PACE SUBURBAN BUS SERVICE
Arterial Rapid Transit Study

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EXECUTIVE SUMMARY

An important component of Pace's strategic plan, Vision 2020, is to strengthen the service on key travel corridors in its service area. In the plan, line-haul routes on these corridors will provide the backbone of a high-speed inter-suburban transit network connecting critical transportation centers. An Arterial Bus Rapid Transit (ART), Bus Rapid Transit (BRT) system specifically tailored to the characteristics of Pace's transit market and suburban service area is the ideal choice to provide high service level at a low cost.

Pace has initiated this study to:

1. Identify the corridor where the initial ART route could be implemented
2. Define the ART network
3. Determine the preliminary characteristics of the ART system
4. Identify the funding options and define the project delivery strategy for the first ART route

Identifying the Initial ART Route

In Vision 2020 Pace has identified 24 key travel corridors in its service area. In this study these 24 corridors were analyzed to identify the corridor with the highest potential for successful ART service. Successful BRT routes share common characteristics, including that they: serve existing transit markets, generate new transit riders, directly connect to the larger transit network, provide rider benefits in terms of reduced travel time and enjoy the support of the local communities and regional agencies. Based on these characteristics, the following criteria were used to determine the potential of the 24 corridors for successful ART service:

- Existing ridership
- Potential to generate new riders
- Regional connectivity
- Support from local communities and regional institutions
- Potential for travel time savings

The list of 24 candidate corridors was reduced to one initial ART route through the application of these criteria through a 4-Phase process.

Phase 1: The initial 24 corridors were evaluated by existing ridership, potential to generate new riders and whether they directly connect to the existing transit network of CTA, Metra and Pace's exurban routes. Socio-economic and route-level transit data, as well as system maps, were used for this evaluation. At the conclusion of Phase 1, 13 corridors were identified to have existing Pace service, transit supportive land use characteristics, population densities, and socio-economic indicators and direct connectivity to the rest of the transit network.

Phase 2: These 13 corridors were further evaluated against the criteria on a more detailed level. The corridors were divided into operable segments. Each segment was characterized with a socio-economic score representing the segment's ridership generating potential; and a transit criteria score representing the segment's productivity and connectivity. High scoring segments were connected into routes operable at a minimum frequency throughout the entire length of the route. Out of these routes, six were selected to be implemented within a 10-year time frame. It

was, in part, the intent to select routes throughout Pace's entire service area. These six routes directly connect to one another as well as to the CTA and Metra networks. The following six routes were selected: Milwaukee, Dempster, Oak Brook, Harlem, 95th Street and Halsted Street.

Phase 3: These six routes were further evaluated by two additional criteria: 1) potential for travel time savings based on Right-of-Way (ROW) characteristics; and 2) support from regional institutions if they were selected to be the first ART route. Based on ROW characteristics (rail road grade crossings and number of lanes and turning lanes), it was determined that achieving travel time savings on 95th Street would be a challenge requiring some familiarity with ART operation. Based on ongoing studies in the region and regional plans for the next 10 years, it was identified that two of the six routes, Harlem and Halsted, would receive regional institutional support in the second 5-year of the 10-year implementation time frame. The remaining three routes, Milwaukee, Dempster and Oak Brook, have no ROW impediment for travel time savings and would receive immediate regional institutional support. These three routes were evaluated in Phase 4.

Phase 4: These three routes were further evaluated by these two additional criteria: 1) potential for travel time savings at signalized intersections and from reduction in the number of stops and 2) support from local communities along the routes. Based on Pace's Transit Signal Priority (TSP) Initiative and Queue Jump Bypass Lane Project, as well as inspection of the corridors, it was determined the TSP, but not queue jump lanes, could result in travel time savings along these routes. Based on input from Pace's community relations staff, local communities supportive of transit were identified along these three routes.

As Milwaukee and Dempster ART routes emerged as the top two candidates from the evaluation process, key stakeholders along these routes were contacted in order to introduce the ART plan and gauge stakeholders' initial reaction to it. The outreach program was successful: all six communities along the routes – Des Plaines, Park Ridge, Niles, Skokie, Morton Grove and Evanston – as well as Chicago DOT (CDOT) and Chicago Transit Authority (CTA) expressed their support for the ART idea and showed interest in working with Pace toward developing ART on Milwaukee and Dempster corridors. Three of the communities, Niles, Skokie and Morton Grove, have provided Pace with their redevelopment plans for future coordination with the ART projects. The result of the community outreach effort strengthened the results of the corridor selection process.

At the conclusion of the evaluation process, the top three routes were compared to one another based an all 5 criteria. At the conclusion of this evaluation process, the Milwaukee ART route was rated as having the highest potential for a successful ART service, followed by the Dempster ART route.

Network Development

The short, medium, and long-term ART networks were developed using results of the segment evaluation in Phase 2 and Pace's goal of connecting all sub-regions of its service area.

It is the recommendation of this study to begin the ART network implementation of the following:

- Milwaukee ART – from the CTA's Jefferson Park Station to Golf Mill Mall (7 miles)

Followed by additional five ART routes within 10 years:

- Dempster ART – from the CTA's Davis Street Station in Evanston to O'Hare K-N-F (15 miles)
- Oak Brook ART – from the CTA's Forest Park Station to Yorktown (12 miles)
- Harlem ART – from Milwaukee Avenue to 95th Street (28 miles)
- 95th Street ART – from the CTA's 95th Street Station to Harlem Avenue (9 miles)
- Halsted ART – from the CTA's 95th Street Station to 159th Street (16 miles)

These six ART routes would form the Short-Term ART Network.

The medium-term network would be an expansion of the short-term network: some of the short-term ART routes would be extended further into the suburbs and segments of the remaining seven corridors would be added.

Four of the short-term ART routes would be extended:

- Milwaukee extension – from Golf Mill Mall to Dundee Road (8 miles)
- Harlem extension – from 95th Street to 159th Street (8 miles)
- 95th Street extension – from Harlem Avenue to LaGrange Road (3 miles)
- Halsted extension – from 159th Street to US 30 (7 miles)

These extension segments, however, are expected to be operated at lower frequency and have wider station spacing than the ART core segments.

The remaining seven corridors will further expand the ART network:

- Touhy ART – from the CTA's Howard Street Station to Mannheim Road (12 miles), extension – from Mannheim to Elk Grove Village (5 miles)
- Cicero ART – from Midway Airport CTA Station to 95th Street (4 miles), extension – from 95th Street to 159th Street (8 miles)
- 159th Street ART – from River Oaks Mall, Calumet City to Orland Square, Orland Park (17 miles)
- Golf Road extension – from Evanston to Woodfield Mall, Schaumburg (15 miles).
- US 30 extension – from Dyer, Indiana to Cicero Avenue (11 miles)
- Route 83 extension – from Harvey to Golf Road (45 miles)
- Mannheim Road / LaGrange Road ART – from O'Hare K-N-F Station to Oak Brook ART (11 miles), extension – from Oak Brook ART to Orland Square, Orland Park (17 miles)

The future long-term network would be an expansion of the medium-term network and would include all remaining segments of the 13 corridors and all the other corridors identified in Pace's Vision 2020 to form a 24-corridor network. While some lower frequency extension segments of the medium-term network may warrant increase in frequency by this time, all new segments are added as low frequency extensions to the medium-term network. The only exception is the J-Line whose planning may commence independently of the ART network.

Preliminary Characteristics of the ART System

The study has developed the preliminary characteristics of the ART system elements, the ART concept. The ART concept was presented to stakeholders and used for project cost estimation for the Milwaukee ART. For each ART system element, such as vehicles, stations, fare collection system and structure, ITS systems, and branding, the study presented options to Pace's executive management. These options were characterized by their effect on agency practices and achieving the ART system goals. Pace has selected the following preliminary characteristics for the ART system:

- Running way will be on arterial streets, operation in mixed traffic. Queue jump lanes could be implemented where applicable.
- Vehicles will be a sub-fleet of low-floor standard 40-foot vehicles that will be branded.
- Stations will be branded and specifically designed for the ART. Shelters will be owned by Pace and will be electrified for heating, lighting and to provide real-time bus arrival information. Station spacing and location will be defined during service planning.
- The fare collection system would be mostly on-board augmented with off-board fare collection at peak times and at peak volume stations. The fare structure will be defined during service planning.
- ITS will include Transit Signal Priority and Real Time Information systems with LED signs at stations.
- Branding will be applied to the vehicles, stations, specialty bus stop poles, and drivers' uniform. Flags and signs may mark the route in between stations. A specialty marketing campaign could be employed to generate public understanding and support for the system.
- Operation will be supported by supervisors dedicated to the ART service. Dynamic dispatch has the potential to improve transfer connections.
- Maintenance of ART vehicles will be given priority.

Funding Options and Project Delivery

Finally, in order to identify possible project funding and project delivery strategies for the most feasible ART corridor, the Study estimated the capital and operating cost for the Milwaukee ART. Capital cost was estimated using the ART concept and data from similar BRT systems in North America; operating cost was estimated using operating data for route 270 and assuming about a 15% travel time improvement. The capital cost of the Milwaukee ART project was estimated at between $17.9 and $27.8 million (including vehicles), or $1.94 to $3.17 million per mile (excluding vehicles). Operating cost was estimated at $5.87 million per year. Such project cost ranges, in addition to the selected ART concept and current ridership level, would allow the Milwaukee ART project to apply for federal funding in the Very Small Starts category of the New Start / Small Starts Program.

On May 6, 2009, Pace Board approved the three most feasible ART routes, Milwaukee, Dempster and Oak Brook, to proceed into implementation. The Board has expressed interest in an accelerated project implementation schedule.

List of Acronyms

AA – Alternative Analysis
APC – Automatic Passenger Count
ART – Arterial Rapid Transit
AVL – Automatic Vehicle Locator
BEA – Bureau of Economic Analysis
BLS – Bureau of Labor Statistics
BRT – Bus Rapid Transit
CATS – Chicago Area Transportation Study
CCSA – Chicago Consolidated Statistical Area
CDOT – Chicago Department of Transportation
CMAP – Chicago Metropolitan Agency for Planning
CMAQ – Congestion Mitigation / Air Quality
CTA – Chicago Transit Authority
DBOM – Design-Build-Operate and Maintain
DOT – Department of Transportation
FTA – Federal Transit Administration
GIS – Geographical Information System
GPS – Global Positioning System
HOV – High Occupancy Vehicle
IBS – Intelligent Bus System
IDOT – Illinois Department of Transportation
K-N-F – Kiss-N-Fly
LED – Light-Emitting Diode
LRT – Light Rail Transit
Metra – Northeast Illinois Regional Commuter Railroad Corporation
MPO – Metropolitan Planning Organization
O-D – Origin-Destination
PPP – Public-Private Partnership
ROW – Right-Of-Way
RR – Railroad
RTA – Regional Transportation Authority
RTI – Real Time Information
TCQSM - Transit Capacity and Quality Service Manual
TCRP – Transit Cooperative Research Program
TIP – Transportation Improvement Program
TSP – Transit Signal Priority
UP – Union Pacific
V/C – Volume/Capacity

Chapter 1
Introduction

An important component of Pace's strategic plan, Vision 2020, is to strengthen the service on key travel corridors in its service area. In the plan, line-haul routes on these corridors will provide the backbone of a high-speed inter-suburban transit network connecting critical transportation centers. An Arterial Bus Rapid Transit (ART), Bus Rapid Transit (BRT) system specifically tailored to the characteristics of Pace's transit market and suburban service area is the ideal choice to provide high service level at a low cost. It is envisioned that ART will not run on its own right-of-way (ROW) or dedicated running way—although it could potentially run on segments or short stretches of bus lanes.

The purpose of this project was to:

1. Identify the corridor where the initial ART route could be implemented
2. Define the ART network
3. Determine the preliminary characteristics of the ART system (Conceptual Development)
4. Identify the funding options and define the project delivery strategy for the first ART route (Implementation Plan)

The Pace Arterial Rapid Transit Study begins with the description of the 4-Phase process used to evaluate the key travel corridors in order to identify the corridor that shows the highest potential for successful ART implementation. Chapter 4 of the study describes the development of the Short, Medium and Long Term ART networks based on the result of the corridor evaluation process and Pace's goal of connecting all sub-regions of its service area. Chapter 5 describes the process by which the preliminary characteristics of the ART systems were selected. These preliminary characteristics were used in Chapter 6 for estimating the project cost of the most feasible ART route identified in Chapter 3. The study closes with Pace's Board recommendation to proceed with the implementation of the three most feasible ART routes.

Identifying the Most Feasible ART Corridor

In Vision 2020 Pace has identified 24 key travel corridors in its service area. In Chapter 2 of this Study these initial 24 corridors were analyzed to identify the corridor with the highest potential for successful ART service. Successful BRT routes share common characteristics, including that they: serve existing transit markets, generate new transit riders, directly connect to the larger transit network, provide rider benefits in terms of reduced travel time and enjoy the support of the local communities and regional agencies. Based on these characteristics, the potential of the 24 corridors for successful ART service is evaluated by the following criteria:

- Existing ridership
- Potential to generate new riders
- Regional connectivity

- Support from local communities and regional institutions
- Potential for travel time savings

The list of 24 candidate corridors was reduced to one initial ART route through the application of these criteria through a 4-Phase process. Each phase in the evaluation process focused the analysis on progressively fewer alternatives with higher levels of scrutiny as depicted on Figure 1.

The importance of the first corridor selected cannot be overstated. The first corridor selected by Pace must be able to secure funding, be able to be implemented in a short timeframe and be a success. If the corridor selected is not successful, this could set back the case for other future ART / BRT service for the near future. Therefore, it is extremely important to introduce ART on a viable corridor with a good probability for success.

Chapter 2 describes the 4-Phase evaluation process.

Chapter 2
Corridor Evaluation Process

Phase 1: Preliminary Screening

One measure of success for a new rapid transit line is the additional ridership it generates. STV researched other successful BRT projects to determine what makes a BRT implementation more likely to succeed. The research evaluated implementing a BRT in an established corridor that already hosts good bus transit service versus implementing a BRT in a corridor with currently no bus service. STV's analysis (See Appendix A) showed that ridership increases are more likely to occur sooner on BRT routes with already existing bus services. The analysis indicated that in many cases, successful BRTs connect with other transit modes such as existing rail service. An established, existing transit ridership improves the chances for obtaining funding and implementing a successful Pace ART project.

Phase 1 began with finalizing the 24 ART corridors and developing the long-term ART network of routes that would define Pace's ART program. In finalizing the ART network, strategic corridors were identified showing how the ART network would connect with Pace's service area and the region's public transportation system. Based on this research, the first set of criteria used to evaluate the 24 initial corridors was:

- Current ridership – measured by average daily ridership of the existing Pace route on the corridor
- Potential for generating additional riders – measured by socio-economic indicators for transit use
- Regional connectivity – measured by route level connectivity to the regional public transportation network, such as the CTA and Metra, and other major Pace routes.

In Phase 1, the 24 corridors were sorted into three groups based on how they performed by these three criteria. Corridors that satisfied all three criteria were assigned into Group 1 and were carried forward into the next phase of the selection process. The termini for corridors in Group 1 were identified such that the corridors connected to the larger transit network.

The following section describes the Phase 1 evaluation process. In addition, Appendix B provides additional details on the Phase 1 evaluation process and data used.

Data Collection

The STV team collected various socio-economic / land use and Pace ridership data in analyzing the 24 corridors:

Current level of service

Routes currently served by Pace
Pace bus facilities
Ridership per route

Potential to generate ridership

Population density per square mile
Employment density per square mile
Population / employment changes (2000 - 2007)
Retail density
Job - household balance
Transportation generators (hospitals, colleges, retail centers)
Work - trip by transit and by bus
Car ownership by households

The data was collected from the U.S. Census, existing regional forecasts from the Chicago Metropolitan Agency for Planning (CMAP) Model, and from Pace. Computerized street atlases, and aerial / satellite photographs were used to identify specific land uses within a corridor to define major traffic generators and termini for bus routes. The composite use of these resources allowed the STV team to evaluate the corridors using the various data.

Graphic Presentation of the Data

A series of exhibits, maps that document the data collected, were developed using a Geographic Information System (GIS). The maps show the important factors that STV considered in selecting the corridors to be studied further. The main sources of data include: a 2007 inventory of population, household, and employment data and the 2000 Census of Population and Housing. Using the 2000 Census Block Group with the most currently available 2007 inventory data ensured that the most current data was used for the study and the data is geographically compatible with the U.S. 2000 Census Block. The graphic presentation and exhibits illustrating the data are provided in Appendix C of this report.

Analysis of the Data

STV used the above socio-economic / ridership data contained in the exhibits discussed, along with analysis of existing Pace bus routes, Pace's 2007 ridership data and our knowledge of the region to analyze the 24 corridors. Specifically, the 24 corridors were superimposed on the various data maps to evaluate each corridor as shown in Appendix C. The corridors were evaluated with the data to identify corridors that had characteristics that are important to having successful fixed route transit service and could support an ART in the short timeframe including:

- Significant levels of Pace service as they demonstrate the need and acceptance of bus service

- High residential density
- High employment density
- Good mixture of both high employment and residential density (The mix of high employment with high residential densities along a corridor is ideal for fixed route transit service.)
- Connection with other transit modes such as CTA / Metra stations
- Significant connection with other Pace bus service
- Transportation generators such as major shopping / retail centers, airports and colleges

The above characteristics were used because they are considered important to support fixed route transit service including an ART. In addition, STV used its professional judgment and knowledge of the region to evaluate the corridors based on regional connectivity.

