



CHAPTER II

Transit Service Options

INTRODUCTION

The basis for any transit plan is the careful consideration of realistic service options. Passenger needs, travel patterns, and funding often dictate the type of service to be provided in an area. However, it is always helpful to research realistic transit service options and costs for transit services. Capital requirements, financial plans, and management options can then be developed to support the planned transit service. The following discussion evaluates the various transit service options for meeting the transportation needs of the local residents.

TRANSIT SERVICE OPTIONS

The following section reviews the various conceptual transit service options. Table II-2, at the end of this chapter, details the various service options reviewed in this analysis. The number of vehicles operating in maximum service for each alternative as well as operating costs are estimated. Each alternative is presented with a brief description of the transit service option and some other attributes.

A cost of \$61.53 per hour of service was derived from the fully allocated costs presented in a previous technical memorandum. Demand-response service was estimated at \$40 per hour.

All of the service options assume operating a 13-hour day compared to the current 11-hour operating time. Having service operating from roughly 6:00 a.m. until 7:00 p.m. allows commuters to more effectively use the system.

It should be noted that the proposed costs do not take into account that ADA paratransit service would operate an extra hour daily. This may add to the cost of providing the Mini-bus service. The exception would be the option that has midday demand-response service, which could lower this cost.

Option 1 - Central Hub

The first transit service option can be seen in Figure II-1. This option has one central transfer point to be located in the vicinity of the existing Delhi transfer center. The current location of the Delhi transfer center may not be appropriate for future options due to the limited size and area for growth. The majority of routes that go through the Eagle Point neighborhood have not changed. This is due to the fact that ridership is highest through these neighborhoods, which also have the greatest transit needs.

Under this option, the downtown shuttle would be similar to the current trolley service being offered, but would operate year round and provide more frequent service. The downtown shuttle extension is used to accommodate people traveling between the Greyhound Park and Downtown.

The route shown in Orange is primarily a shopping circulator, which runs from the transfer point and accesses locations such as Wal-Mart, Kennedy Mall, Kmart and HyVee. The turquoise route is designed to serve individuals living in the southern part of Dubuque. It allows residents to travel to the transfer center or to downtown. The maroon route serves Pennsylvania Avenue as well as the growing industrial park. The teal route is designed to serve the northwestern part of the city, along with Goodwill and the rest of Asbury Road.

Three scenarios were explored in terms of frequency. Costs and ridership were determined for Option 1 using both 30- and 60-minute headways, as well as a combination option that operates with a 30-minute headway during peak times, and a 60-minute headway during midday. Under each scenario, the downtown shuttle operates at ten-minute intervals, with the extension operating with a 30-minute headway.

60-Minute Headway

- Number of vehicles in maximum service: 12
- Total number of vehicles: 15
- Initial capital cost: \$600,000
- Paratransit cost: \$787,514

- Annual operational cost: \$2,927,597
- Annual hours of service: 47,580
- Annual passenger-trips: 540,700
- Passengers per hour: 11.4
- Cost per passenger-trip: \$5.41

