226	81.45
32	21.26	71	28.44	110	37.41	149	46.84	188	56.37	227	81.73
33	21.45	72	28.56	111	37.63	150	47.10	189	56.66	228	84.83
34	21.60	73	28.95	112	37.68	151	47.26	190	56.81	229	85.18
35	21.62	74	29.19	113	38.18	152	47.76	191	57.09	230	86.45
36	21.62	75	29.43	114	38.33	153	47.78	192	57.62	231	87.12
37	21.68	76	29.48	115	38.41	154	47.94	193	57.83		
38	21.75	77	29.63	116	38.59	155	47.98	194	58.93		
39	21.89	78	30.00	117	38.61	156	47.99	195	60.10		

Service T	5	Min:	5.00
Speed	60-90	Max:	218.26
		Avg:	63.21

BIOGRAPHICAL SKETCH

Niyazi etinkaya, the candidate of Master of Science in Industrial Engineering Department in Galatasaray University, was born in Sivas on June 10, 1981. He graduated from Kuleli Military High School in 1999, and received his B.Sc. degree in Systems Engineering from Turkish Military Academy in 2003. He worked for Turkish Military until he was first lieutenant. Since 2013, he has been working at Disaster and Emergency Management Presidency (AFAD). He managed AYDES software project from scratch. Meanwhile he also studied for degree of M.Sc. in Industrial Engineering from Galatasaray University. This thesis was written in order to fulfill the requirements for his graduation from Galatasaray University under the supervision of H. Ziya Ulukan. His research interests are combinatorial optimization, heuristic algorithms, and disaster management.