Results of Phase 1 Preliminary Screening

The corridors were divided into 3 groups.

Group 1 demonstrated suitable population / land use densities, have higher concentrations of areas with excess jobs and job deficit areas, have existing Pace service, have supportive ridership levels and show promise as far as regional connectivity. The corridors in Group 1 are considered viable candidates for an ART in the short-term timeframe and are carried forward to Phase 2 of the selection process. STV identified the termini for these corridors such that they form a connected network.

Group 2 had limited or no Pace service, does not have a defined route alignment at this time, but does have land use characteristics that could attract bus ridership. The corridors in Group 2 were considered viable candidates for an ART as transit market strengthens over time.

Group 3 lacked the residential / employment densities within the corridors, does not have good regional connectivity and lacks significant Pace service at this time. Corridors in Group 3 have a long-term timeframe for ART system implementation.

<u>Group 1 Corridors</u>:

- Golf Road – Evanston Hospital via Central Street Station to Woodfield Mall, Schaumburg (19 miles).

- Dempster Street – Evanston Davis Street Station to O'Hare Kiss'n' Fly" (K-N-F) Station – via Lee Street and Mannheim Road (15 miles).

- Touhy Avenue – Howard Street Station to Alexian Brothers Hospital, Elk Grove Village, with a detour and a stop at the O'Hare K-N-F Station (20 miles).

- 95th Street – 95th Street CTA Station to LaGrange Road (12 miles). This route would serve Advocate Christ Medical Center, Little Company of Mary Hospital, and Fox College (Oak Lawn).

- 159th Street – River Oaks Mall, Calumet City to Orland Square, Orland Park (16 miles).

- US 30 – Saint Margaret Hospital, Dyer, Indiana to Orland Square, Orland Park (24 miles).

- Harlem Avenue – This route would serve Rush Oak Park Hospital, McNeal Hospital (Berwyn), and Concordia University (River Forest) (37 miles).

- Mannheim Road / LaGrange Road – O'Hare K-N-F Station to Orland Square, Orland Park (28 miles).

- Milwaukee Road / Sanders Road – Jefferson Park CTA Station to Baxter Labs Campus, Deerfield (16 miles).

- Oak Brook – Forest Park CTA Station west to Yorktown Center via Oak Brook Shopping Center (13 miles).

- Cicero Avenue – Midway Airport CTA Station to Lincoln Mall, Matteson (20 miles).

- Halsted Street – 95th Street CTA Station to Saint James Hospital, Chicago Heights (16 miles).

- Route 83 - Harvey to Golf Road (45 miles).

The termini for the routes in Group 1 were identified on a conceptual level using logical origins and destinations such as connections with the CTA rapid transit system or major traffic generators, such as hospitals, airports, and retail shopping malls. Operational issues were not considered at this time in defining the termini. In Phase 2, the termini and length of the corridors changed as the corridors were evaluated in more detail.

Group 2 Corridor:

- J-Line - The route alignment in Group 2 was not defined at this time and the termini could not be established. The J-line generally travels from the western suburbs of DuPage County to Oak Brook, to O'Hare and northern Cook County.

Group 3 Corridors:

- The termini for the routes / corridors in Group 3 were not well defined at this time because of limited or no Pace service and low residential and employment densities. The corridors include:

- IL Hwy 120 in Lake and McHenry Counties
- Randall Road in McHenry and Kane Counties
- IL Hwy 19 (Irving Park Road) in Kane, DuPage and Cook Counties
- IL Hwy 62 (Algonquin Road) in Cook, Kane and McHenry Counties
- IL Hwy 12 (Rand Road) in Cook and Lake Counties
- Route 59 in Lake, Cook, DuPage and Will Counties
- IL Hwy 68 (Dundee Road) in Cook County
- IL Hwy 64 (North Avenue) Cook and DuPage County
- Route 34 / I-88 from Naperville to Oak Brook
- Roosevelt Road in Kane and DuPage Counties

Regional Connectivity

The 13 corridors in Group 1 are part of a regional network connecting the routes in the north with the routes in the south via the north - south connecting routes. In north Cook County - Golf, Dempster and Touhy corridors run east - west from Evanston / Chicago to the O'Hare region. All three of the northern, east – west corridors connect with the Milwaukee Avenue corridor providing access to the CTA's Blue Line station at Jefferson Park.

In the southern region, there are three east – west corridors (95th Street, 159th Street and US Route 30). All three of the southern east – west corridors connect with the regional transit network. There are also two north - south corridors in the southern region: Halsted and Cicero.

Halsted, which is a north – south corridor, connects with the CTA's rapid transit line at 95th Street. Cicero Avenue, also a north – south corridor, connects with the CTA's rapid transit station at Midway. All three of the east – west corridors connect with Halsted and Cicero Avenue.

The ART network includes three north – south routes (Harlem, Mannheim and Route 83) connecting the southern corridors and northern corridors. There is also one corridor (Oak Brook) that extends west from the CTA's Forest Park rapid transit station to the Oak Brook and Yorktown Shopping Centers. This corridor connects with the north – south Mannheim Road and Route 83 corridors and serves the job rich areas in Oak Brook.

Summary and Recommendations of Phase 1

In Phase 1 of the selection process, 13 corridors were identified as having characteristics to support ART service in a short-term timeframe. These corridors are carried forward for further analysis in Phase 2.

The corridors that are not ready for ART implementation in the short-term will mature over time as these parts of the region continue to experience rapid growth and development. Pace may consider working closely with communities along these corridors to build a transit base.

The connectivity of the strategic corridors ensures that as growth continues in the outer regions of Pace's service areas, corridors in Groups 2 and 3 will connect with the network of Group 1 corridors.

Pace Concurrence

On May 30, 2008, Pace's Working Group for the ART study concurred with the findings of Phase 1 of the evaluation process, authorizing the 13 corridors to be evaluated further in Phase 2.

Phase 2: Evaluation of the 13 Corridors

The 13 corridors identified in Phase 1: Preliminary Screening, that have the characteristics to support ART service in the near future (Group 1) were examined further in Phase 2 in order to determine the initial "short-term" network of ART routes that can be implemented in 10 years and will connect all sub-regions of Pace's service area.

Corridors were evaluated by the same three criteria but in more detail:

- Existing ridership
- Potential ridership
- Regional connectivity

In addition, it was the goal to connect all sub-regions of Pace's service area with the corridors included in the short-term network.

The following process was used in Phase 2 of the selection process for screening the Group 1 corridors:

- Developed route segments for each of the 13 corridors to conduct a more detailed analysis of the corridors
- Analysis of socio-economic criteria to determine potential ridership
- Analysis of current transit service to gain an understanding of the current transit market
- Combined socio-economic and transit service evaluation
- Rated the segments for each corridor
- Linked viable segments into routes with termini
- Connected the six routes into an initial short-term network of ART routes
- Recommended six routes most suited for the first ART project

Existing ridership was evaluated using transit productivity measures by segments. Potential ridership was inferred from socio-economic indicators by segments within ½ mile on either side of a corridor and the level of regional connectivity was assessed by how well the segments are connected with the existing transportation network.

A more detailed discussion of this process, analysis and scoring system is contained in Appendix D. The data was displayed in maps and tables to communicate the strength of each corridor segment as shown in Appendix E.

Route Segmentation

The STV team initiated the evaluation process by subdividing the 13 corridors into a total of 52 route segments. Using segments allowed STV to evaluate the segments of corridors to identify portions of corridors that could support an ART. Various socio-economic / land use and transit data was developed for each segment – using census blocks ½ mile on either side of the corridor. This provided a more detailed analysis of each corridor segment that allowed the STV team to evaluate individual segments for an entire corridor. The termini for these segments were selected

by determining logical connections to other major transit facilities (e.g. CTA / Metra train stations and airports), other potential ART routes, and major transit generators such as retail facilities and hospitals. STV used maps and our knowledge of the corridors to determine logical termini. The scoring of the segments allowed STV to determine what corridor segments would be viable to implement an ART in a short-term timeframe.

Two evaluations of the corridors were initiated. The first evaluation concentrated on the socio-economic characteristics of the corridor to make inferences about potential travel demand for ART, while the second evaluation focused on existing transit service characteristics of the corridor to evaluate current demand.

Potential Ridership

Ideally, each corridor's potential to generate new riders would be arrived through a travel demand forecast model. Unfortunately, there was insufficient funding to conduct a regional forecast, or a forecast for each corridor. Therefore, socio-economic data was evaluated to approximate the ART's ridership potential for each corridor. As discussed in the Phase 1: Preliminary Screening, fixed route transit service or an ART works best in a corridor that has certain characteristics. The goal was to devise a series of indicators that would differentiate these corridors and to identify which corridors have more potential than others.

The strength of a fixed route transit service is partially determined by socio-economic data within ½ mile on either side of a corridor. As stated above, the corridors were divided into 52 segments. The STV team used 2000 census blocks as a geographical border ½ mile on either side of a segment. The various socio-economic data was obtained per linear mile and normalized per square mile for each segment using the census block borders. The variables included population / employment densities, excess jobs - job deficit balance, households with zero or 1 vehicle and areas that currently use transit.

All the data criteria were summarized showing:

- The minimum score for each criteria
- The maximum score for each criteria
- The average score for each criteria
- The mid-point score between the minimum and average
- The mid-point score between the maximum and average

As an example, for population per square mile, the sum of all the segments was 476.42. The minimum score was 2.13, the maximum was 21.79, the average was 9.34 and the two mid-points were 4.67 and 15.57.

The summary statistics for each socio-economic criterion is as follows:

- 0 - if the data equals the minimum
- 1 - if the data is greater than the minimum, but is less or equal to the mid-point between minimum and average

- 2 - if the data is greater than the above mid-point, but is less or equal to the average
- 3 - if the data is greater than the average, but is less or equal to the mid-point between the average and maximum value
- 4 - if the data is greater than the above mid-point, but is less than the maximum
- 5 - if the data is equal to the maximum

All of the socio-economic criteria were summed for each segment providing a numeric ranking for the segment. The top 30 segments were identified and divided approximately into thirds as illustrated in Appendix E. The top segments are marked in red, the next highest segments are marked in orange and the third highest segments are marked in yellow. The remaining lowest segments are in white.

This allowed STV to illustrate the segments using a color scheme in identifying the corridors or portions of corridors with the higher scored segments and contiguous segments that have the socio-economic characteristics to support an ART. The socio-economic scoring of the segments allowed the corridors to be divided into three subsets by comparing the color and numeric value of each segment.

Corridors with the Highest Scored Segments

Dempster
This route extends from the O'Hare K-N-F station at O'Hare, via Lee Street to Dempster Street, and terminates in Evanston at the CTA and Metra Stations. Based on socio-economic indicators, this route is scored as the most viable for an ART service. Both population and employment densities within the corridor are relatively high. All segments of this route score above average on almost all of the socio-economic variables. Based on the socio-economic analysis, the Dempster corridor rated the highest.

Milwaukee
This route extends from the Jefferson Park station (CTA Blue Line) and Metra Station, along Milwaukee Avenue, via Golf Mill Center to Sanders Road, and along this road to Lake Cook Road, and then along the latter to the Deerfield Metra Station at Milwaukee Road. This route links areas of high concentration of excess jobs with high concentrations of excess labor. The corridor, however, is rated highest from Golf Mill to Jefferson Park.

Oak Brook: Forest Park CTA Terminal to Oak Brook / Yorktown Center
Two options are considered for this ART route. One option is to have the first segment as an express service along the Eisenhower Expressway to Oak Brook, and then an ART along 22nd Street and Butterfield Road to Yorktown Center. The second option is to link these locations via Hines Medical Center and Roosevelt Road. Both of these options have strong socio-economic characteristics for ART; the second option has an added advantage of serving very important hospitals and health facilities. Decisions as to the best operating option for the corridor will be made in future studies. The scope of this study does not include an operating plan. The Expressway route would be faster while Roosevelt Road would serve the Medical Center and

residential areas, possibly increasing ridership. Both options are evaluated in this phase of the study.

Touhy
This route was initially extended from Alexian Hospital, Elk Grove Village to the Howard Street Station on the CTA Red Line. For this current phase of the socio-economic analysis, the route was divided into two segments. The western segment, from Alexian Hospital to the O'Hare K-N-F station, does not perform strongly; and it is not recommended for further evaluation in this study. The eastern half of this route parallels the Dempster Avenue ART route and does perform very well with a logical terminus at O'Hare Airport.

Harlem
This is the strongest candidate among the proposed north - south ART routes considering socio-economic criteria. Yet, only its northern segments, (Harlem / Kennedy to Grand, Grand to Roosevelt, and Roosevelt to 95th Street), are considered viable using socio-economic criteria for inclusion for further analysis.

Corridors with Moderately High Scored Segments

Halsted, 95th Street, Cicero, and Golf
The ART corridors serving the south suburbs – Halsted Street, 95th Street and Cicero Avenue – have not performed as strongly as initially anticipated from a socio-economic perspective. The segments of these routes do have the prerequisite residential densities and several of the other criteria for viable transit service (e.g. high number of households with no or low auto ownership). In addition, these block groups have high concentrations of excess labor. However, the southern suburbs have very few jobs (low employment densities). The routes in the southern suburbs that connect to CTA's rapid transit stations perform better because people take the CTA to destinations in other parts of the region. Concentrations of excess jobs are not in proximity to any of the considered segments along these routes.

The northern most segments of the Halsted Street corridor and Cicero Avenue, and the east - most segments of 95th Street do perform well in terms of population density. However, overall, the segments of these corridors do not exhibit strong employment densities. Therefore, these corridors do not score highly because they lack the employment densities.

Golf Road scored high on the east and west segments of the route in the socio-economic evaluation. However, the adjacent segments performed only marginally well followed by two lesser-performing segments.

Corridors with Low Scored Segments

US-30, 159th Street, Route 83 and Mannheim Road / LaGrange Road
US-30, 159th Street, Route 83 and Mannheim Road / LaGrange Road scored low for ridership generating potential based on the socio-economic criteria. These corridors do not have the population densities and employment densities as compared with the other corridors. These corridors are not good candidates for the first ART project.

Existing Transit Ridership

Current transit ridership is an important indicator in evaluating the potential for an ART service. The ART should have sufficient ridership and frequency of service to meet FTA's BRT guidelines. The ART must have connectivity with other Pace and regional transit services. Such criteria will help determine the potential success for an ART.

The following transit criteria were evaluated:

- Passengers per Revenue Hour
- Passengers per Revenue Mile
- Frequency of Service
- Transit Connectivity

Appendices D and E provide additional data on the evaluation and scoring of the transit data.

Passengers per Revenue Hour / Passengers per Revenue Mile
Statistics on Passengers per Revenue Hour and per Revenue Mile were obtained from the First Quarter 2008, "Pace Route Profile by Service Day" report.

Frequency of Service
STV performed an analysis of service frequency using Pace's route schedules and timetables including the number of Pace trips provided along the corridor. The timetable was divided into four time periods:

- AM Peak: 6 a.m. to 9 a.m.
- Mid-day: 9 a.m. to 3 p.m.
- PM Peak: 3 p.m. to 6 p.m.
- Evening: 6 p.m. to 8 p.m.

Average frequencies for each route segment in each of the four time periods were calculated by dividing the total number of minutes in the time period by the number of weekday trips in the peak direction.

Transit Connectivity
Connections to existing transit services is an important feature for Pace services. According to the 2004 Customer Satisfaction Survey, only 22% of Pace customers do not transfer to another vehicle to complete their trip. The percentages below reflect the Pace rider response to the question, "What other vehicles do you ride during your trip?" (Note that the percentages total more than 100% due to multiple answers.)

- CTA train: 37%
- Pace bus: 19%
- CTA bus: 31%
- Metra train: 21%
- None: 22%

Additionally, the Pace 2006 Market Analysis found that CTA connector routes (those that connect to CTA services) carry 72% of Pace weekday trips. It is clear that connections to CTA services are very important to Pace customers and this was considered in the transit connectivity analysis. Each ART route segment was reviewed to identify transit connections. For each of the types of connections made, each segment received a corresponding score.

Results of the Transit Analysis

All the above criteria were given scores utilizing the similar method employed for the socio-economic analysis. Using the same 52 segments and census blocks, transit data were summarized showing:

- The minimum score for each criteria
- The maximum score for each criteria
- The average score for each criteria
- The mid-point score between the minimum and average
- The mid-point score between the maximum and average

All of the transit criteria were summed for each segment providing a numeric score for the segment. The top segments were identified and divided approximately into thirds as illustrated in Appendix E. The top segments are marked in red, the next highest segments are marked in orange and the third highest segments are marked in yellow. The remaining lowest scored segments are in white. This allowed STV to illustrate the numeric scoring using a color scheme in identifying the corridors or portions of corridors with the higher scored segments and contiguous segments that have the transit ridership characteristics to support an ART. The transit criteria scoring of the segments allowed the corridors to be divided into three subsets.

<u>Corridors with the Highest Scored Segments</u>

Dempster
The Dempster corridor performed highly throughout the entire corridor. Dempster scored very high from Evanston to Des Plaines and high between Des Plaines and O'Hare. The corridor has good bus service provided by Pace route 250 and the route achieves high productivity marks.

Touhy
The Touhy corridor, in this highest rated group, is limited to the two eastern segments of the corridor: O'Hare to the CTA Howard Station. The eastern portion of Touhy from the Howard CTA Station to Village Crossing is rated very high but the western portion is rated lower. The western segments between O'Hare and Alexian Hospital are very poor performing because no bus service is currently provided.