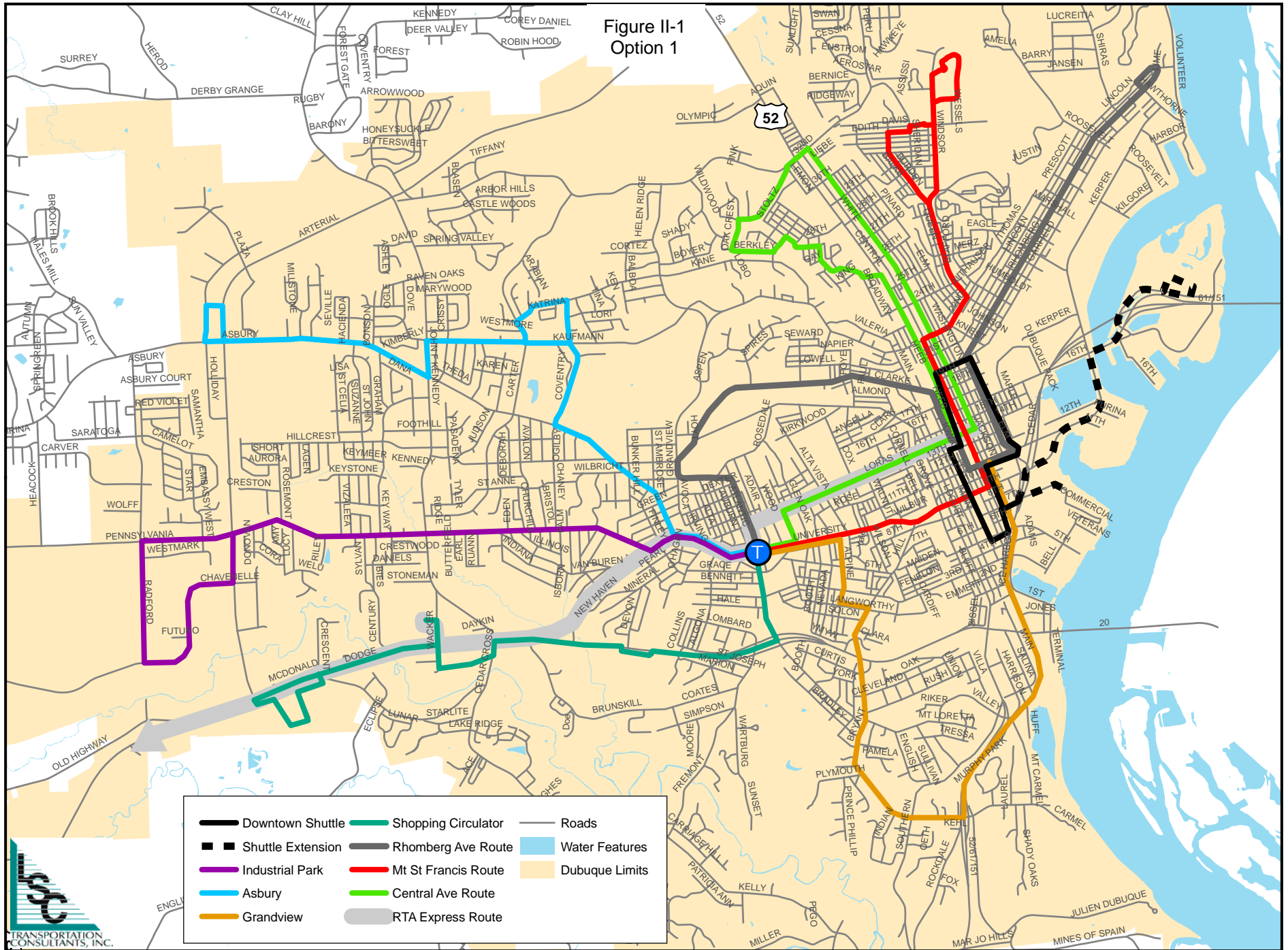
30-Minute Peak Headway, 60-Minute Off-Peak

- Number of vehicles in maximum service: 18
- Total number of vehicles: 22
- Initial capital cost: \$1,350,000
- Paratransit cost: \$787,514
- Annual operational cost: \$3,601,000
- Annual hours of service: 58,500
- Annual passenger-trips: 747,500
- Passengers per hour: 12.5
- Cost per passenger-trip: \$4.96

30-Minute Headway

- Number of vehicles in maximum service: 18
- Total number of vehicles: 22
- Initial capital cost: \$1,350,000
- Paratransit cost: \$787,514
- Annual operational cost: \$4,391,000
- Annual hours of service: 71,370
- Annual passenger-trips: 990,250
- Passengers per hour: 13.9
- Cost per passenger-trip: \$4.43

Figure II-1
Option 1



Option 2 - East and West Hubs

The second option is based on two transfer points as shown in Figure II-2. The transfer points would be located downtown and at Kennedy Circle or Kennedy Mall. This option incorporates the Eagle Point routes and the downtown shuttle configuration described in Option 1. Three crosstown routes were developed to connect riders between the two transfer points. This option also contains a shopping shuttle that leaves from the Kennedy Circle transfer point and serves many of the popular shopping destinations.

This option also explored using 60- and 30-minute headways as a base and the combination peak and off-peak headways. The downtown shuttle is the only route that differs, with a 10-minute headway and 30 minutes for the extension.