Milwaukee
The Milwaukee corridor is limited to the two southern segments of the corridor: Jefferson Park to Sanders Road. Milwaukee Avenue scored very high from Jefferson Park to Golf Mill. North

of Golf Mill the corridor scored lower due to few transit connections and a lack of service along portions of the proposed route.

Oak Brook
Both Oak Brook corridor options scored very high from Forest Park west to Oak Brook via Roosevelt and Route 83 or the I-88 Expressway. It is also performs high from Oak Brook to Yorktown Center via 22nd Street / Butterfield. The high marks are generally due to the high productivities associated with Pace routes 301 and 322.

Harlem
Harlem Avenue scored very high from Grand Avenue to 95th Street. It received a low score from the Kennedy Expressway to Grand Avenue segment because Pace service is not offered on this segment. The southern most segment from 95th Street south to 159th Street also scores low due to lower service levels and fewer transit connections.

Cicero
Cicero Avenue scores very high from the CTA Station at Midway to 95th Street. This reflects the higher transit connections and service levels in this area. It does not do well from 95th Street to 159th Street. It scored poorly south of 159th Street.

95th Street
95th Street scored very high from the CTA Red Line to Cicero Avenue and from Cicero to Harlem due to service levels and productivity of Pace route 381. It scored only high from Harlem to LaGrange Road because of the lack of transit connections along this segment.

Halsted
Halsted Street scored very high from 95th Street (CTA Red Line) to 159th Street. This reflects the transit connections at 95th Street terminal and the frequency of Pace route 352. It scored high from 159th Street to US-30.

Golf Road
Golf Road has high scored segments on the western portion from O'Hare to Dempster / Des Plaines River Road and from Des Plaines to Milwaukee Avenue. The eastern - most segment on Golf Road also has high marks between McCormick / Green Bay / Central to Evanston Hospital. However, the two intermediate segments between Milwaukee and McCormick receive only a moderate scoring, primarily due to a lack of transit connections.

<u>Corridors with Moderately High Scored Segments</u>

159th Street
159th Street corridor has high scored segments from River Oaks to Halsted Street and from Halsted Street to Cicero Avenue. The remaining segments between Cicero Avenue and LaGrange Road / 151st Street scored low because of few transit connections. Although Pace route 364, which operates in the 159th Street corridor, is one of Pace's top ten ridership routes, the service levels, productivity and frequency were insufficient to include the corridor among the highest corridors.

US-30
US-30 has a high scored segment from Cicero Avenue to Halsted Street but the adjacent segment between Halsted Street and Dyer, Indiana is very low.

Corridors with Low Scored Segments

Route 83
Route 83 corridor scored very low throughout because there is no existing service in the corridor.

Mannheim Road / LaGrange Road
Mannheim Road / LaGrange Road corridor scored very low in the transit service evaluation because very little existing service is provided in the corridor.

Combining of Socio-Economic and Transit Analyses' Results

In comparing the separate analysis of the 13 corridors, using both socio-economic and transit criteria, there were similar findings. This confirms the correlation between socio-economic and transit ridership discussed previously in this report. Certain socio-economic characteristics such as residential / employment densities are essential for a successful fixed route or ART service. The combined analyses identified nine corridors that have segments that exhibit a high potential for ART service:

- Halsted: one segment from 95th Street to 159th Street
- 95th Street: two segments from the CTA Station to Harlem/Milwaukee
- Cicero: one segment from Midway (CTA Station) to 95th Street
- Harlem: three segments from Milwaukee Avenue to 95th Street
- Oak Brook: two segments from Forest Park to Yorktown Center via Roosevelt, Rt. 83, 22nd Street
- Milwaukee: one segment from Jefferson Park (CTA Station) to Golf Mill
- Touhy: two segments from O'Hare to Howard CTA Station
- Dempster: four segments from O'Hare to Evanston
- Golf: five segments from O'Hare to Evanston

Summary and Recommendations of Phase 2

Based upon the analysis of socio-economic and transit criteria, STV identified segments on nine corridors that can be linked together into routes operable at a minimum frequency throughout the entire length of the route.

Regional connectivity was also considered in evaluating and selecting the corridors to be part of Pace's short-term ART network. It is desired that the short-term ART network connects all sub-regions of Pace's service area. Having two ART projects serving the same geographic region is not desirable in the short-term of the ART network. Therefore, a sub-regional evaluation of the nine routes was conducted to ensure that the most feasible route was identified for each sub-

region. The sub-regional analysis used both the socio-economic and transit analyses along with regional connectivity in selecting the six most feasible routes.

The following summarizes the results of Phase 2 analyses, identifies the length and termini of the ART routes, recommends six routes for further evaluation and connects these six routes to form the "short-term" ART network. Chapter 4 of this study will describe how the short term network was expanded into the medium and long-term ART network and depict the networks on maps.

The following is the summary of the sub-regional evaluation and recommendation for each of these corridors.

South Regional Routes

95th Street

95th Street is highly rated using transit criteria from the CTA Red Line station to Harlem. It is not rated quite as high for the socio-economic criteria due to the lack of employment densities along the corridor. It intersects with the Harlem and Halsted corridors, which are considered potential ART candidates.

Halsted

Halsted Street is rated highly using transit criteria from the CTA Red Line station to 159th Street. Halsted Street is not rated quite as high for socio-economic criteria because, similar to 95th Street, there is a lack of employment density. It intersects with 159th Street and 95th Street, which are major Pace bus routes.

North - South Routes

Harlem

Harlem Avenue is rated highly from Grand Avenue to Roosevelt Road for both socio-economic and transit criteria. It is also rated highly using transit service criteria from Roosevelt Road to 95th Street but rated only moderately high using socio-economic criteria. Harlem Avenue is a good north - south route as it connects with 95th Street in the southern region and with Milwaukee Avenue in the northern region.

Cicero

Cicero Avenue is rated highly from the CTA Station at Midway to 95th Street for both socio-economic and transit criteria. Cicero Avenue is a north - south corridor in southern Cook County that parallels the Harlem corridor. Although Cicero Avenue is rated highly, it serves the same geographic area as Harlem Avenue, which has the advantage of serving as a better north - south regional corridor. Harlem Avenue has better regional connectivity opportunities than Cicero Avenue. From a transportation and regional perspective, Harlem Avenue has the advantage.

North Regional Routes

Dempster
Dempster Street is rated high throughout the corridor from O'Hare to Evanston on both socio-economic and transit criteria. The corridor connects with Metra and CTA rapid transit lines. Dempster also connects with the Milwaukee corridor that is also highly rated for ART service.

Golf
Golf Road has high rated segments on the western portion from O'Hare to Dempster / Des Plaines River Road and from Des Plaines to Milwaukee Avenue. Golf Road also has high rated corridors on the eastern portion from McCormick / Green Bay / Central to Evanston Hospital. The segments connecting the eastern and western portions of the corridor are lower rated making it less conducive to support an ART compared with Dempster and Touhy in the same geographic east - west area.

Touhy
The two eastern segments of the Touhy Avenue corridor are rated highly under the socio-economic criteria. It is only rated very high using the transit criteria on the eastern portion from Howard Street Station to Village Crossing. Touhy, Golf and Dempster are east - west corridors that serve many of the same communities in northern Cook County. Dempster has an advantage over Touhy and Golf because Dempster is more centrally located, is higher rated throughout the entire corridor and has the best access to Des Plaines and O'Hare. In addition, the existing Pace route 290 does not connect directly with O'Hare. Although portions of Touhy are rated highly, it serves the same geographic area in Pace's service area as Dempster and Dempster is rated higher than Touhy.

Milwaukee
Milwaukee Avenue is highly rated from Jefferson Park (CTA Blue Line) to Golf Mill for both the socio-economic and transit criteria. It intersects with Dempster and Touhy and serves as an extension of the CTA rapid transit line.

West Regional Route

Oak Brook
Oak Brook is rated high from the CTA's Forest Park Station to Oak Brook via the Hines / Loyola Medical Center or the I-290 Expressway using transit criteria. It is rated high using socio-economic criteria from Oak Brook to the Yorktown Center. The Oak Brook corridor is significant for regional connectivity. It is the only east – west corridor that serves the western suburbs including DuPage County. This connectivity is important for the entire ART network.

The following six routes were recommended for further study in Phase 3:

- Halsted Street from 159th Street to the CTA's 95th Street Station (16 miles)
- 95th Street from the CTA's 95th Street Station to Harlem Avenue (9 miles)
- Harlem Avenue from 95th Street to Milwaukee Avenue (28 miles)
- Dempster Street from the CTA's Station in Evanston to O'Hare K-N-F (15 miles)

- Milwaukee Avenue from the CTA's Jefferson Park Station to Golf Mill (7 miles)
- Oak Brook from the CTA's Forest Park Station, via the expressway, to Oak Brook Mall and Yorktown Center (12 miles)

Pace Concurrence

On September 30, 2008, Pace's Working Group for the ART study concurred with the findings of Phase 2 of the selection process including the selection of six routes to be further evaluated in Phase 3.

Phase 3: Evaluation of the Six Short-Term ART Routes

The six remaining routes provide regional connectivity as the short-term ART network. Pace must, however, select the most feasible route for the first ART project based on the highest likelihood for successful implementation. Therefore, in Phase 3 these six routes were evaluated by additional criteria that would affect the success of implementation in the short-term.

These six routes were further evaluated by two additional criteria:

- Institutional Support – regional plans, programs or funding sources
- Travel time savings potential
  - Right-Of-Way (ROW) characteristics
  - Railroad (RR) grade crossings

Appendix F provides further data on the sources used for the institutional evaluation.

Institutional Support

The implementation of a successful ART requires consensus and conformity with local and regional plans and programs.

A summary of the evaluation of institutional support associated with each of the proposed ART routes follows.

Halsted
CMAP's 2030 Plan identified the CTA's Red Line Extension Project to serve the needs of the same corridor. The Regional Transportation Authority's (RTA) strategic plan also supports the CTA's Red Line project for the corridor. Currently, the CTA's Red Line project and Metra's Southeast Commuter Rail project are in the FTA's Alternative Analysis (AA) process. FTA will not support a second AA in the same corridor until these studies are completed. The RTA's representative stated that funding would not be available due to the current AA in the corridor. Funding support from the RTA and FTA for an ART on this route is not possible in the near-term.

Due to the institutional issue discussed above, the Halsted route is not ready for an ART service until the AA has been completed. The Halsted route could not receive funding from the RTA or FTA in the short-term timeframe. As a result, the Halsted route cannot be considered for the first ART project. This would delay consideration of an ART for the Halsted route until after AA studies are concluded.

95th Street
There are no current local or regional studies that conflict with implementation of ART service or major capital transit service improvements along the route at this time. Parts of the 95th Street route travels through the City of Chicago. Coordination with the CTA and City of Chicago would be required for an ART.

Harlem
The Southwest Conference of Mayors, with RTA funding, will be conducting a study of the Harlem corridor including 95th Street north to 63rd Street to make recommendations to improve the corridor for future transit improvements. The study is scheduled to begin in 2009 and continue for approximately 18 months. Any decision for an ART in this segment of the corridor should be deferred until the study has been completed. The segment of the route north of 63rd Street to the Green Line and from the Green Line to Milwaukee Avenue will not be a part of the study. However, the results of the study could impact the northern portion of the Harlem route. The recommendations of the study will be used in implementing an ART after the study is completed. As a result of this study, the Harlem route is not likely to be funded or implemented in a short-term timeframe. The Harlem route cannot be considered for the first ART project because of the delay until the completion of the RTA study.

Dempster
There are no current local or regional studies that conflict with implementation of ART service or major capital transit service improvements along the route at this time.

Milwaukee
Most of the corridor is within the Village of Niles. The Village of Niles has developed a plan that calls for BRT service along Milwaukee Avenue showing strong support for an ART by the Village. There are no current local or regional studies that conflict with implementation of ART service or major capital transit service improvements along the route at this time. Parts of the Milwaukee corridor travel through the City of Chicago and would require coordination with the CTA and City of Chicago. Jefferson Park terminal improvements will also have to be coordinated with the City of Chicago and the CTA.

Oak Brook
CMAP's 2030 Plan recognizes the need for service from the CTA's Forest Park Station west to Oak Brook. The 2030 Plan calls for extension of the Blue Line west into DuPage County. The Cook - DuPage Corridor Travel Market Analysis Report highlighted the trip demand between western Cook County and DuPage County, including the demand for reverse commute travel in the Oak Brook corridor. The Oak Brook route is consistent with regional plans to support transit in the corridor.

Travel Time Savings

Pace's goal is to improve reliability and travel time by the ART service. ROW characteristics affect both reliability and travel speed. Good traffic flow is especially important for Pace's ART program because the ART will travel on existing arterial roads in mixed traffic. The STV team identified ROW constraints that could make it difficult to achieve reliability and travel time goals for the ART.

Freight RR grade crossings were cited by all of Pace's Divisions as a major cause of traffic delays and have major effect on reliability as well. RR grade crossings effects on transit operations cannot be easily mitigated.

As part of the ROW and RR grade crossing analysis, STV:

- Interviewed the four Pace Divisions that operate service along the corridors
- Used Google Earth to examine the corridors
- Drove the corridors to note general conditions that would impede an ART project

The four Pace Divisions interviewed were

- South Division (Halsted)
- Southwest Division (95th Street and southern Harlem)
- West Division (Oak Brook and central Harlem)
- Northwest Division. (Dempster, Milwaukee and northern Harlem)

Halsted

The Halsted route from 159th Street north to 95th Street has four traffic lanes with sufficient left turn lanes to permit good traffic flow. Most of the corridor does not have on-street parking.

The Halsted route turns east onto 95th Street which has four traffic lanes. However, on this portion of 95th Street, there are several intersections that do not have left turn lanes including Union, Wallace, Parnell, Eggleston, Lowe, Princeton, Yale, LaSalle, and Perry. This significant number of no left turn lanes can cause delays as vehicles make left turns. This portion of the route has on-street parking on both sides of the street. The South Division said delays often occur, especially turning left from 95th Street south onto Halsted. Officials of both the South Division and Southwest Division commented that congestion along this portion of 95th Street is a problem.

There are three RR grade crossings on the route. Two crossings (at 153rd Street and at Eggleston) experience freight traffic. The third crossing is at 120th Street and carries commuter traffic. The South Division indicated that delays occur at Eggleston but not as often at 153rd and 120th Streets. The 95th Street portion of the route is less than 10% of the corridor and overall the Halsted corridor has a good ROW for an ART.

95th Street

The 95th Street route from the CTA station west to Western Avenue has four traffic lanes but there are numerous intersections that do not have left turn lanes including Perry, LaSalle, Yale, Princeton, Harvard, Eggleston, Parnell, Wallace, Union, May and Emerald. The ROW on this portion of the route is narrower than the ROW west of Western Avenue. The Southwest Division officials interviewed reported that this portion of 95th Street is congested and traffic delays occur regularly during peak periods at Halsted and Ashland. There is on-street parking on both sides of the street. West of Western Avenue, the ROW improves with at least four traffic lanes and left turn lanes at most intersections. There is very limited parking throughout this portion of 95th Street. The Southwest Division reported that bus movement on this portion of 95th Street (west of Western Avenue to Cicero Avenue) is significantly faster than the portion east of Western Avenue. The portion of the ROW from Cicero to Harlem is wide with left turn lanes at most intersections.

There are six RR grade crossings along the route including three freight crossings that the Southwest Division stated cause delays. The RR crossing at Eggleston is a freight crossing while the crossing at Vincennes and Vanderpole are commuter train crossings. There are also two freight RR grade crossings from Western Avenue to Cicero Avenue at Campbell and Albany. There is one commuter rail crossing from Cicero Avenue to Harlem Avenue at Museum Drive that causes delays.

The Southwest Division reported that the RR grade crossings on 95th Street are an issue. Freight trains often cause delays and malfunctioning crossing gates and signals have caused unnecessary interruption of bus service.

Based on the comments from the Southwest Division, visual inspection of the 95th Street route and the number of RR grade crossings, the 95th Street route is not a good candidate for the first ART project. The ROW on 95th Street from Western Avenue to the CTA's Red Line station is narrow, has multiple no left turn lanes and RR grade crossings, creating delays. This portion of 95th Street is the most important part of the corridor as it connects with the CTA's 95th Street station.

Harlem

The Harlem Avenue route from 95th Street to Oak Park has at least four traffic lanes with ample left turn lanes at intersections. There are six traffic lanes around 79th Street and 71st Street, Archer Avenue and Cermak Road. Most of this portion of the route does not have on-street parking. Traffic congestion occurs entering Oak Park. The Southwest Division stated that delays occur at 63rd, 65th and between 79th to 95th Streets during peak times.

From Oak Park north to Milwaukee Avenue a portion of the ROW is not conducive for an ART. Beginning at North Avenue to Irving Park Road, there are only two traffic lanes with parking on both sides of the street. Even during non-peak hours, it can take several traffic signal cycles for a vehicle to pass through intersections. Left turns into shopping centers and streets without left turn lanes are common. North from Irving Park to Milwaukee Avenue, the route resumes with four traffic lanes with left turn lanes provided. Delays on the significant part of the route from North Avenue to Irving Park Road are an issue making this portion of Harlem Avenue less feasible for an ART.

There are three RR grade crossings from 95th Street to the CTA's Green Line in Oak Park. There is a lightly used freight crossing at 61st Street. The Burlington Northern commuter and freight traffic occurs at approximately 34th Street, and a freight crossing is located just north of Riverside Drive.