60-Minute Headway

- Number of vehicles in maximum service: 12
- Total number of vehicles: 15
- Initial capital cost: \$600,000
- Paratransit cost: \$787,514
- Annual operational cost: \$2,927,000
- Annual hours of service: 47,580
- Annual passenger-trips: 511,000
- Passengers per hour: 10.7
- Cost per passenger-trip: \$5.73

30-Minute Peak Headway, 60-Minute Off-Peak

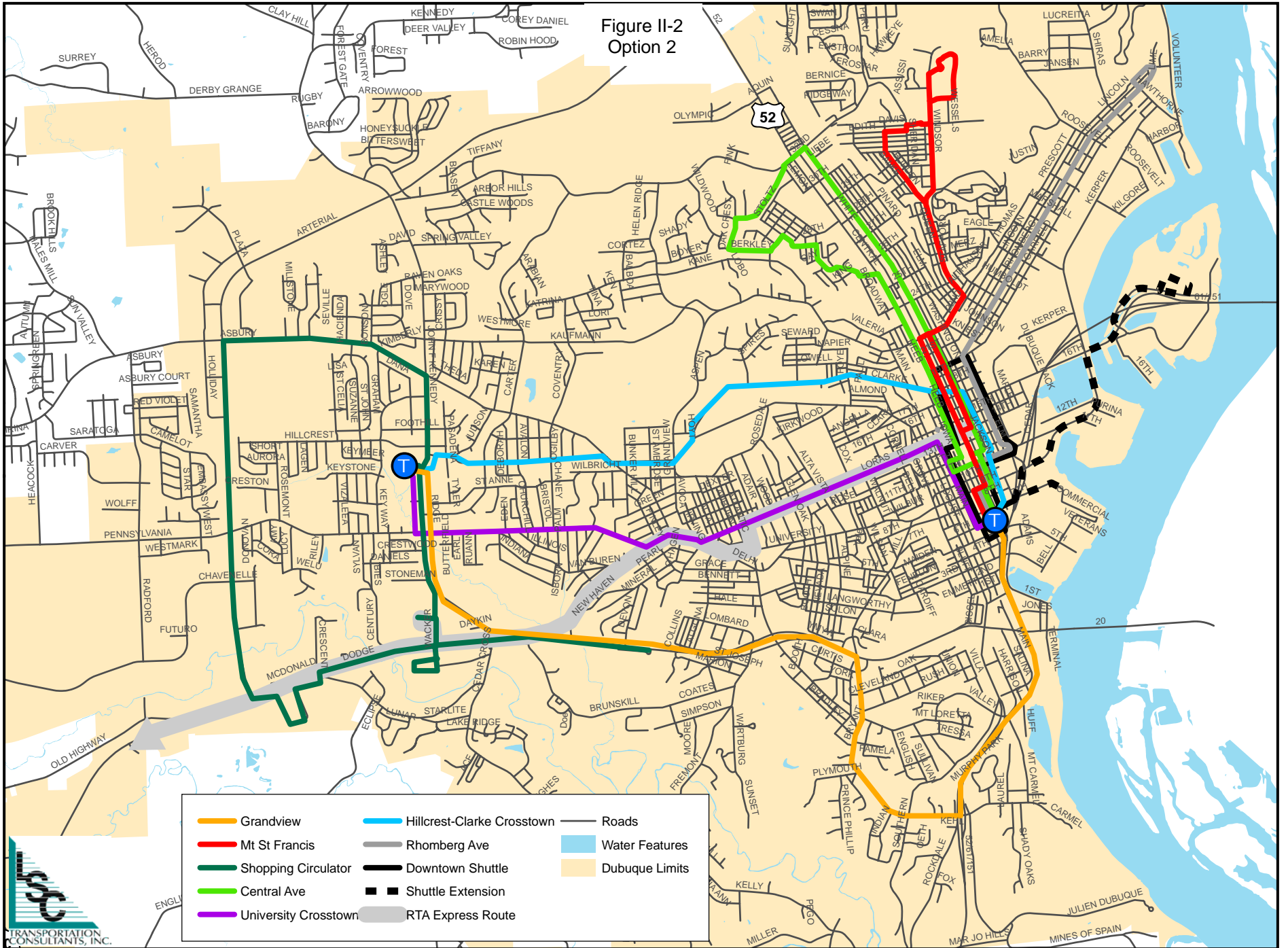
- Number of vehicles in maximum service: 18
- Total number of vehicles: 22
- Initial capital cost: \$1,350,000
- Paratransit cost: \$787,514
- Annual operational cost: \$3,601,000
- Annual hours of service: 58,500
- Annual passenger-trips: 706,250
- Passengers per hour: 11.8
- Cost per passenger-trip: \$5.25

Transit Service Options

30-Minute Headway

- Number of vehicles in maximum service: 18
- Total number of vehicles: 22
- Initial capital cost: \$1,350,000
- Paratransit cost: \$787,514
- Annual operational cost: \$4,391,000
- Annual hours of service: 71,370
- Annual passenger-trips: 935,000
- Passengers per hour: 13.1
- Cost per passenger-trip: \$4.69

Figure II-2
Option 2



Grandview	Hillcrest-Clarke Crosstown	Roads
Mt St Francis	Rhomborg Ave	Water Features
Shopping Circulator	Downtown Shuttle	Dubuque Limits
Central Ave	Shuttle Extension	
University Crosstown	RTA Express Route	



Option 3 - Central Hub Hybrid System

The third option is shown in Figure II-3. This option is the most different from the current service being utilized. It involves a central and western transfer center. The key features of this option are the utilization of demand-response zones. These demand-response zones offer flexibility for patrons.

In addition to the demand-response zones, there are two circulators that depart from the transfer points. There is a medical circulator that leaves from the Delhi transfer point and that operates as a deviated route. This means that it can deviate a set distance from the route to serve passengers. The Kennedy transfer point operates a shopping shuttle similar to the ones presented in the previous options.

This option was explored with four different scenarios. The first scenario is to have 15-minute headways during peak times with 30-minute headways during the rest of the day. The second option looks at 30-minute headways all day. The third option involves a 30-minute peak headway with 60-minute headways the rest of the day. The last option considers using 30-minute peak headways with only demand-response service during the middle portion of the day.

15-Minute Peak Headway, 30-Minute Off-Peak

- Number of vehicles in maximum service: 27
- Total number of vehicles: 33
- Initial capital cost: \$3,150,000
- Paratransit cost: \$787,514
- Annual operational cost: \$5,296,577
- Annual hours of service: 90,243
- Annual passenger-trips: 1,152,000
- Passengers per hour: 12.8
- Cost per passenger-trip: \$4.60

30-Minute Headway

- Number of vehicles in maximum service: 20
- Total number of vehicles: 25

- Initial capital cost: \$1,100,000
- Paratransit cost: \$787,514
- Annual operational cost: \$4,623,330
- Annual hours of service: 79,300
- Annual passenger-trips: 1,023,000
- Passengers per hour: 12.9
- Cost per passenger-trip: \$4.52