There are two RR grade crossings from the CTA's Green Line in Oak Park to Milwaukee Avenue. Freight and commuter crossings are located at Fullerton, and a commuter line at Northwest Highway.

The ROW from 95th Street north to Oak Park has the potential for an ART. The ROW from Oak Park north to Milwaukee Avenue is not ideal for an ART because of the narrow two lanes between North Avenue and Irving Park Road.

Dempster
The Dempster route from the O'Hare K-N-F to Des Plaines River Road, from River Road to Greenwood and from Greenwood to the CTA's Skokie Swift has four traffic lanes with left turn lanes at all major intersections. The ROW is wide with very limited on-street parking. There is a concern in Des Plaines traveling toward O'Hare as there is no designated left turn lane at Graceland where the ART would make a left turn toward O'Hare. Officials from the Northwest Division stated that delays occur in Evanston, at the Skokie Swift station, the Des Plaines Metra station and at Maine East High School at certain times.

From the CTA's Skokie Swift east to downtown Evanston, there are four traffic lanes with ample left turn lanes until Asbury in Evanston, where the ROW turns into two traffic lanes with on-street parking from Ridge Avenue to the CTA station at Chicago Avenue. This portion of Dempster is a challenge for an ART operation.

There are two RR grade crossings from the O'Hare K-N-F to River Road. A freight crossing is located at Thacker and a commuter line is located in downtown Des Plaines. There are no RR grade crossings from River Road to Greenwood, and there is one RR grade crossing (mostly commuter) from Greenwood to Skokie Swift at Lehigh. There are no RR grade crossings from Skokie Swift to downtown Evanston.

Milwaukee Avenue
The Milwaukee Avenue route has four traffic lanes with left turn lanes at intersections. There are long distances between major intersections that expedite traffic flow. There is no on-street parking between Devon Avenue and Golf Mill. There is on-street parking between Jefferson Park and Devon, but the ROW is sufficient so that the on-street parking does not significantly impede traffic flow. The Northwest Division noted that congestion does occur at Devon and Oakton during peak periods.

There are no RR grade crossings along the route.

Oak Brook
The Oak Brook route has four traffic lanes with ample left turn lanes at all intersections. Parts of the route from the Oak Brook Mall to Yorktown Center have six traffic lanes. The West Division stated that the route has a very good ROW with few major congestion problems.

There are no RR grade crossings along the route.

Summary and Recommendations of Phase 3

Based on ROW characteristics (RR grade crossings, number of lanes and turning lanes), it was determined that achieving travel time savings on 95th Street would be a challenge for an ART. Based on ongoing studies in the region and regional plans for the next 10 years, it was identified that two of the six routes, Harlem and Halsted, would receive regional institutional support in the second 5-year of the 10-year implementation timeframe. These three routes were not carried forward for further evaluation but remain part of the short-term ART route network. The remaining three routes, Milwaukee, Dempster and Oak Brook, have no ROW impediment for

travel time savings and would receive immediate regional institutional support. They are carried forward for further evaluation in Phase 4.

Phase 4: Evaluation of the Final Three Routes

Through the previous phases of the selection process, three routes were identified as having the highest likelihood as successful for the first ART project:

- Dempster
- Milwaukee
- Oak Brook

The three remaining routes were further evaluated in this phase of the study with the goal of selecting the corridor for the first ART project. The corridors were evaluated by the criteria of Phase 3 but now measured differently:

- Support
    - Community support
    - Divisions' support
    - Divisions' technical / management capabilities

- Travel Time Savings
    - At stops (dwell time)
    - At signals (queue jump /TSP)

Finally, the three corridors were compared to one another using all criteria. In addition, FTA guidelines for the New Start / Small Starts Program were also used in evaluating the three remaining routes. In summary, the final three corridors were compared to one another according to the following criteria:

- Support
    - Regional institutional support
    - Community support
    - Divisions' support
    - Divisions' technical / management capabilities

- Connectivity
    - Regional connectivity
    - Connecting Pace's sub regions

- Transit Ridership
    - Current
    - Potential to generate new riders

- Travel Time Savings
    - At stops (dwell time)
    - At signals (queue jump /TSP)
    - Traffic flow (ROW characteristics, RR grade crossings)

STV rated the three remaining routes using a comparison rating system of the above criteria. This methodology is used effectively for other alternative corridor studies including FTA's AA process. It is more direct for the final selection process to compare the remaining three routes against each other.

The ratings for the routes are:

3 - Rated higher than the others
2 - Rated the same as the others
1 - Rated lower than the others

With this system, only one of the routes can receive a "3" or a "1" rating.

The following sections present the comparison of the top three corridors according to all criteria. Appendix G provides further additional data on travel time savings and ROW information.

Support for the Implementation of the First ART Route

Successful implementation of the first ART route requires support from local and regional institutions, local communities, key municipal stakeholders, and Pace's operating divisions. The following section first summarizes the results of the evaluation of support from local and regional institutions performed in Phase 3. Next, it describes the evaluation of community support, which includes the expert judgment of Pace's community relations staff and an outreach effort toward key stakeholders. Finally, the operating divisions' support and technical and management capabilities are discussed.

Institutional Support

The implementation of a successful ART requires consistency with local and regional plans and programs. In evaluating support from local and regional institutions, the study identified those existing local and regional plans and programs that could affect the implementation of an ART on these corridors.

The STV team discussed with Pace and RTA officials existing regional plans / programs relating to the corridors. The STV team reviewed the CATS / CMAP 2030 Regional Transportation Plan, the Illinois DOT FY 2009 - 2014 Highway Improvement Program, the Milwaukee Avenue Plan and the Cook - DuPage Corridor Travel Market Analysis.

Dempster
There are no current local or regional studies that conflict with implementation of ART service or major capital transit service improvements along the route at this time. However, no major local or regional transit study has been conducted along the Dempster corridor to support BRT or major transit capital investments. Therefore, the Dempster route is the lowest rated. Coordination with the CTA will be needed at the Evanston and Skokie Swift stations.

Milwaukee
The Village of Niles has developed a plan that calls for BRT service along Milwaukee Avenue showing strong support for an ART by the Village. There are no current local or regional studies that conflict with implementation of ART service or major capital transit service improvements along the route at this time. Therefore, the Milwaukee route is the highest rated corridor. Coordination with the City of Chicago and CTA will be needed for the portion of the ART that is in the City of Chicago and at the Jefferson Park station.

Oak Brook
CMAP's 2030 Plan calls for an extension of the CTA Blue Line west into DuPage County that is similar to the Oak Brook corridor. There are no current local or regional studies that conflict with implementation of ART service or major capital transit service improvements along the route at this time. The Illinois State Toll Highway Authority plans on implementing High Occupancy Vehicle (HOV) lanes in the Chicago region. If HOV lanes are established on the Interstate Expressway (I-290), there will be an opportunity for ART service to use the express lanes linking Forest Park with Oak Brook in the future. Coordination with the CTA will be needed at the Forest Park station.

Dempster Rating: 1
Milwaukee Rating: 3
Oak Brook Rating: 2

Community Support

A BRT cannot succeed without support from the communities it serves. Pace's staff has a long term working relationship with the communities. Interviews and a survey with Pace staff provided input on local communities' level of support for Pace initiatives as summarized below.

Dempster
The communities along the Dempster route received a high rating from Pace staff as being supportive of Pace.

Milwaukee
The Milwaukee route received the highest rating from Pace staff as being supportive of Pace.

Oak Brook
The communities along the Oak Brook route received lower ratings from Pace staff as being supportive of Pace compared with the other corridors.

Dempster Rating: 2
Milwaukee Rating: 3
Oak Brook Rating: 1

Based on this initial rating of community support, concurrent with Phase 4 evaluation, an outreach effort toward key stakeholders was conducted and is discussed in the following section.

Municipal Outreach

Key stakeholders' support is necessary for a successful ART implementation. Pace's community representatives identified transit supportive communities along the top three ART routes. As the corridor evaluation process progressed, the project team met with representatives of the key stakeholders along the top two routes: Milwaukee and Dempster.

Milwaukee ART stakeholders:

- Niles
- CTA
- Chicago DOT

Dempster ART stakeholders:

- Des Plaines
- Park Ridge
- Skokie
- Niles
- Morton Grove
- Evanston

The purpose of the outreach effort was to gauge preliminary reaction to and elicit feedback about the proposed ART projects. These public outreach meetings were the first step in an open collaborative planning process. The results of the outreach effort were positive:

- All stakeholders showed interest in and support for an ART project.
- All asked direct questions and raised issues demonstrating an interest and willingness to assist Pace in planning an ART.
- Some communities recommended their corridor as the best for the first ART.
- Three of the communities offered Pace their local plans for future cooperation:
    - The Village of Niles transit, traffic, and redevelopment plan, *Milwaukee Avenue Plan*, has incorporated both the Milwaukee Avenue and Dempster Street ART.
    - The Village of Morton Grove's redevelopment plan, *Dempster Street Commercial Corridor*, proposes the phased removal of on-street parking from Dempster Street, among other improvements that will support ART operation on Dempster Street.
    - The Village of Skokie conducted the *Skokie Swift Station Location Feasibility Study* that proposes transit supportive land use development.
- The Village of Des Plaines Traffic and Transportation Committee voted to pass a recommendation to City Council to work with Pace on an ART.
- Stakeholders asked about the next steps and offered support in coordinating with Pace on the ART projects.

The strong support from these municipalities showed a high interest in an ART and validated the study's selection of the Milwaukee and Dempster corridors as good candidates for Pace's first ART.

Appendix H provides more details on the meetings and outreach process.

Support of the Divisions for Implementing an ART

Pace's Divisions provided opinions on the potential for ART service on the routes operated by Pace. The Divisions' comments are highly valued as they are the most knowledgeable about the routes characteristics, conditions and issues. The Division has a long history of operating service within the route making their opinions valuable.

Dempster
The Northwest Division thought Dempster would be a good route for an ART but the Milwaukee route would be better. The Division noted that delays occur at the Des Plaines Metra station, at Maine East High School, at the Skokie Swift Yellow Line and in the City of Evanston.

Milwaukee
The Northwest Division thought that the Milwaukee route would be a very good route for an ART. The Division was supportive and enthusiastic about ART on the Milwaukee route. The Division stated that congestion occurs at Devon and Oakton. The Division said that Milwaukee would be a better route for an ART than Dempster. The Milwaukee route was given the highest rating as a result of the positive comments from the Division.

Oak Brook
The West Division thought that an ART could work. The Division stated that off-peak ridership is not good compared with the peak hours for the existing express service from Forest Park to Oak Brook.

Dempster	Rating: 2
Milwaukee	Rating: 3
Oak Brook	Rating: 1

Technical / Management Capabilities of the Divisions

Operating a premium bus service such as an ART requires a commitment from management and staff, and an ability to maintain and operate the sub-fleet. The West Division is responsible for the Oak Brook route and the Northwest Division is responsible for the Milwaukee and Dempster routes. The Divisions were interviewed to gauge their technical / management capabilities to operate a premium bus service.

The results of the interviews indicated the following for both Divisions: 1) they have past experience in operating and maintaining premium service; 2) have capacity to ensure that spare ART vehicles would be used to replace an ART vehicle that has mechanical problems; 3) they have the capacity to give priority to ART vehicles for cleaning, maintenance and repairs; 4)

Pace's Intelligent Bus System (IBS) can monitor the ART vehicles; 5) they foresee no issues with training mechanics to maintain an ART fleet; 6) union rules dictate driver selection for ART; 7) training would be required if new technology or equipment is needed; and 8) additional staff (drivers and mechanics) would be needed for an ART program.

Based upon STV's interviews, both Divisions responded that they have the technical / management capabilities to operate premium service based on past experience. However, both the West and Northwest Divisions stated that their existing facilities do not have space for additional vehicles. Before implementing an ART service, this issue will have to be resolved by Pace.

Dempster and Milwaukee
The Northwest Division was enthusiastic about an ART as compared with the other Division. The Division noted that union rules would not allow management to select the bus drivers. The Northwest Division stated that they did not consider this to be an issue. The Division also made recommendations including the need for supervisors for the ART service to ensure that the service would be managed smoothly and the importance of a public awareness / outreach program for the new service. As a result, the Northwest Division was rated higher.

Oak Brook
The West Division was supportive of the ART concept. The West Division mentioned that driver selection will be determined by union rules. The West Division did not make suggestions or recommendations towards an ART.

Dempster	Rating: 2
Milwaukee	Rating: 2
Oak Brook	Rating: 1

Regional Connectivity

Regional connectivity is important in developing Pace's short-term ART network. It is important for the first ART project to be the cornerstone for Pace's regional short-term ART network and connect with the other ART routes.

All three routes connect with the CTA's rapid transit system.

Dempster
Dempster connects with the Milwaukee ART route as part of the short-term ART network. It also connects with Metra's Union Pacific (UP) North lines in Evanston and Northwest (NW) lines in Des Plaines.

Milwaukee
Milwaukee connects with both Dempster and Harlem ART routes as part of the short-term ART network. Milwaukee has the most connections with the short-term ART route network giving Milwaukee the highest rating. It also connects with Metra's UP Northwest lines at Jefferson Park.

Oak Brook
Oak Brook does not connect directly with any of the short-term ART network routes.

Dempster Rating: 2
Milwaukee Rating: 3
Oak Brook Rating: 1

Transit Ridership

Transit ridership is a key indicator in evaluating new service. As stated in Phase 1: Preliminary Screening, a BRT with existing ridership has earlier and larger success in generating new riders. Higher ridership routes indicate that transit is already serving a transit market and the service connects active origins and destinations. Higher ridership routes have more frequent service and longer service hours, and are therefore better candidates for ART service. Such routes are also more likely to meet FTA criteria for Small Starts funding.

FTA's BRT guidelines are the industry standard for evaluating projects. Even if the first ART is implemented entirely without federal funds, subsequent corridors may seek FTA funding and Pace's first ART project must be viewed as a success to be a catalyst for future funding. FTA's BRT guidelines include a minimum of at least 3,000 riders per day for a Small Starts project with service frequencies of 10 minutes in the peak and 15 minutes in the off-peak.

The transit ridership criterion is composed of two separate ratings: Current Ridership and Potential Ridership.

Current Ridership

The criteria evaluated for current ridership includes Weekday Ridership, Ridership by Route Segment and Time of Day Ridership.

Weekday Ridership
Average weekday ridership for each of the three routes was compared to determine the highest ridership route, and to determine if the corridor met criteria for FTA Small Starts funding. The current average weekday ridership on bus routes in each of the three corridors under study is listed in the table below.

Average weekday ridership in the highest ridership month is normally used for analysis. The highest ridership month generally occurs in the fall. Fall 2008 data was unavailable at the time of analysis. Therefore, September 2007 data was used for routes 250 Dempster and 270 Milwaukee, while August 2008 ridership figures were used for the Oak Brook corridor - routes 301 Roosevelt and 747 DuPage connection. This is because monthly ridership trends on route 747 DuPage Connection showed that ridership began to steadily rise in June 2008. August 2008 ridership was greater than September 2007 ridership. It is reasonable to assume that this trend would continue into the fall of 2008 and that ridership in September 2008 would be significantly higher than in September 2007. Therefore, August 2008 data was deemed more appropriate for analysis for the Oak Brook corridor.

The weekday ridership figures show that Milwaukee has the highest level of average ridership, while the Oak Brook corridor has the lowest level. Routes in the Milwaukee and Dempster routes meet the Small Starts ridership criteria but the Oak Brook corridor does not.

Corridor	Bus Routes in Corridor	Average Weekday Riders
Dempster	250	3,174
Milwaukee	270	3,383
Oak Brook	301 and 747	2,497
Riders for Dempster & Milwaukee reflect Sept 2007 data, for Oak Brook Aug 2008 data was used.		

Ridership by Route Segment

Weekday average ridership figures provide total ridership for the entire route. However, ridership is rarely evenly spaced along the route. When contemplating the most feasible route for an initial ART service it is useful to know where ridership is concentrated because the ART may not be implemented on the entire existing route. Automatic Passenger Count (APC) data can provide an indication as to what portions of the route experience the highest ridership and whether ART can be implemented on only a portion of the existing route.

APC data for the month of September 2008 was used to determine ridership by route segment. The data was first separated into Weekday, Saturday and Sunday ridership. The analysis used weekday data because weekdays represent higher ridership than weekends, generally have a consistent ridership pattern from day to day and provides a sufficient size dataset. Each record in the dataset represents a boarding or alighting activity at a bus stop. Each bus stop was then identified with a particular segment and the data sorted by segment number. The boardings for each segment were then summed and the percentage of ridership represented on each segment was then calculated.

The results, illustrated in the table below, show that ridership in the Milwaukee corridor between Jefferson Park and Golf Road exceeds the FTA requirement of 3,000 riders per day. In the Dempster route, the entire existing route between the O'Hare K-N-F and Evanston must be implemented as ART to meet the FTA requirement.

In the Dempster route, 36% of the riders board in the segment between the Skokie Swift station and Greenwood. The segment between the Evanston CTA station and the Skokie Swift station represents the next highest segment at 27% of the riders. In the Milwaukee route, 92% of total riders board between Golf Road and Jefferson Park station. The Oak Brook route is composed of two bus routes, 301 Roosevelt and 747 DuPage Connection. Route 301 ridership is concentrated between Forest Park Station and Wolf Road. The findings for route 747 revealed that 58% of total riders board west of Oak Brook Mall.

Segment	Estimated Average Weekday Ridership
Dempster	
1. CTA Evanston Station to Skokie Swift	869
2. Skokie Swift Station to Greenwood	1,135
3. Greenwood to Des Plaines River Road	377
4. Des Plaines River Rd to O'Hare K-N-F	793
Milwaukee	
1. Jefferson Park Station to Golf Road	3,112
2. North of Golf Road	271
Oak Brook (Pace 301)	
1. Forest Park Station to Roosevelt/Wolf	1,232
2. North of Roosevelt/Wolf to shopping center	165
3. 5th Avenue trips to Proviso East HS	5
Oak Brook (Pace 747)	
1. Forest Park Station	257
2. Roosevelt/York to Oak Brook Mall	208
3. Route 83 to Charlestowne Mall	630

Time of Day Ridership

A review of ridership by time of day provides information on whether current off-peak ridership will support ART service. FTA criteria requires that Small Starts projects provide frequent service levels throughout the day. Therefore, ridership on the existing routes should show sufficient boardings in the off-peak to support frequent service levels.

One measure to determine the level of off-peak activity is to compare off-peak activity to ridership activity in the peak. Routes appropriate for ART service will have ridership totals in the off-peak hours that are closely equivalent to the number of total riders in the peak. To determine daily ridership patterns by time of day, weekday APC data from September 2007 was analyzed and divided into peak and off-peak ridership. The APC data provided a "trip start time" that was utilized to determine if the trip was a peak trip or an off-peak trip. Peak trips were defined as those with a "trip start time" between 4 a.m. and 8 a.m., and between 2 p.m. and 6 p.m. All other trips were considered off-peak trips.

The data was limited because the exact time of boarding was not available. Assumptions were made regarding the time boardings occurred based on the trip start time. The time of day data was used in conjunction with current mid-day frequency on the route to determine if ridership in the off-peak could support frequencies recommended by FTA. The time of day data acted as a check of the current frequency in case current frequency level was inadequate.

On Dempster Street the relationship between peak and off-peak ridership on Pace route 250 shows the percent of ridership which occurs in the rush hour is approximately 58.5%. This is a relatively high percentage which would indicate that off-peak activity may be insufficient to support frequent service. This is supported by the current mid-day frequency of 30 minutes. FTA criteria would require the doubling of service levels to meet minimum frequencies of 15 minutes in the off-peak.

Milwaukee Avenue APC data for Pace route 270 indicates that 55.6% of the boardings occur during the peak period. Again, this shows a higher percentage of peak ridership compared to off-peak. However, the current service frequency between Jefferson Park and Golf Mill in the mid-day is approximately 20 minutes. It is conceivable that the improved service levels of ART service will attract a sufficient number of off-peak riders to support improved mid-day frequencies of 15 minutes.

On the Oak Brook alignment, rush hour ridership on route 301 represents 82.5% of total daily riders, while rush hour ridership on route 747 includes 70.5% of total ridership. This ridership pattern indicates that mid-day ridership levels will not support ART service at 15-minute frequencies. Current frequencies on the two routes also indicate that meeting FTA service level criteria would be a challenge. Mid-day frequency on both routes is approximately 60 minutes.

Ridership Potential

The potential for ridership on a new route can be impacted by a variety of factors. This analysis examines two factors associated with ridership potential: Socio-Economic / Transit Connectivity factors and Ridership Trends.

Socio-Economic / Transit Connectivity

The level of ridership on any given route is influenced by population density, employment density, the number of residents already predisposed to taking transit, the number of automobiles in the household, and connections to other transit services. These characteristics, among others, have been used to forecast ridership in route-level forecasting models. While this study did not have the budget to perform a travel demand forecast, the study was able to draw inferences about ridership potential through evaluating socio-economic and transit data discussed in Phase 2.

The criteria used in this analysis to rate ridership potential includes population density, employment density, the number of residents already predisposed to taking transit, the number of automobiles in the household, and connections to other transit services. The data for the criteria was obtained from the 2000 Census results. The transit connection criterion was developed by identifying the number of transit connections encountered in each corridor.

These socio-economic and connectivity characteristics are good indicators for successful transit ridership and are presented in the following table.

Corridor	Population / sq. mile	Employment / sq. mile	Commutes by Transit / sq. mile	Households with 0 or 1 vehicle / sq. mile	Transit Connections Rating
Dempster	4,351	3,727	190	822	24
Milwaukee	8,084	3,994	404	1,778	13
Oak Brook	2,567	5,327	93	502	12

The Milwaukee route exhibits the highest ridership potential of the three based on census data. It exhibits a very high population density, a high current propensity to use transit, and a high

number of households with less than two vehicles. All of these characteristics indicate that improved service levels in this corridor will have a positive impact on ridership levels. The Dempster route displays socio-economic characteristics that are supportive of transit. The transit connection rating is highest for the Dempster route at 24, compared to 13 for Milwaukee and 12 for Oak Brook. This is a partial reflection of the length of the Dempster route (15.1 miles) versus 7 miles for Milwaukee and 12.8 miles for Oak Brook. The Oak Brook route exhibits the lowest scores in all but one category - employment per square mile. Employment per square mile is highest for the Oak Brook corridor. Unfortunately, the majority of the employment is inaccessible by transit. If ART was implemented in this corridor, a well developed shuttle system would be required to shuttle employees between their job locations and the ART service.

Ridership Trends

Ridership trends are an important criterion in route selection because they are an indication of market growth as well as an indication of future ridership potential.

Average weekday ridership for the month of October between 2003 and 2007 was obtained from the RTA's website. System ridership in 2003 and 2007 was obtained from the National Transit Database. The ridership change on each route was calculated for each year between 2003 and 2007, and was calculated for the 5-year trend 2003 to 2007. The five year trend was compared to the system trend to determine if the individual route trends were greater than or less than the system trend. Increasing trends that exceed the system level trend indicate a growing market with good ART potential.

Ridership has consistently increased in all three corridors, and has increased at a greater rate than the system average. The Dempster route experienced the most dramatic change, increasing to 3,265 riders per weekday from 2,323 riders in October 2003. This increase may be related to the route's extension to the O'Hare K-N-F. The Milwaukee route reflects a relatively modest ridership increase of 12%. Although modest compared to the Dempster route, this increase is three percentage points higher than the system average ridership gain. The Oak Brook route has experienced increased ridership on both routes serving the corridor. The increase on route 747 may actually be higher than what is reflected here, because ridership in the month of August 2008 was 56% higher than in October 2007.

Corridor	Pace Routes	2003	2004	2005	2006	2007	5-Year change
Dempster	250	2,323	2,472	2,891	3,075	3,265	40.55%
Milwaukee	270	3,032	3,219	3,257	3,228	3,394	11.94%
Oak Brook	747	588	623	663	631	703	19.56%
	301	1,213	1,277	1,374	1,443	1,443	18.96%

Transit Ridership Summary

This section summarizes the transit ridership evaluation for the three corridors. Transit ridership was evaluated by reviewing current ridership and ridership potential. Current ridership examined

weekday ridership, ridership by route segment, and ridership by time of day. As the table below illustrates, the Milwaukee route received the highest overall rating for current ridership.

Corridor	Weekday Ridership	Ridership by Route Segment	Time of Day Ridership	Current Ridership Overall Rating
Dempster	2	2	2	2
Milwaukee	2	3	3	3
Oak Brook	1	1	1	1

The ridership potential ratings are shown in the table below. The Dempster and Milwaukee routes received the same rating under this criterion. Dempster had the highest ratings for ridership trends and Milwaukee rated highest for socio-economic and transit connectivity factors.

Corridor	Socio-Economic/ Connectivity	Ridership Trends	Ridership Potential Overall Rating
Dempster	2	3	2
Milwaukee	3	2	2
Oak Brook	1	2	1

Dempster

Average weekday ridership on Pace route 250 Dempster Street has approximately 3,174 riders for the entire corridor. This ridership level meets the FTA Small Starts criteria of 3,000 riders per weekday for Small Starts funding.

The Dempster route exhibits fairly strong ridership levels along its entire length. The heaviest traffic is on the portion between Skokie Swift and Greenwood. The portion between Greenwood and Des Plaines River Road (just east of downtown Des Plaines) exhibits the lightest ridership levels.

The Dempster route experiences a slightly higher rush hour ridership percentage with 58.5% occurring in the peak period. The frequency of service is less in comparison with the Milwaukee route. Current rush hour frequencies are approximately 20 minutes in the peak, while mid-day frequency is approximately 30 minutes. FTA criteria would require doubling of service levels to meet the minimum service frequencies of 10 minutes peak and 15 minutes off-peak.

The transit connection rating is highest for the Dempster route. This is a reflection of both the length of the route and two connections with the CTA's rapid transit system.

The Dempster route experienced the most dramatic ridership increase over five years, increasing to 3,265 riders per weekday from 2,323 riders in October 2003. This increase may be related to route changes and the extension of the route to the O'Hare K-N-F.

Milwaukee

Average weekday ridership on Pace route 270 Milwaukee Avenue is approximately 3,383 riders. This ridership level meets the FTA Small Starts criteria of 3,000 per weekday riders.

Ridership on the Milwaukee route appears concentrated south of Golf Road. This supports the recommendation to implement ART on the southern portion of Milwaukee as an initial first step before extending the service to Lake / Willow. This ridership pattern is also reflected in the schedule, with approximately two-thirds of the trips operating between Jefferson Park and Golf Mill.

APC data for Pace route 270 indicates that 55.6% of the boardings occur during the peak period. This peak ridership is fairly well balanced with the off-peak ridership of 44.4%. The weekday rush hour frequency between Jefferson Park and Golf Mill is approximately 10 minutes, while the mid-day frequency is approximately 20 minutes. It is possible that the improved service levels of ART service will attract a sufficient number of off-peak riders to support improved mid-day frequencies of 15 minutes as required by FTA Small Starts criteria.

The Milwaukee route exhibits the highest ridership potential of the three corridors. It displays a high population density in comparison to the other corridors, a high current propensity to use transit, and a high number of households with less than two vehicles. All of these characteristics indicate that improved service levels in this corridor will have a positive impact on ridership levels.

Ridership trends since 2003 for the Milwaukee corridor reflect a relatively modest ridership increase of 12%. Although modest compared to the Dempster corridor, this increase is 3% higher than the system average ridership gain.

Oak Brook

The Oak Brook corridor is composed of two Pace bus routes: 301 Roosevelt and 747 DuPage Connection. Average weekday ridership on both routes total approximately 2,497 riders. This ridership level is insufficient for FTA Small Starts eligibility. APC data for route 301 demonstrates that the majority of the ridership occurs between the CTA terminal and Wolf Road. The route 747 ridership pattern shows that most boarding occurs west of the proposed ART corridor. These ridership patterns indicate that a Roosevelt Road alignment for the proposed ART is the better alignment, but that ridership may not be sufficient to support the service.

APC data for Pace routes 301 Roosevelt and 747 DuPage Connection show that the distribution of ridership throughout the day within the corridor indicates that mid-day ridership levels will not support ART service at 15 minute frequencies. Current frequencies on the two routes also indicate that meeting FTA service level criteria would be a challenge. To meet the FTA criteria, frequency in the rush hour would need to double, and frequency during the mid-day would need to improve by four fold.

Among the top three, the Oak Brook route exhibits the lowest scores for population density, number of residents predisposed to taking transit, the number of automobiles in the household, and connections to transit services. However, employment per square mile is highest for the Oak

Brook route. An ART on the Oak Brook route would require the implementation of shuttle service to connect with existing destinations.

The Oak Brook route has experienced increased ridership on both routes serving the corridor. Route 747 increased by 10.9%, while route 301 increased by 10.3%. Both of these increases are just slightly over the system-wide increase of 9%; however, much of the route 747 ridership is west of the proposed ART corridor.

Travel Time Savings

Travel time is adversely impacted by lost time at stops (deceleration, dwell time, re-entering traffic, acceleration), at signalized intersections (waiting at red lights) and traveling along the route through traffic flow (congestion). This section of the study examines travel time savings potential of the corridors at these three locations.

As a point of reference, the speed of Pace service was examined to compare Pace travel speeds with arterial bus lane speeds in other cities.

The Transit Capacity and Quality of Service Manual, (TCQSM), Transit Cooperative Research Program (TCRP) Report 100, estimates average bus speeds on dedicated arterial street bus lanes as 9 to 11 miles per hour with one-quarter mile stop spacing. Reducing the number of stops to one-half mile spacing, increases speeds to 15 to 25 miles per hour. Pace travel speeds for the corridors under study are shown in the table below.

Corridor	**Estimated Speed**
Milwaukee	14 - 16 mph
Dempster	12 - 16 mph
Oak Brook (route 301)	19 - 20 mph
Oak Brook (route 747)	18 - 40 mph
BRT Lanes ¼ mile stops [1]	9 - 11 mph
BRT Lanes ½ mile stops [1]	15 - 25 mph
[1] TCRP Report 100, 2003.	

With the exception of route 747, which operates on the expressway, the existing bus speeds are similar to bus speeds anticipated with BRT dedicated lanes according to the TCQSM.

Stops

The amount of travel time expended at bus stops depends on the number of stops and the dwell time at these stops. Many transit properties have found that reducing the number of bus stops by stopping every one-half mile instead of every quarter mile improves travel time. Although dwell times at the remaining stops increases slightly, the overall speed improves. This is due to the fact that the bus no longer takes time to merge into traffic at the eliminated stops, and the acceleration and deceleration time associated with these stops is also eliminated.

To determine if Pace would benefit from fewer stops, APC data from September 2008 was reviewed to estimate the average stop spacing for the Milwaukee route. The Milwaukee route

was chosen for review because this corridor is the most "urban" of the three corridors (highest population density) and would therefore have more stops than the Dempster or Oak Brook corridors per mile.

The review found that current average stop spacing in the southbound direction is .64 miles, and the average stop spacing northbound is .56 miles. Since the Milwaukee route currently averages slightly more than one-half mile between stops, it is unlikely that improved travel speed will result from designating one-half mile stops. However, designated stops at regular intervals may improve customers' perception of reliability, and may actually improve on-time reliability on a per trip basis.

To achieve travel time savings through a reduction in bus stops, Pace's ART service will need to designate stop spacing longer than every ½ mile given that Pace's average stop spacing is over ½ mile.

Signal Delay

Signal delay information can point out where to implement TSP or Queue Jump lanes. STV's review of existing bus speeds and number of bus stops in each corridor indicated that implementation of TSP and Queue Jump lanes holds the greatest potential for improving Pace travel speeds on the proposed ART routes. Routes with intersections that would benefit from these treatments would experience improved travel speeds.

The "Bus Rapid Transit Practitioner's Guide, TCRP 118", provides estimates of running time savings for TSP systems based on the experience of several transit agencies. Running time savings is estimated between 2 and 18 percent. Queue Jump lanes can reduce travel times by 5 to 15 percent. Queue Jump lanes are an effective option to TSP in the event that TSP cannot be implemented at a particular intersection. The Pace TSP Initiative report was reviewed to identify route segments with particularly long signal delays. The report collected signal delay data by operating probe vehicles equipped with a Global Positioning System (GPS) for two peak and two off-peak trips in each corridor. For the three routes under study, signal delay ranges from zero seconds to over 4 minutes. For this analysis, any route segment with a signal delay greater than one minute is identified.

Signal delay data for some segments of the proposed ART corridors were not included in the TSP Initiative; therefore, this study could not use the signal delay data for ART route rating. The signal delay information in each corridor is utilized along with professional judgment to determine the final ratings.

The Dempster route contains 11 segments in the Pace TSP Initiative report. Four segments with a signal delay greater than one minute were identified. The Milwaukee route contains seven segments in the Pace TSP Initiative report. The report identified three segments with a signal delay greater than one minute. The Oak Brook corridor contains 10 segments in the Pace TSP Initiative report and only one segment with a signal delay greater than one minute was identified.

Congestion

Volume / Capacity (V/C) ratios provide an indication of traffic congestion. Improvements in travel time and avoidance of traffic congestion are desirable elements of ART implementation.

V/C ratios contained in the Pace TSP Initiative dated February 2008 were reviewed to determine the corridor(s) that would benefit from TSP treatment. A V/C ratio greater than 1.00 indicates oversaturated traffic conditions where the volume of traffic is greater than the capacity of the roadway. TSP is most effective at signalized intersections with V/C ratios between .80 and 1.00. The Pace TSP report was reviewed to identify route segments with V/C ratios between .80 and 1.0.

Data for some segments of the proposed ART routes were not included in the TSP Initiative, therefore, the data was not available to utilize V/C ratios in the rating scale for several segments along the routes. The V/C ratio information on each route was utilized along with professional judgment in the final ratings.

The Pace TSP Initiative report divided the Dempster route into 11 segments. Of these 11 segments, four have V/C ratios within the effective range for TSP. Within the Milwaukee route, the Pace TSP Initiative identified seven segments that would be included in the proposed ART. Only one segment between Harts Road and Harlem Avenue has a V/C ratio (.94) that falls within the effective range for TSP. The Pace TSP Initiative report divided the Oak Brook route into 10 segments. Of these 10 segments, three have V/C ratios within the effective range for TSP.

Travel Time Savings Summary

This section summarizes the travel time savings evaluation for the three routes. Travel time savings was evaluated by reviewing number of bus stops, signal delay and congestion.