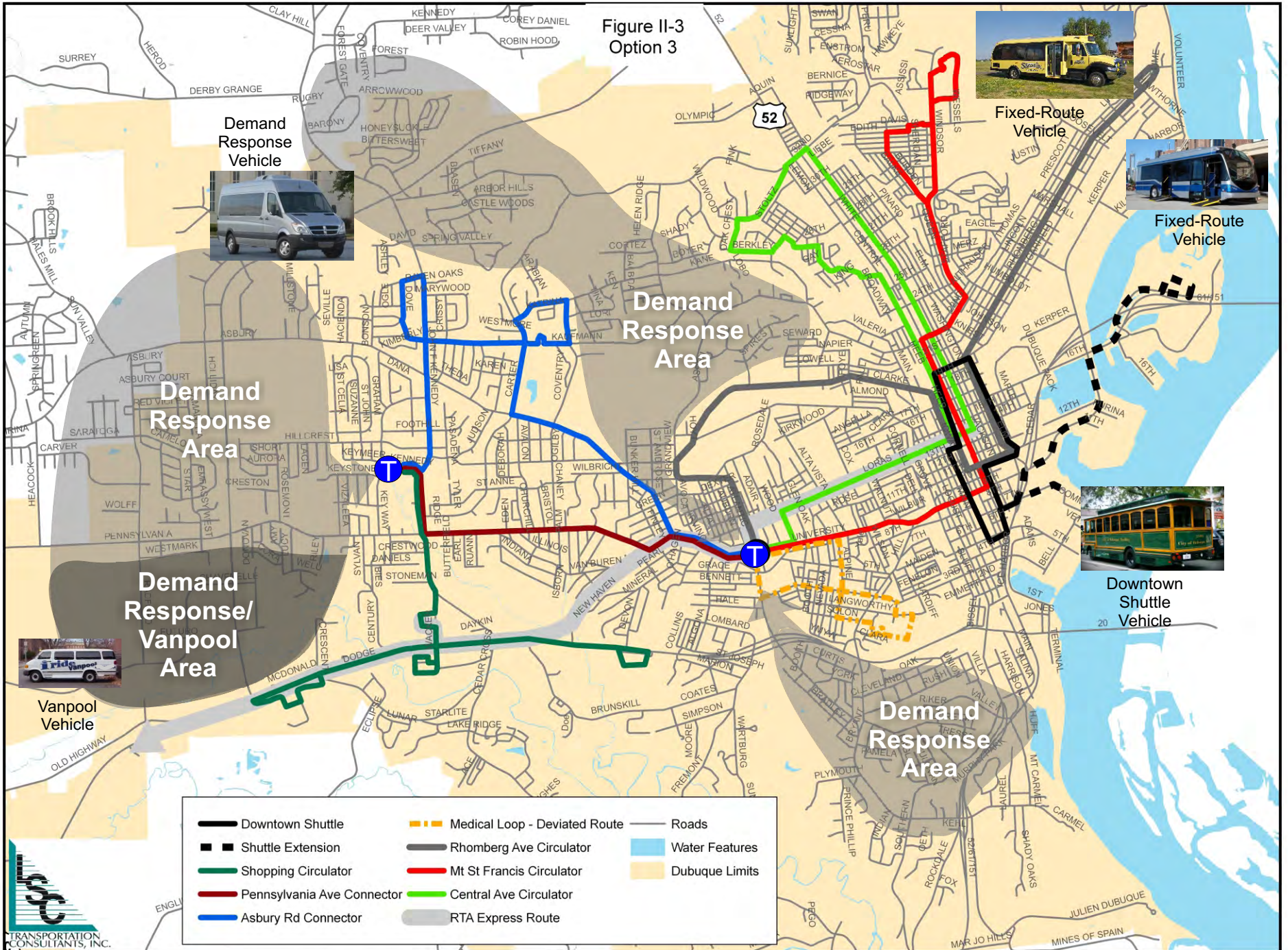
30-Minute Peak Headway, 60-Minute Off-Peak

- Number of vehicles in maximum service: 20
- Total number of vehicles: 25
- Initial capital cost: \$1,100,000
- Paratransit cost: \$787,514
- Annual operational cost: \$3,964,520
- Annual hours of service: 68,595
- Annual passenger-trips: 780,000
- Passengers per hour: 11.4
- Cost per passenger-trip: \$5.52

30-Minute Peak Headway, Midday Demand-Response Service

- Number of vehicles in maximum service: 20
- Total number of vehicles: 33
- Initial capital cost: \$1,400,000
- Paratransit cost: \$748,138
- Annual operational cost: \$3,650,008
- Annual hours of service: 68,713
- Annual passenger-trips: 662,000
- Passengers per hour: 9.6
- Cost per passenger-trip: \$5.52

Figure II-3
Option 3



Option 4 - Taxi Voucher Program

Taxi voucher programs are fairly common in rural areas and smaller communities. They allow users to have subsidized trips with the convenience of a private provider. Riders generally purchase vouchers that are redeemable for a taxi trip with certain conditions. The user generally pays for the voucher, the cost of which would be comparable to bus fare. The taxi company then redeems the vouchers with the issuer to receive full payment for the trip.

We looked at this option under multiple scenarios. The first was to determine the cost based on current demand. We then examined the cost if demand increased due to convenience and enhanced service. The last option looked at the cost of providing taxi vouchers from 7:00 p.m. to 11:00 p.m. and on Sundays to supplement the regular transit service. Using costs provided by the local taxi company and an average trip length of 4.6 miles, the average cost per passenger was estimated at \$10.80. The trip length of 4.6 miles is a fairly typical national average for passenger trip length on transit.

Please note that this option would eliminate the need to provide paratransit service. It is assumed that current paratransit riders would be shifted to the taxi voucher program. At least a few available vehicles will have to be wheelchair-accessible in order to accommodate users with limited mobility. In Table II-2 the costs associated with paratransit riders are listed under paratransit costs even though these riders would most likely be using the voucher program.