Dempster

The Pace TSP Initiative report identified 11 segments within the Dempster route. Approximately five one-mile segments are missing from the TSP Initiative report. Of the 11 segments identified, three have V/C ratios greater than 1.00, four have ratios of less than .80, and four have V/C ratios within the effective range for TSP. These four segments are:

- Mannheim Road /Higgins to Mannheim Road/Sherwin
- Dempster/Crawford to Dempster/Skokie Boulevard
- Dempster/Skokie Boulevard/Dempster/Central
- Dempster/Central/Dempster/Narragansett

The Dempster route segments with a signal delay greater than one minute are as follows:

- Sheridan to Ridge (WB)
- Ridge to McDaniel (WB)
- Skokie Boulevard to Central Avenue (EB)
- Mannheim Road/Higgins to Mannheim Road/Sherwin (SB)

The intersections within the Dempster route were field checked. The field check indicated that the intersections at Graceland and Miner require some transit improvements.

Pace's Queue Jump Study recommends Queue Jump lanes at the following locations:

- Milwaukee and Greenwood
- Lee and Miner
- Miner and Pearson
- Lee and Prairie
- Des Plaines River Road and Miner

Milwaukee
The Pace TSP Initiative report identified seven segments on Milwaukee that would be included in the proposed ART. No segments on Milwaukee were missing from the TSP Initiative report. Three of these segments are located between Harlem Avenue and Golf Road and have a V/C ratio greater than 1.00. Three segments located between Jefferson Park station and Harts Road have V/C ratios less than .80. Only one segment between Harts Road and Harlem Avenue has a V/C ratio (.94) that falls within the effective range for TSP.

The segments along the Milwaukee route with a signal delay greater than one minute are as follows:

- Veteran to Catalpa Avenue (SB)
- Catalpa to Hyacinth Street (NB)
- Birchwood to Ottawa Avenue (NB)

The intersections within the Milwaukee route were field checked. The field check indicated that the intersection at Devon and Oakton requires some transit improvements.

Oak Brook
The Pace TSP Initiative report divided the Oak Brook route into 10 segments. Approximately two one-mile segments are not included in the report. Of the 10 identified segments, four have V/C ratios greater than 1.00, three have ratios of less than .80, and three have V/C ratios within the effective range for TSP. These three segments are:

- Roosevelt / Des Plaines to Roosevelt / 9th Street
- Roosevelt / Mannheim Road to Roosevelt / Wolf
- Roosevelt / Wolf to Roosevelt / I-294

The Oak Brook route segments with a signal delay greater than one minute are as follows:

- Roosevelt/Des Plaines Avenue to Roosevelt/9th Street (WB)

All three routes could benefit from TSP or Queue Jump lanes. Therefore, the STV team found it hard to rate the individual routes in the area of travel time savings using stop / dwell time and signals. All three routes were given the same rating.

Dempster Rating: 2
Milwaukee Rating: 2
Oak Brook Rating: 2

ROW

Another component of travel time savings comes from improving traffic flow along the route. Traffic flow is influenced by the volume of traffic on the roadway, the number of signalized intersections, and by impediments to consistent flow such as RR grade crossings and lack of turning lanes. The traffic flow evaluation discusses ROW conditions.

In addition, the study collected information on pedestrian accessibility of the route and space for bus stops / stations.

ROW Conditions
The most important feature of an ART is "rapid transit". The ROW for an ART to travel should have minimum interruptions and pedestrian friendly access such as sidewalks. The ROW data was developed using Google Earth and inspection of each route.

ROW data was developed for each route including:

- Number of lanes
- Turn lanes
- Signal type
- Signal condition
- Distance to previous signal
- Street parking
- Sidewalks
- Room for bus shelters

Appendix G provides a ROW data table for each of the three routes. A discussion of the ROW for each route is provided below along with a summary of the ROW characteristics and issues that could delay ART service.

Dempster
The Dempster route is 15 miles long with 52 traffic signals (3.44 traffic signals per mile). The segments with the most traffic signals are from Greenwood to Skokie Swift (3.47 signals per mile) and from Skokie Swift to Chicago Avenue in Evanston (4.21 signals per mile). The Dempster ROW has more traffic signals per linear mile than any of the three corridors. On average, the corridor has a traffic signal every 1,440 feet.

The Dempster route has three RR grade crossings: two from the O'Hare K-N-F to River Road and one from Greenwood to Skokie Swift.

The route has at least four traffic lanes from the K-N-F to Evanston; however, in Evanston (Fowler Avenue) the ROW narrows and turns into two lanes at Asbury with parking lanes.

Throughout the route, there are left turn lanes available at major intersections. The traffic signals are modern and many are actuated. Much of the route has sidewalks to assist pedestrian traffic and offer space for possible bus shelters.

Congestion on the route occurs at the Metra Station in Des Plaines, Skokie Swift and in Evanston. A Queue Jump lane or TSP is recommended for the left turn at Graceland (Lee) in Des Plaines. Evidence from the TSP Initiative and the Queue Jump Study indicates that implementation of TSP and Queue Jump lanes at selected intersections will improve traffic flow in the Dempster corridor.

Issues with the Dempster corridor include:

- Three RR grade crossings will cause delays especially at the Metra station in Des Plaines and the freight RR just south of the Metra station.
- Turning left from Dempster to Graceland is an issue. There is a left turn arrow but no left turn lane. TSP or Queue Jump could improve progression through the intersection.
- The narrow corridor in Evanston with only two traffic lanes and on-street parking causes delays. Removal of on-street parking could improve traffic flow.
- Delays occur at Skokie Swift, City of Evanston, Maine East High School and downtown Des Plaines during peak periods.

Milwaukee

The 7 mile route has at least four traffic lanes and has left turn lanes at major intersections. The traffic signals are modern and many are actuated. From the Jefferson Park station to Devon, there are parking lanes along the corridor, bike path lanes from Holbrook / Elston to Devon, sidewalks throughout the corridor and many intersections have bus shelters.

Milwaukee's ROW has 17 traffic signals (2.43 traffic signals per mile). There are no RR grade crossings. On average, the corridor has a traffic signal every 2,000 feet. Entering the CTA's Jefferson Park station is difficult and there is parking south of Devon to Jefferson Park. Congestion occurs at Oakton and Devon. Evidence from the TSP Initiative and the Queue Jump Study indicates that implementation of TSP and Queue Jump lanes at selected intersections will improve traffic flow on the Milwaukee route.

Issues with the Milwaukee route include:

- Tight ROW at the Jefferson Park station makes it difficult for buses to make left turns into the station.
- Infrastructure improvements at Jefferson Park are needed to improve safety conditions for passengers and bus movement.
- On-street parking south of Devon to Jefferson Park.
- Delays occur during the peak periods at Oakton and Devon.
- As a diagonal route, there are triangular intersections that tend to cause delays.

Oak Brook

The Oak Brook route is approximately 12.8 (via Roosevelt Road alternative) miles long with 33 traffic signals (2.58 traffic signals per mile). The Roosevelt Road alternative was used because it has more traffic signals that could impede an ART. There are no RR grade crossings.

The first part of the route travels from the CTA's Forest Park station to the Medical Center and to the Oak Brook Mall. The route travels on Roosevelt Road and then takes the same route as Pace's Bus 747 using York Road and 22nd Street. This portion of the corridor has wide lanes, left turn lanes and long stretches between traffic signals. There are six traffic lanes on 22nd Street as you near Oak Brook Mall. The second portion of the corridor is from Oak Brook Mall to Yorktown Center using 22nd Street and Butterfield. There are six traffic lanes with many left turn and right turn lanes.

There is very limited on-street parking. There are sidewalks in areas but only limited or no sidewalks in other areas, especially in Oak Brook. In areas that do not have sidewalks, there is usually ROW space available for sidewalks or shelters.

The Oak Brook route has four wide traffic lanes throughout and six traffic lanes from the Oak Brook Mall to the Yorktown Center. There are a high number of left / right turn lanes, mostly no parking and well spaced traffic signals. Traffic flow within the Oak Brook corridor is generally very good. Congestion occurs in the vicinity of the two shopping malls. ROW conditions are better than the other corridors and there are no significant impediments to traffic flow compared with Dempster and Milwaukee. Oak Brook's route is rated highest as far as ROW conditions.

Issues with the Oak Brook route include:

- The lack of sidewalks is not a pedestrian friendly environment and makes transit less attractive.
- The general land use requires significant walking to arrive at destinations in some areas.

The overall rating for ROW for each route is shown below:

Dempster	Rating: 2
Milwaukee	Rating: 2
Oak Brook	Rating: 3

Chapter 3
Summary and Recommendations of the Selection Process

All of the data that was evaluated throughout the study has been used as part of the rating for the final three routes. Throughout the study, a screening process that evaluated corridors was conducted in arriving at the final three routes.

In Phase 1 of the study, the STV team collected various socio-economic / land use and Pace ridership data in analyzing the 24 corridors including population / employment densities. Using exhibits and maps of the various data, the 24 corridors were evaluated. 13 corridors were identified with characteristics that are important for having a successful fixed route transit service and could support an ART in the short-term timeframe. In Phase 2, the 13 corridors were divided in 52 segments for a more detailed analysis of socio-economic data, transit data and regional connectivity. The data was quantified for each corridor segment including population, employment and households with 0 or 1 vehicle. This analysis allowed STV to identify areas with excess jobs and job deficits which is a key indicator for successful fixed route service. The socio-economic data allowed us to draw an inference to potential ridership for an ART. The corridor segments were evaluated using this data along with regional connectivity with other transit systems. From this analysis, the six most feasible routes were selected for further evaluation.

In Phase 3, STV reviewed regional plans and programs and ROW conditions for the six routes. This evaluation eliminated three of the six routes based on the institutional and ROW evaluations. In Phase 4, more detailed transit ridership data / trends, travel time savings, ROW analyses were conducted for the three remaining routes as well as support for the route and regional connectivity.

The rating of the final thee routes is contained in the matrix below.

Comparison of Final 3 Routes

Corridor	Length (miles)	Current Ridership (Average Weekday)	Institutional Support	Community Support	Divisons Support	Technical/Management	Regional Connectivity	Current Ridership	Potential Ridership	Travel Time Savings	ROW	TOTAL
Dempster	**15**	**3,174**	1	2	2	2	2	2	2	2	2	17
Milwaukee	**7.0**	**3,383**	3	3	3	2	3	3	2	2	2	23
Oak Brook	**12**	**2,497**	2	1	1	1	1	1	1	2	3	13

Oak Brook

The Oak Brook route has the lowest overall rating in comparison to Dempster and Milwaukee. The Oak Brook route scored highest only in the ROW category. This can be attributed to the fact that land use density is less than the other corridors and the corridor has a very good ROW (4-6 lanes) that supports good traffic flow. The Oak Brook corridor, however, rated lower in other categories including: Community Support based on the opinion of Pace's staff; Regional Connectivity as the Oak Brook corridor does not have sufficient feeder bus service (connectivity) as compared with the other routes and does not connect with any of the other short-term ART routes; Transit Ridership because it does not meet FTA's guidelines for Small Starts projects for ridership or frequency of service; and Division's Support as the Division remarked that off-peak ridership was low. The Oak Brook route also has accessibility issues as the route does not have transit friendly sidewalks in several areas making it difficult for pedestrians. Even if the first ART is implemented entirely with local funds, subsequent corridors may seek FTA funds. Pace's first ART project must be viewed as a success to be a catalyst for future funding. The Oak Brook route is not recommended as the first ART project but remains as an important route for Pace's short-term ART network.

As a result of follow-up discussions with Pace, it was decided that there are two potential alignments that should be considered for the Oak Brook corridor: 1) from the CTA's Forest Park Station to Oak Brook as presented by STV in this report and 2) from the CTA's Pink Line Station along Cermak Road to Oak Brook. Both alignments will be evaluated further in subsequent studies.

First ART Project

STV recommends that either the Dempster or the Milwaukee routes be selected as the first ART project.

Dempster

Dempster is the second highest rated route. The Dempster route scored higher than Oak Brook in Community Support, Division's Support, Regional Connectivity and Transit Ridership. Pace staff rated Dempster second only to the Milwaukee Avenue route in Community Support. The Division supported an ART on the Dempster route but felt that the Milwaukee route would be better. For Regional Connectivity, Dempster has connections with two CTA rapid transit stations in Evanston and at Skokie Swift. Dempster also connects with Metra's UP North Line in Evanston and the UP Northwest Line in Des Plaines. Dempster also connects with the Milwaukee ART route. Transit ridership on the route meets FTA's Small Starts guidelines. In Phase 1, Dempster was rated the highest for the socio-economic analysis.

The Dempster Street route is 15 miles which is long for a BRT, especially for Pace's first ART. Most of the ridership is east of Greenwood with destinations to the CTA's Yellow line (Skokie Swift). An ART from Lutheran General Hospital, just west of Greenwood, to Skokie Swift and possibly to Evanston is an option. This portion of the route is approximately 9 miles long and avoids two RR grade crossings and the difficult left turn at Graceland (Lee Street) in Des Plaines. If successful, the ART could be extended to Des Plaines and O'Hare at a later date. The problem with this phased implementation option is that, according to the ridership data, this

segment alone is below FTA's Small Starts guidelines. The entire 15 mile corridor meets FTA's guidelines.

Milwaukee

Milwaukee is the highest rated route. The route scored the highest in Institutional Support, Community Support, Division's Support, Regional Connectivity and Transit Ridership. The Village of Niles already has a plan for a BRT on the Milwaukee corridor that supports the high Institutional Support rating. The Division was very supportive of an ART on the Milwaukee route. The route connects with the CTA's rapid transit line and Metra's UP Northwest line at the Jefferson Park station and is the only route that connects with two of the six short-term ART routes: Milwaukee and Harlem. Milwaukee also is rated highest in Transit Ridership and best meets FTA's Small Starts guidelines.

The Milwaukee route was never rated the lowest in any category. The route is 7 miles long, a length that is preferable for the first ART based on industry experience. It has parking available at Golf Mill and there are long stretches between traffic signals in several areas.

Although both Dempster and Milwaukee are considered the most feasible to be successful as the first ART route, the Milwaukee route has an advantage. The length of the route (7 miles) is preferable for the first ART. Parking is already available at Golf Mill and the route connects with the CTA's Blue line providing quicker access to downtown Chicago. Of the three routes, the Milwaukee route best satisfies FTA's Small Starts requirements. The Division was very supportive of an ART along this route. The Village of Niles is a strong supporter of Pace service and has a plan that recommends a BRT along Milwaukee Avenue. This local support will be needed in securing funding and implementing a successful ART. An issue with the Milwaukee route is the entrance to the Jefferson Park CTA station. Left turns into the station are difficult. This issue can be addressed with infrastructure improvements at the station.

STV recommends the Milwaukee route for the first ART project.

Chapter 4
Development of the Short, Medium and Long-Term ART Network

The project's second goal of developing the short, medium, and long-term ART networks was achieved using information generated as a result of Phase 2 of the selection process described in Chapter 2 of this report and Pace's goal of connecting all sub-regions of its service area. This section of the report recaptures how the short-term ART network was developed and describes how the short-term network was expanded into the medium and long-term networks.

As described in Phase 2 of the selection process, the 13 corridors were segmented. Each segment was characterized with a socio-economic score representing the segment's ridership generating potential and a transit criteria score representing the segment's productivity and connectivity.

There were nine corridors with segments with a minimum 25 socio-economic score and a minimum 13 transit score. These high scoring segments were connected into routes operable at a minimum frequency throughout the entire length of the route. Out of these routes, six were selected to be implemented within a 10-year short–term time frame. It was, in part, the intent to select routes throughout Pace's entire service area. These six routes directly connect to one another as well as to the CTA and Metra services. Based on the current level of service and the evaluation of the corridors' service area, it is expected that these routes will operate at 10 minute frequency in the peak period and 15 minute frequency in the off-peak period (based on FTA requirements for the Small Starts program).

A medium-term network would be an expansion of the short-term network. It would consist of extending some of the short-term routes further into the suburbs and by adding segments of the remaining 7 corridors.

- Four short-term routes are to be extended with segments whose socio-economic score was lower than 25. These extension segments, however, are expected to be operated at lower frequency and have wider station spacing than the ART core segments.

- The remaining 7 corridors will further expand the ART network.
    - On two of the corridors, strong segments that could be linked into operable routes were added to the network as ART routes. These two ART routes are to be extended with lower scoring segments to be operated as extensions at a lower frequency.
    - On the remaining five corridors, segments were linked into operable routes to be operated at the lower frequency of extensions.
    - There were exceptions:
        - Golf Road has strong segments on each end of the corridor, but a weak segment in the middle. One strong segment would overlap with a segment of the Dempster ART. Due to the weaker longer middle segments this route is expected to be operated at lower frequency.
        - One segment on Mannheim Road between O'Hare K-N-F (terminal of the Dempster ART) and the future Oak Brook / Cermak Road ART was marked as ART in order to provide regional ART service connectivity even though this segment's scores are lower than the threshold.

- 159th Street was marked for ART service, even though all four of its segments scored slightly lower than the threshold, indicating Pace's plans for the corridor to become the east - west anchor of the South region.

The future long-term network would be an expansion of the medium-term network and would include all remaining segments of the 13 corridors and all the other corridors identified in Pace's Vision 2020 to form a 24-corridor network. While some lower frequency segments of the medium-term network may warrant an increase in frequency by this time, all new segments are added as a low frequency extension to the medium-term network. The only exception is the J-Line whose planning may commence independently from that of the network.

Appendix I contains maps and route miles of the short, medium and long-term ART networks.