Current Demand

Looking at the cost of providing taxi vouchers at the current ridership level of 554 unlinked daily trips, provides a good baseline. Using the aforementioned rate yields an approximate daily cost of \$5,972. The yearly cost of providing this service is estimated at \$1.86 million. The additional cost of providing this service to those individuals who were previously using Mini-bus service is approximately \$545,000 annually.

Increased Demand

The use of taxi vouchers would undoubtedly cause an increase in use due to the convenience and cost. Using a comparable demand to the Central Hub system that operates a 30-minute headway during peak times and a 60-minute headway during off-peak times, the system would cost approximately \$5,475,600 annually to operate. In addition, it is estimated to cost another \$545,000 to accommodate former paratransit riders with the service, bringing the total cost to over \$6,000,000.

Late Nights and Sunday Service

While using taxi vouchers as the primary service doesn't seem feasible, using it to supplement transit service might be. If taxi vouchers were used to cover gaps in service, such as from 7:00 p.m. until 11:00 p.m. Monday through Saturday and 6:00 a.m. until 7:00 p.m. on Sunday, it is more practical. Using current ridership statistics, this type of service would cost \$1.56 million to operate on week nights and \$1.03 million to operate on Sunday. The cost to provide this service to former paratransit users is estimated to be around \$168,500 per year. This option does pose a potential unintended consequence. Riders might avoid using regular transit service, instead opting to wait until it was time to use their taxi vouchers, as it is more convenient.

Taxi Voucher Examples

The following section gives brief descriptions of some communities that are currently using taxi voucher programs in various scenarios. When available, statistics on cost and ridership are provided. Three applicable examples were found that could be used in some form for Dubuque.

Iowa City, Iowa

The After Hours Cab program was developed in 2008 to supplement current transit service. This program is designed to allow users to access job and education opportunities during times when transit service is not in operation. The program is available to city residents for a work, education or child daycare trip. These limitations exist in part because the program is funded through JARC. The participants are accepted based upon a pre-qualification application process,

which then gives them the ability to ride. The program provides them with half-priced cab fare. The transit system is billed the remaining cab fare.

Olathe, Kansas

The City of Olathe, Kansas offers a taxi voucher program for residents who are elderly, disabled, or low income. This program is available Monday through Saturday from 6:00 a.m. until 7:00 p.m. Participants in this program must first apply and receive verification. Elderly and disabled individuals are able to get green coupons, while low-income individuals are issued purple coupons. The two coupons determine the purpose for which they can be used. The elderly and disabled may use their coupons, which cost \$2.50 each way, for any general purpose. Low-income individuals, who also pay \$2.50 each way, may only use their coupons for trips related to work or job skills training. Participants are allowed to purchase up to 20 vouchers per month. The program has approximately 1,000 participants who are registered in order to be able to use the service in some capacity.

Washington County, Maryland

County Commuter of Washington County currently operates the Ride Assist program through the Statewide Specialized Transportation Assistance Program (SSTAP). This program is open to disabled individuals and the elderly. Individuals in the program must submit an application to the transit system before being allowed to participate. Program participants may use the vouchers Monday through Saturday from 6:00 a.m. until 10:00 p.m. The cost for vouchers varies by location within the county and ranges between \$3.75 and \$5.00 for a booklet worth \$10.00. Thus, users pay a maximum of half of the fare. A maximum of fourteen booklets may be purchased within a one-month period; the vouchers do not expire. Total expenses for this program in FY 2008 were \$202,000. There were approximately 200 clients enrolled in the program, meaning that the cost per participant was roughly \$1,000.

Rhineland, Wisconsin

The City of Rhineland, Wisconsin operates a general public taxi voucher program. The program cost passengers \$2.50 each way per trip and may be used

within Oneida County. The program provided 73,000 trips during 2007, the most recent year that data were available. The total operational cost for the voucher program was \$629,000. This equates to a cost per passenger-trip of \$8.60. The total mileage traveled for the system is approximately 270,000 miles. The cost per mile was approximately \$2.33.

ORGANIZATIONAL OPTIONS

Central Dispatch for All Demand-Response Service

One way to improve service in the region may be to consolidate services. Currently, the RTA and KeyLine have separate dispatching functions and personnel. Consolidating these services into one location would be more efficient. Both systems use comparable scheduling and dispatching software; consolidation would save on licensing and upgrade costs. It is estimated that the consolidation of scheduling and dispatching could improve efficiency of the Mini-bus by as much as one passenger per hour. This efficiency increase would save a total of 7,400 hours of service if the Mini-bus went from 2.5 passengers per hour to 3.5 by placing some passengers on RTA buses and some RTA passengers on the Mini-bus. The cost savings could amount to approximately \$208,000 annually. This option would also require a service agreement between the RTA and the City for the dispatching service and for passengers transported on vehicles operated by the other agency. A non-monetary benefit is the enhanced customer service that could arise from this scenario. Local residents would be able to have the majority of their transportation needs covered by one office, making both systems more convenient to use.

RTA Operation of All Demand-Response Services

Both KeyLine and RTA provide paratransit services within the region. The Mini-bus service being operated by KeyLine costs approximately \$47.90 per hour. The service provided by RTA is significantly less, costing only \$42.73 per hour. This cost difference suggests that it may be wise financially for KeyLine to contract their paratransit services to RTA.

Using the current expenses for both agencies, the total estimated cost for both agencies to provide paratransit services is approximately \$2.4 million. If KeyLine

were to contract the services to RTA, this cost would be reduced to roughly \$2.1 million with an estimated savings of \$328,000 annually. This represents a savings of 14 percent in total paratransit costs. This figure represents the cost of RTA providing paratransit services along with having centralized dispatch which would increase the efficiency of the system.

ITS Technology Improvements

Many intelligent transportation system (ITS) elements can help improve transit service by providing information or by giving buses a distinctive advantage. This includes providing information in real time as well as signaling improvements. In the late 1900s, the use of automatic vehicle location (AVL) systems to better monitor and control operations was being used. As these AVL systems further developed, transit agencies recognized that data from an AVL system could be used to customers' benefit by providing real-time predictions of bus arrivals.

Intelligent Transportation Systems (ITS) applications for KeyLine Transit should be considered to reduce the amount of information drivers must record and to streamline the information processes. By combining systems on vehicles with computer-aided dispatch, there is the potential for significant improvements in productivity. One component of the system is automatic vehicle location (AVL), which includes a global positioning system (GPS) receiver on the vehicle with digital communication to a central computer. The AVL system provides information to the dispatcher showing the vehicle's precise location at any time. KeyLine already has an AVL component in place. The second key component is a mobile data terminal (MDT), which displays information for the driver and can serve as a data entry terminal. Rather than using manual tally boards to record passengers, passenger boardings are entered on the MDT and the data is transmitted to the central computer. This reduces the need for the driver to record total boardings at the end of the shift. It is also possible to record deadhead mileage directly using the MDT. KeyLine could install MDTs for recording passenger counts. These systems cost approximately \$10,000 to \$12,000 per vehicle.

ITS is also used to improve service to the customer and to benefit the community at large. The public values information about when the next vehicle is coming,

potential delays, possible travel itineraries for future trips, etc. They expect more reliable travel times and connections, etc. These expectations will only build further as communication technologies permeate society. ITS realtime display boards can be installed in parking garages, colleges, major downtown businesses, transfer locations, malls, and major shopping centers in the City of Dubuque. However, to achieve increased ridership, control must be effective enough to permit accurate estimates of vehicle arrival times. Security, through quick response to incidents, can also result in increased ridership.

According to the *TCRP Synthesis 48: "Real-Time Bus Arrival Information,"* most transit systems use light-emitting diode (LED) signs to present bus arrival information at stops. Other methods of real-time bus information being used are the Internet, cell phones, and personal digital assistants (PDAs). Information displayed on LEDs are the route number and final destination of the vehicle, waiting time displayed either in a countdown format or as a time range, and, in some cases, service disruptions and/or a security message is displayed. The view among patrons is that bus services have improved and that people traveling late at night now have the reassurance that the next bus is not far away. Also, real-time bus arrival information results in benefits to the transit agency such as less time required to monitor and control schedule adherence, improved safety and security for personnel and riders, and less time invested in responding to customer inquiries.

Implementation

Passenger Information Signs

Buses operated by the RTA and KeyLine are equipped with automatic vehicle locators (AVL) that allow their locations and other variables to be tracked. This information can be relayed to screens that are placed at the busiest or most prudent locations. Table II-1 provides a list of preliminary locations along with the quantities required. The screens cost approximately \$9,900 each. The total cost for the 22 proposed locations would be approximately \$217,800. *TCRP Synthesis 68: Methods of Rider Communication* reveals a varying degree of operation and maintenance costs for electronic signs at stops. Dubuque can most likely expect

to pay between five and ten percent of the capital cost annually for operation and maintenance. This is estimated to be between \$11,000 and \$22,000 per year.