Chapter 5
Concept Development for Pace's ART System

The project's third goal is to develop the preliminary characteristics and concept of Pace's ART system. The Milwaukee ART route was used as the environment to visualize the future ART system. Chapter 5 describes the process and result of developing the ART concept.

BRT can best be described as a combination of facilities, systems and vehicle investments that convert conventional bus services into a rapid transit service, greatly increasing its efficiency and effectiveness to the end user. This process of customizing the elements with system performance, leading to the system benefits is illustrated.

Investments in BRT facilities, systems and vehicle enhancements can be made to develop new full-corridor service, much like a new rail line. This is the approach advocated by Pace and defined here as Arterial Rapid Transit. Direct benefits include reduced travel times, more reliable and frequent service and more comfort and convenience to the customer. In addition, many indirect benefits can accrue to the community as a whole, such as transit supportive land use development, environmental benefits and operating efficiencies.

BRT is more than the sum of its elements. It is a system whose benefits depend on the combination and coordination of its elements. These elements have options; each option is a strategic decision for the agency because they have implications to Pace's practices.

It is essential that Pace management select those ART elements that align with the agencies strategic plans, can be implemented and operated and achieve Pace's goals for the ART service.

In order to facilitate the selection of the ART elements a meeting of the Deputy Executive Director's (DED's) was held on March 5, 2009 for the purpose of requesting input from the DED's on the proposed Conceptual ART Plan. The strategic decision matrix that was used to assist with the decision making process has been updated to reflect the decisions that were made. The updated matrix is shown in Appendix J. The following assumptions were made about some of the strategic decisions:

- The service will be branded.
- Vehicles and stations will be branded.
- Forty-foot buses will be used and will operate as a branded sub-fleet of the current Pace system.

- BRT shelters will be enhanced.
- Stations will be located far side of the intersection wherever it is safe.
- The ART will operate with TSP.
- TSP specifications will be selected at a later stage of the planning process.
- No level boarding will be provided.
- No precision docking will be provided.

The DED's concurred with the assumptions that were made in developing the Conceptual ART Plan with the understanding that "no level boarding" did not mean that low floor buses would not be considered as part of the Conceptual ART Plan.

The areas that were discussed for strategic decision-making were as follows:

- Vehicle Types
- Fare Collection System
- Fare Structure
- BRT Shelters
- Branding and Marketing
- Operations
- Maintenance
- Intelligent Transportation Systems

Each of these elements above included a discussion of the decision alternatives as well as the pros and cons of each alternative. The DED's were then requested to provide a decision on the conceptual plan element under consideration. The decisions that were made are reflected at the conclusion of each of the elements.

Vehicle Types

The assumption is that Pace will brand the ART vehicles. Branding will create a sub-fleet. The implication of a sub-fleet is that a) only branded ART vehicles are to operate on the ART service and b) spare vehicles and parts need to be determined for the sub-fleet specifically.

Based on ridership trends and anticipated frequency of future BRT operations, it is reasonable to assume that Pace will be able to provide premium level of service without 60-foot buses. Therefore, the assumption is that 40-foot buses will be used for ART operations. The strategic decision to be made is whether to use BRT-branded existing 40-foot Pace buses or acquire specialized 40-foot BRT buses. The primary advantages of using the existing Pace fleet are that acquisition of new buses are not required, maintenance of and spare parts are the same as the existing fleet, and retraining of maintenance staff will not be required. The disadvantage is that the public may perceive the use of existing Pace buses as business as usual and it may not reflect the image associated with premium service planned for the ART program, thus, reducing the brand's potential to generate new ridership.

Specialty BRT vehicles could be off-the-shelf BRT vehicles (for example, the NABI vehicles operated in Los Angeles) or specifically designed by Pace (for example, the redesigned Van Pool

vehicles operating on the VIVA system in Toronto). Utilizing specialty BRT vehicles has the advantages of increasing the visibility of the service, increasing the perception of a premium service by the customer and the opportunity to introduce a unique brand identity for the ART service, thus increasing the potential to generate new ridership. The disadvantages include the acquisition costs of a new fleet, possible increased maintenance costs, development of new maintenance procedures, spare parts inventory may not be compatible with Pace's existing fleet, retraining drivers and maintenance crews, and possible changes to existing facilities (for example, refueling stations). Further specializing BRT vehicles would allow Pace to develop a fleet unique to its suburban service and trip characteristics, while it will further increase cost of acquisition and maintenance. Vehicle aesthetics, both internal and external, are important features in establishing the brand identity of the BRT fleet. The vehicles are the BRT element that are most widely observed by users and potential users. They have a major impact on the perceived quality of the entire system, thus affecting future ridership.

Strategic Decision:
Based upon the results of the March 5th meeting with the DED's and subsequent discussions, it was decided that the vehicle type would be a low-floor standard 40-foot Pace Bus that will be branded, easy to identify, and would be dedicated for the ART service only.

Fare Collection System

There are two basic fare-paying options that are under consideration: pay on-board and off-board fare collection systems. A strategic question for Pace is whether to use on-board or off-board fare collection systems.

The advantages of on-board systems are that they do not require significant fare collection infrastructure outside the vehicle, reduces the potential for vandalism, they are easily understood by the customer, and are less expensive. The disadvantages of an on-board fare system is that it requires passengers to board through a single front door and pay as they enter, which will result in a slower boarding times and significant increase in dwell time at ART stations and shelters.

Off-board fare collection systems require the passenger to carry a valid ticket or pass when on the vehicle. In addition, off-board fare collection will require ticket vending and/or validating machines at the BRT shelters or stations. The advantages of off-board fare collection include reduction in dwell times, faster boarding times, improves overall travel time and reliability, and multiple door boarding can decrease the dwell times at the station and allow for easy internal circulation in the vehicle. The disadvantages of off-board fare collection systems include: increases the potential for vandalism, need for additional personnel to check for fares, increased risk of fare evasion, increased maintenance and operating costs, and additional staff required to service the fare collection equipment requires changes in data collection. Achieving the full benefit of off-board fare collection system requires coordination with vehicle design characteristics such as the number, location and width of doors.

Strategic Decision:
Fare collection system will be mainly on-board augmented with off-board face collection at peak times at peak volume stations. In the future smart cards will be utilized.

Fare Structure

The fare structures that are currently under consideration in association with the ART program are: higher fares for BRT, flat fares, and distance based fares. Transit agencies generally decide on fare structure based upon several factors including network, organization, and customer base as well as financial, political, and management related goals.

The advantages of higher fares for the BRT program is that it can convey an image of a higher level of service. The rationale is that premium service warrants a premium charge and that premium service has higher costs than conventional service. Premium based fares are charged in several cities including New York City and Houston for express bus service. The disadvantages are that there could be public resistance to a premium fare and there is potential to lose customers due to the increased fare of the ART. If local all stop service underlays the ART, passengers who consider the ART too costly could use the local lower fare service and forfeit the time savings associated with the use of the ART.

The advantage of a flat fare is that it is easier for the customer to understand. The disadvantage is that the flat fare structure is not equitable for all passengers.

The advantage of distance-based fares is that it is a more equitable fare structure. Costs are distributed based upon where a customer enters the system. The downside is that it is difficult to enforce, may require new technology, complicates the fare collection process, and increases dwell time if the collection of the fare is on-board.

Strategic Decision:
The Pace Management Team deferred a decision on this element until the next phase of project development.

BRT Shelters

Pace has decided that its BRT system will have designated, branded BRT stations, which will feature enhanced shelters. With regard to the enhanced shelter, a strategic decision to consider is whether to provide heat and lighting, and who may own the shelters and at what spacing stations will be placed along the ART route.

Providing heat and lighting will increase the quality of the waiting environment reinforcing the image and message of a premium service and reduces the perception of waiting times. Providing heating would enhance transit experience in winter months, while lighting increases the feeling of security for passengers, thus potentially contributing to ridership gains. However, providing electricity at shelters will increase capital and maintenance cost of shelters, increases the potential for vandalism and potentially exposes Pace to liabilities.

An additional strategic question is whether Pace should own and maintain the BRT shelters or contract out these functions. The advantages of the Pace Owned Shelter program are that it gives Pace control of shelter maintenance and design, and it increases the ability of Pace to brand the ART program. The disadvantage is the increased cost of installation and maintenance.

While a contractor owned/maintained program may reduce costs and on-going maintenance for the transit agency, it may reduce the agency's ability to brand the ART program and reduces control over quality by Pace. The advantage of this program is that contract arrangement reduces the cost of installation and maintenance. The disadvantages are that that the contract arrangement reduces Pace's role in the selection of locations and appearance, which may not be consistent with the quality of the shelters and the branding of the ART program, and it will require more oversight of contractors by Pace.

BRT station spacing and locations will be developed at a later stage of the planning process. It is mentioned here because station design and potential locations should be developed in close cooperation with the community as part of the environmental and public involvement process. The chief advantage of wider spacing is that the longer span will reduce travel time. The disadvantages are that wider spacing reduces accessibility and requires the operation of a separate tier of service to serve local stops.

Strategic Decisions:
The Pace Management Team decided that Pace should own the bus shelters and all bus shelters should be electrified.

Station spacing will be deferred until the next phase of project development.

Branding and Marketing

One of the key assumptions is that the Pace ART vehicles and stations will be branded. Specifics of the brand type, logo, color schemes, slogans, etc. will be determined at a later stage of the planning process in close cooperation with the communities. However, prior to that effort Pace may consider additional items that could be branded including operator uniforms, specialty poles to identify Pace's BRT routes' stations, and a specialty BRT marketing campaign.

The use of distinct operator uniforms in association with ART program will increase the visibility of the service and contribute to the brand identity of the program. The primary advantage is that operator uniforms conveys an image of a premium quality service that choice riders desire. The disadvantages are that the uniform may not be consistent with current Pace operator's uniforms, and may require operators on the ART service to have two sets of uniforms, one uniform for regular Pace service and a second set for the ART service. The downside to the agency is that there may be an additional uniform fee allowance in the operator's collective bargaining agreement for the ART service.

Part of the branding of the ART system may include the specialty pole that Pace utilizes to identify ART bus routes. These specialty poles will help to promote the ART bus routes, image and brand identity. The disadvantage is that there will be an increased cost with the implementation and maintenance of this specialty pole due to its unique construction and branding.

A specialty BRT marketing campaign has the potential to increase ridership. Such a specialty BRT focused campaign would start during the planning stage to introduce the service to and gain

support of communities, and continue during operation of the ART service to maintain community relations and to provide continuity from one corridor to the next as Pace develops the ART Network corridor by corridor. The advantages of marketing of the brand would include increasing the public awareness of the brand identity of the ART and could increase ridership. The disadvantages include increased costs in either additional staff or for the purchase of contracted services for this effort.

Strategic Decision:
The Pace Management Team decided that in order to present a neat and professional image consistent with the branding of the ART service, it is preferred that all ART Bus operators wear a uniform that is consistent with the overall ART marketing campaign. In addition, it was decided that Pace would identify the corridor as an ART corridor including design specialty poles, lane markings, signage, flags to identity approaching street / stations, bus colors, etc. The DED's indicated that a specialty ART marketing campaign should be included with the implementation of the ART Service.

Operations

There are a few strategic questions for Pace to consider with the operation of the ART including whether to contract this service out and use non-Pace operators to provide this service or use existing staff, apply dynamic dispatching to the BRT service and its feeders, provide dedicated supervision, and whether to operate weekend service.

Pace may wish to consider contracting out operations and maintenance of the ART program. The advantage of Pace not directly operating the ART service is that there is potential for a reduction in operating and maintenance costs. The disadvantages may require coordination with the union and the reduction in quality and brand control of the ART program.

The advantages of using existing Pace operators to operate the service are that there will be limited training required and better quality and brand control of the ART program. The disadvantage is that coordination with the union may be required.

Dynamic dispatch can significantly improve service quality, stimulate demand, increase productivity and enhance connectivity between ART and feeder services. Headway variations virtually eliminate guaranteed vehicle "meets" among connecting routes at transfer stations. Technologies such as Automatic Vehicle Locator can reduce transfer time by providing vehicle arrival times to passengers, supervisors and dispatchers. Real-time dispatching of vehicles at transfer stations and management of service along the route can be optimized to improve the transfer efficiency, reducing waiting time for passengers and to increase service reliability, thus potentially increasing ridership. The advantages of the dynamic dispatch system include: improved operating efficiencies, increased service reliability, reduction in travel time, improved passenger transfer efficiency, improved traveler advisory services, and increase ridership. The disadvantages include: the cost of the implementation for new communications system and vehicle tracking components required with the acquisition of the new vehicles, training, and personnel dedicated to ART operation.

A continuous commitment toward service quality and maintenance is necessary to ensure reliable premium service level. Making the ART a premium customer focused service will require increased, dedicated, supervision by Pace. The advantage of increased, dedicated, continuous supervision is that it maintains premium quality service. The disadvantage include the additional cost of supervisory personnel.

The days and hours of operation will be determined based upon demand. However, it is assumed that span of operations for the ART program will be 5-days per week and the service will operate all-day. A strategic question for Pace to consider is whether to include weekends as part of the operations plan. In order for transit to be effective, it must be available when passengers need it. Not all travel is made during the typical 5-day, nine-to-five workday. Some jobs require weekend work during off-peak hours. The advantages of providing 7-day early and late service include consistent headways throughout the span of service, projects an image of premium quality service, improves mobility options for the customer, and will increase ridership. The disadvantage of a 7-day early and late service is that there will be an additional cost to the agency for weekend service. A decision on whether to adopt headway or schedule-based service intervals must be made when operating plans for the ART service are developed.

During the next phase of project development the operating plan for the implementation of the ART program will be developed. Since the ART program could possibly be a FTA financed project, the FTA criteria require a peak hour of service at 10 minutes headways during the peak and 15 minutes during off-peak and at least 14 hours of service per day.

Strategic Decisions:
The Pace Management Team decided that the preferred ART service delivery mechanism will be determined in the next phase of developing the ART Program. In addition, the preferred method of supervision would include dedicated Pace supervisory staff and the use of Pace's dynamic dispatch system for oversight to maintain the quality of the service required of the ART program.

A decision on the frequency and span of service was deferred until the next phase of project development.

Maintenance

If Pace selects specialty BRT vehicles, the maintenance crews will have to be trained. Some facilities may require alterations. In order to maintain a premium level of service, and to ensure that only BRT vehicles are operated on BRT routes, Pace's maintenance procedures will have to be examined, especially to ensure achieving these BRT requirements without interfering with Pace's existing service for regular vehicles.

Some transit agencies, for example, AC Transit, practices en-route maintenance for their premium service. This will ensure the appropriate level of service and may reduce the number of spare vehicles, but increases maintenance cost by requiring additional equipment and personnel.

Strategic Decision:
The Pace Management Team indicated that it is preferred that ART vehicles receive priority for repairs and maintenance in the maintenance queue over other Pace vehicles.

Intelligent Transportation Systems

Pace already provides Real Time vehicle arrival Information (RTI) on its website. If the ART operation is to be headway-based, RTI must be provided at the stations. If the operation is schedule-based, RTI still offers benefits that have the potential to increase ridership. RTI reduces the perceived waiting time for the customer, provides added convenience for the customer, increases perception of a premium service, improves the perception of reliability, and has the potential to increase ridership. Its disadvantages include cost of implementation and operation, risk of misinforming riders with incorrect information, and the added responsibility to keep the information current.

The question is through what media should RTI be provided: LED dynamic message signs and/or the use of cell phones. LED dynamic messaging signs are the most prevalent media for providing real-time bus information. The LED maintenance can be contracted out. Most of these displays provide real time information including the following: route number of arriving vehicle, final destination, and estimated time of arrival. The advantages of LED systems include: information about delays, other regional information, a perception of premium quality bus service, and improved perception of security at night. The disadvantages include: information is only available at stations, cost of the implementation and maintenance and increased staff requirements in information systems, operations and customer service.

There has been increased interest in providing real-time passenger information to customers through mobile devices such as personal cell phones used by the travelers. This can be done through accessing the web via web hand held devices or through a text messaging service accessible by any cell phone. Pace is already capable of providing RTI through the web. However, developing a text messaging option in addition to the web format would increase equitability of this service to all customers. The advantages of using cell phones include: personal access to updated travel information about the arrival time and delays at any locations, improved security, hardware is not required at the stations, and no maintenance would be required at the station for the service. The disadvantages of using cell phones to provide RTI include that it does not contribute to projecting a premium quality service image, the cost of implementation and it is not equitable for passengers with auditory impairments.

Strategic Decision:
The Pace Management Team decided that the ART service would provide Real Time Information through LED displays at stations. In addition, receivers may be part of the real time information system so that bus patrons in nearby stores could be signaled when the next bus approaches.

Summary

The following table summarizes the conceptual ART system elements:

ART Elements	Conceptual Decisions
Running way	Mixed traffic arterial.
Vehicles	40-foot, low floor, conventional, branded sub-fleet.
Stations	Branded, shelters are Pace owned, electrified, specially designed for ART. Spacing has been deferred.
ITS	Transit Signal Priority; RTI with LED signs at stations.
Fare Collection	On-board augmented with off board fare collection at peak stations. Fare Structure has not been selected.
Branding	Branded are: stations, vehicles, specialty poles, and drivers' uniform. Flags, signing and marking may be used to mark the route. Specialty marketing campaign
Operation	Frequency, service span and service hours have been deferred. Dedicated supervision will be considered. Dynamic-dispatch will be explored.
Maintenance	ART vehicles to receive priority.