Table II-1 Real-Time Information Board Locations	
Board Location	Number
Parking Ramps	3
Medical Associates (East and West)	2
McKesson	1
IBM	1
Prudential	1
Mercy Hospital	1
Finley Hospital	1
Dubuque Internal Medicine	1
Target	1
Kennedy Mall	1
Kmart	1
Wal-Mart	1
Hy-Vee (Locust)	1
Downtown Transfer Center	1
Kennedy Circle	1
Delhi Transfer Center	1
NICC	1
Dubuque College	1
Loras College	1
Total	22

Real-Time Internet Information

This same technology can also be used to provide information to passengers over the Internet. This information can be used in a variety of ways, giving passengers access to important bus information. The buses can be tracked so that users know exactly where they are or they can provide similar information to the passenger signs, just in a different medium. Recently a similar system in Des Moines was estimated to cost approximately \$101,000. The downside to this system is that it excludes users without Internet access.

Queue-Jump Lanes

A queue-jump lane gives buses priority at a signalized intersection. Buses have a designated lane in which only they are allowed to queue. This allows the bus not to have to wait in line behind other vehicles. This is a common occurrence in bus rapid transit systems. The creation of a queue-jump lane is made easier if right-of-way is able to be purchased or if there are multiple single-direction lanes that can

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be modified. The cost to retrofit a signalized intersection can be between \$5,000 and \$50,000 or more depending on the magnitude of required improvements.

Signal Priority

Signal priority gives buses a priority signal over other forms of travel. This allows the bus to depart a few seconds ahead of traffic. Signal priority is often used in conjunction with queue-jump lanes. The cost associated with signal priority are the signal heads. Certain configurations of signals may exist that allow them to be reprogrammed to coincide with a transponder on the bus. Converting a signal to give buses priority can cost between \$2,000 and \$8,000 depending on the current signal system.

Table II-2 Service Operation Summary									
Service Type	Base Frequency	Vehicles Operated in Max. Svc.	Estimated Annual Ridership	FR Operating Cost	Paratransit Costs	Total System Operating Costs	Revenue-Hours	Cost/Trip	Pass/Hour
<i>Current Service</i>	60	10	270,762	\$1,545,816	\$729,180	\$2,274,996	25,122	\$5.71	10.8
Central Hub	60	12	540,696	\$2,927,597	\$787,514	\$3,715,111	47,580	\$5.41	11.4
	30 Peak, 60 Off	18	747,508	\$3,600,945	\$787,514	\$4,388,459	58,523	\$4.96	12.5
	30	18	990,288	\$4,391,396	\$787,514	\$5,178,910	71,370	\$4.43	13.9
East and West Hub	60	12	511,056	\$2,927,597	\$787,514	\$3,715,111	47,580	\$5.73	10.7
	30 Peak, 60 Off	18	706,243	\$3,600,945	\$787,514	\$4,388,459	58,523	\$5.25	11.8
	30	18	935,376	\$4,391,396	\$787,514	\$5,178,910	71,370	\$4.69	13.1
Central Hub Hybrid	15 Peak, 30 Off	27	1,151,904	\$5,296,577	\$787,514	\$6,084,091	90,243	\$4.60	12.8
	30	20	1,022,736	\$4,623,330	\$787,514	\$5,410,844	79,300	\$4.52	12.9
	30 Peak, 60 Off	20	779,688	\$3,964,520	\$787,514	\$4,752,034	68,595	\$5.08	11.4
	Midday DR	20	661,752	\$3,650,008	\$748,138	\$4,398,146	68,713	\$5.52	9.6
Taxi Voucher Program	Current Demand	n/a	172,848	\$1,866,758	\$544,936	\$2,411,694	n/a	\$10.80	n/a
	Increased Demand	n/a	507,000	\$5,475,600	\$544,936	\$6,020,536	n/a	\$10.80	n/a
	Nights and Sunday	n/a	240,832	\$2,600,986	\$168,480	\$2,769,466	n/a	\$10.80	n/a