Appendix J shows the strategic decision matrix used to evaluate the advantages and disadvantages of the various elements of an ART.

Chapter 6
Implementation Plan for the Milwaukee ART

The corridor selection process has identified the Milwaukee Corridor as the first corridor for implementation of bus rapid transit concepts within the Pace service area. The Conceptual Plan of this study has documented those BRT elements that Pace identified as system elements of the Pace ART system. This section of the Study achieves the fourth goal of the project: identifying how the first ART corridor can be implemented. Chapter 6 provides a high-level cost estimate for the Milwaukee ART in order to assess the approximate funding needed to implement this ART. It identifies available funding sources and examines possible project delivery mechanisms. Based on the information gathered it identifies the next steps in implementing Pace's first ART corridor after the completion of this Study.

Cost Estimation

In this section, high-level capital and operating cost estimates are developed for the Milwaukee ART project in order to guide the development of the funding and implementation plan. The project cost estimation requires estimating the cost of each ART element. Cost of the Milwaukee ART project has been estimated based on the descriptions of each Pace-selected ART element, unit costs from recently completed similar arterial BRT projects such as Kansas City MAX, York area (Toronto) Viva and Los Angeles Metro Rapid systems and general capital cost ranges published in the Characteristics of Bus Rapid Transit for Decision-Making, August 2004. Operating cost estimates are necessary to evaluate the viability of private sector involvement in project delivery. The developed cost estimates have been inflated to reflect the value of year 2009 dollars based on an annual 3.5% inflationary rate. The approximate capital cost ranges are presented for each of the elements defined for the Pace ART Program. As a general guide, these costs have been inflated a further 10% to provide a generalized guide for the year of expenditure costs during the project implementation period over the next five years. As the plan develops, these costs will need to be refined further to better reflect a more specific development schedule and those years of expenditure dollar values.

In the following section those ART system elements that affect the cost estimate are discussed.

Running Way – The running way drives travel speeds, reliability and identity of the service. The Milwaukee corridor has been selected as the first corridor for implementation. This corridor is seven miles in length with one terminus at the CTA Jefferson Park Station. This station serves the CTA's Blue Line segment connecting downtown Chicago with the northwestern portion of Chicago and terminating at the O'Hare International Airport. The Jefferson Park Station also connects with Metra's Northwest Union Pacific line. Pace plans to utilize the existing travel lanes and introduce selected transit preferential treatments to improve travel times of the ART buses in mixed traffic. One preferential treatment that has been considered for this corridor is a queue jump lane. However, the Pace Queue Jump Bypass Lane Project Phase I study did not identify any of the major intersections on the 7 mile stretch of the future Milwaukee ART as candidates for queue jump implementation. Thus, the cost of queue jump lanes is not included in the capital cost estimates.

Vehicles – BRT systems can utilize a wide range of vehicles, from standard buses to specialized vehicles. Based upon ridership estimates and service frequency guidelines, Pace has decided to use standard low floor 40-foot buses.

The ART vehicles will be a dedicated branded sub-fleet within the overall Pace fleet. This will necessitate separate spare vehicles to cover maintenance requirements and a dedicated parts inventory to support this sub-fleet.

The typical base price capital cost for standard buses with limited upgrades range from $350,000 to $450,000, depending upon the number of buses in the order and the extent and type of upgrades. Only a limited effect ($50,000 each) of vehicle upgrades have been reflected in the Pace ART fleet cost estimate.

Based on the alignment length of 7 miles, current revenue speed of 15.5 mph (from Pace's Cost Model), about 16% improvement in revenue speed to 18 mph (due to TSP, stop spacing and placement to far side), and 10 min non-revenue time per total cycle time, the total cycle time was estimated at 70 minutes for 10-minute frequency service and to allow recovery time for reliable operation. A ten-minute peak frequency of service requires seven standard buses for service. The ART sub-fleet should include a reserve operational bus to ensure service availability and another two for scheduled maintenance. This results in a fleet requirement of ten buses. This conservative estimate does not take into account the effect of TSP on fleet requirements.

Stations – Pace has elected to provide enhanced stations for its ART service, which is likely to be specially designed to differentiate it from other transit stations and to provide additional features such as more weather protection, heating and lighting. This ART station type may incorporate additional design treatments such as walls made of glass or other transparent material, high quality material finishes, and passenger amenities such as benches, trashcans, heating elements and communication links for passenger information systems. The capital cost for these enhanced shelters has ranged from $175,000 to $450,000 per station, depending upon the length of the platforms, the extent of pedestrian facilities and the number of passenger amenities included.

The estimate used for this Pace ART project of $275,000 to $350,000 includes the cost of the shelter, bus pad, cost of platform area, pedestrian areas and the enhanced passenger amenities of heating elements and systems conduit and electrification installation support for communications and passenger information systems. This enhanced shelter capital cost range is similar to that shown from the Kansas City MAX Line. Although exact shelter locations have not been determined at this point, it is anticipated that Pace's ART shelters will be spaced farther apart than stops for local service. Given the length of the proposed ART route and the land use characteristics of the corridor the STV team recommends a range of 14 - 20 shelters for the Milwaukee Pace ART project.

In addition, a more extensive intermodal station will be required at the CTA Jefferson Park Station to accommodate the high volumes of transfer and local origin/destination passengers. A modest cost estimate for this bus transfer facility will be in the range of $4.0 to $6.0 million. This modest range estimate focuses on the Pace bus berthing and transfer passenger

requirements. The higher range of this estimate includes more berthing and passenger amenities for the additional bus and passenger facilities for some Pace / CTA bus jointly operated areas of the station. A modest or mid range bus intermodal station cost for this Jefferson Park transfer station has been included at $4.0 to $6.0 million.

Systems / ITS – Pace plans to implement Transit Signal Priority system (TSP) for ART service. Transit Signal Priority system (TSP) is proposed to improve schedule adherence and travel time savings. The proposed TSP technology for communication between bus and signal controller is Wi-Fi based wireless mesh network with backhaul communication system to monitor the TSP system from Pace Headquarters. Signal timing optimization, Interconnect software, controller and software upgrades are parts of the TSP system. TSP will be conditional and based on schedule adherence. It will rely on Pace's existing AVL system, Intelligent Bus System, for schedule adherence information. The TSP system for the Milwaukee ART route, with an assumed 20 intersections would have an estimated capital cost of about $1.5 to $2.0 million. The high estimate assumes that Pace would implement all related hardware and software of the TSP system, while the low estimate assumes that some acceptable hardware, for example, controllers, are already in place. These estimates are based on Pace's ongoing TSP Demonstration Project. This compares favorably with the capital cost estimates for a similar transit signal priority and passenger information systems recently installed for the Kansas City MAX BRT system.

The ART Concept plans include providing real-time passenger information to customers. Pace is already capable of providing Real Time Information (RTI) through its web site. The Pace ART service will include LED displays at stations. The capital cost for a NextBus-type RTI system for 11 routes, 40 buses, 22 LED display units was estimated at $500,000 to $750,000. The capital cost estimate included the purchase and installation of hardware and software, license fees, and system configuration. It is assumed that RTI would be provided only at ART stations for the ART route and 10 other Pace routes that connect with the Milwaukee ART. The higher estimate includes cost of providing RTI for the Niles circulator buses that will be feeder buses to the ART.

Fare Collection along the Milwaukee Corridor is planned to be mainly on-board with the possibility of off-board fare collection at peak stations, in this case, at Jefferson Park. Costs associated with Jefferson Park Station are accounted for in the cost estimate for Jefferson Park improvements. Since no other off-board fare collection location has been identified at this time, no cost will be estimated for off-board fare collection systems. The cost of on-board fare collection is included in the cost of the vehicle.

Branding and Marketing – Brand identity is communicated visually through names, logos, color schemes, graphics, physical design, and marketing materials. Pace's ART branding plans will emphasize branding the stylized vehicles and stations. Cost of branding is accounted for in the cost of these items respectively.

A specialty ART marketing campaign will be included with the implementation of the ART. However, it is too early in the planning process to estimate the cost of this specialty ART marketing campaign for this project, nor is there a general rule of thumb that could be used for a high-level estimation.

Facility Cost – It is assumed that Pace will not build a new garage for the additional 10 ART buses of the Milwaukee ART. The current route 270 is operated out of the North-West Garage. It is assumed for this estimation that the proposed Milwaukee ART could operate out of this garage. Currently the North-West Garage does not have space for housing 10 additional vehicles. However, it is assumed that several routes or parts of routes could be transferred from the North-West Garage to the North-Shore Garage which has space, creating space for the ART fleet at North-West Garage. As a result, no additional cost for facility expansion was assumed for this capital cost estimation. Furthermore, the ART concept plan calls for standard 40-foot vehicles be branded for ART service; therefore, no additional cost was estimated for modification of existing facilities to accommodate different types of vehicles.

For this cost estimation it is assumed that, if there are no service reduction of the local route due to the Milwaukee ART, expanding the fleet by 10 vehicles may require the addition of one maintenance bay at a garage. Thus, Pace may be expected to incur an approximate $1.0 to $2.0 million in incremental facility costs to adapt an existing maintenance facility if needed for these additional vehicles.

Operating Plan

Route - This initial Pace ART route will be developed along Milwaukee Avenue and along the route 270 alignment. Pace route 270, service will continue as operated, possibly with a slightly reduced service level. The Pace ART service will provide north-south service between Jefferson Park CTA Blue Line Metra Stations and Golf Mill via Milwaukee Avenue. Major stops include Oak Mill Mall, Golf Mill Mall, and Heritage Pointe Apartments. The service will operate directly along Milwaukee Avenue from Jefferson Park Station to the current Golf Mill terminal of route 270 service along Milwaukee Avenue.

ART Operation plan – The most conservative estimate for an ART service operation assumes that the ART service will be overlaid and coordinated with the existing Pace Milwaukee route 270.

Span / Frequency of Service – For this cost estimation, the ART span of service is assumed for a minimum of 14 hours of service during the weekdays, following FTA guideline of the New Starts / Small Starts Program. A determination on the actual span for service for the Milwaukee ART has been deferred until the next phase of project development. The planned ART headways are 10 minutes peak and 15 minutes off peak on weekdays, following FTA's guidelines of the New Starts / Small Starts Program.

Capital Cost Estimate Ranges

Capital Cost Estimate – Based on the assessment of each ART element, a range has been estimated for the capital costs to account for the uncertainty in the project definition and development schedule, especially at this feasibility stage of project development. The following range estimates have been developed in year 2009 dollars.

- Vehicles – $3.5 to $4.5 million – This range is based on ten buses with a cost range between $350,000 to $450,000 per vehicle.

- Stations – $7.8 to $13.0 million total
  - In-line stations – $3.8 to $7.0 million – This range is based on 14 stations with a lower cost of $275,000 per station to 20 stations with a higher cost of $350,000 per station.
  - Jefferson Park Station – $4.0 to $6.0 million

- Systems – $2.0 to $2.7 million (TSP and RTI)

- Additional Facilities Costs – $1.0 to $2.0 million

In addition, soft costs for the planning, engineering and design of this project would be an incremental 25%, based on the experience of comparable bus facility projects. This totals to a capital cost range of $17.9 million (($13.3 + $1.0) * 125%) to $27.8 million (($20.2+ $2.0) * 125%).

	Minimum Unit	**Minimum Cost/Unit**	**Minimum Cost**	**Maximum Unit**	**Maximum Cost/Unit**	**Maximum Cost**
Buses*	10	$350,000	$3,500,000	10	$450,000	$4,500,000
Enhanced Shelters	14	$275,000	$3,850,000	20	$350,000	$7,000,000
CTA Jefferson Park	1	$4,000,000	$4,000,000	1	$6,000,000	$6,000,000
Systems	1	$2,000,000	$2,000,000	1	$2,750,000	$2,750,000
Facility Costs	1	$1,000,000	$1,000,000	1	$2,000,000	$2,000,000
		TOTAL	$14,350,000		TOTAL	$22,250,000
Milwaukee ART Capital Costs w/soft costs			**$17,937,500**			**$27,812,500**
Milwaukee ART Capital Costs w/soft costs without vehicles			**$13,562,500**			**$22,187,500**

*The per mile capital cost of the Milwaukee ART, excluding vehicles is estimated at between $1.94 million per mile and $3.17 million per mile.

Operating Cost Estimate Ranges

The operating speed of the Pace Milwaukee Corridor service will increase, thus allowing more vehicle miles of service to be operated with the same number of vehicle hours. For vehicle miles related operating costs, the typical cost per mile rate remains constant for the existing maintenance functions and increases to account for the additional ART elements. For the time-based costs, there are similar speeds, so vehicle hour costs, through the cost per hour rate remains the same. The effects of these impacts are generally estimated for the ART service from the Pace route 270 Milwaukee service cost parameters.

Service Level Requirements – Revenue and total hours and miles for the Pace ART service are based on 10 minute weekday peak and 15 minute off-peak weekday and all-day weekend service frequencies. Peak period is defined as six hours covering 6:00-9:00 AM and 3:00-6:00 PM. Full span of service is assumed as the same 18 hours weekday and weekend as the route 270 local service. Weekday revenue speed for Milwaukee route 270 was estimated at 15.5 miles per hour revenue service by the Pace Cost Model using average weekday revenue time and revenue mile. Weekday operating speed for route 270 was estimated at 14.2 miles per hour total service (including non-revenue hours and miles) by the Pace Cost Model using average weekday vehicle time and vehicle mile. Similarly, route 270 Saturday revenue speed was estimated at 14.7 miles per hour and Sundays at 14.9 miles per hour using the Cost Model. Operating speed was estimated to increase for the Pace ART to 18 miles per hour for revenue service during all day types and 12 miles per hour total service with the effect of the transit priority system and station spacing. From these service characteristics, the following service levels were estimated.

- Weekdays
  - 90 revenue bus hours
  - 1,620 revenue bus miles
- Saturdays
  - 60 revenue bus hours
  - 1,080 revenue bus miles
- Sundays
  - 40 revenue bus hours
  - 720 revenue bus miles

These represent an increase from the existing Milwaukee Avenue route 270 service levels.

- Weekdays
  - 76.4 revenue bus hours
  - 1,181.1 revenue bus miles
- Saturdays
  - 52.1 revenue bus hours
  - 766.7 revenue bus miles
- Sundays
  - 35.4 revenue bus hours
  - 529.3 revenue bus miles

With a typical 255 weekdays, 58 Saturdays and holidays, and 52 Sundays annually, the annual service level estimates provide a reasonable basis to estimate operating costs.

- Milwaukee Route 270
  - Revenue Bus Hours – 24,345
  - Revenue Bus Miles – 373,173

- Milwaukee Corridor ART Route
  - Revenue Bus Hours – 28,510
  - Revenue Bus Miles – 513,180

These annual service levels have been combined to estimate the annual variable operating cost of the Pace ART.

Incremental Maintenance Cost Range – This ART subfleet will be similar to the existing Pace forty-foot bus fleet. Most of the major vehicle components are similar to the recent Pace fleet with the exception of the bus branding that adds little to the vehicle maintenance costs. Facility maintenance costs may increase slightly with the addition of this ART subfleet unless they merely replace existing buses and the total bus fleet remains nearly the same. There may be minor maintenance cost increases for the transit signal priority and passenger information systems, but the majority of incremental maintenance costs should be limited to these systems. The existing cost per mile rate should increase only slightly to cover these incremental costs. The extent of this cost increase will depend upon the level of service maintained on the existing route 270. This should be refined at the next stage of project development.

Operating Cost Estimate – The following route 270 unit cost rates were used to estimate the resulting Milwaukee Corridor ART rates. Variable costs were used to focus on the service costs and their allocated indirect costs, but without the central administrative costs that will not change with limited incremental service decisions. Revenue unit cost rates were used since the revenue service levels could be reasonably estimated, while the non-revenue service levels are more dependent upon Pace facility and scheduling decisions, separate from the ART services.

- Milwaukee route 270
    - Variable Cost per Revenue Hour - $94.18
    - Variable Cost per Revenue Mile - $6.09
- Milwaukee Corridor ART Route
    - Cost per Hour - $94.18
    - Cost per Mile - $6.20

These unit costs were applied to the service levels of the route 270 and Milwaukee ART services.

- Milwaukee route 270
    - Revenue Bus Hours – 24,345
    - Revenue Bus Miles – 373,173
- Milwaukee Corridor ART Route
    - Revenue Bus Hours – 28,510
    - Revenue Bus Miles – 513,180

The annual operating and maintenance costs were then calculated from the service level and unit cost rates for the existing route 270 and the Milwaukee ART services.

- Milwaukee route 270
    - Revenue Bus Hours – $2.29 million
    - Revenue Bus Miles – $2.27 million
    - Total Operating Costs – $4.56 million

- Milwaukee Corridor ART Route
    - Revenue Bus Hours – $2.69 million
    - Revenue Bus Miles – $3.18 million
    - Total Operating Costs – $5.87 million

These operating and maintenance cost estimates provide a good basis to measure the impacts of this investment in ART services. However, these are only cost estimates and a more detailed operating plan will be completed in the next phase of the study. The additional service frequency and speed, plus the ART facility and branding investments will attract additional ridership. This benefit of additional ART transit ridership will be combined with other ART benefits to demonstrate cost effectiveness in the alternatives analysis study in the next stage of ART project development.

ART Funding Options – Program Authorization and Oversight Requirements

Transit projects can utilize a wide range of federal formula, discretionary and earmark programs as part of their funding sources to help fill this funding need. These program funds are available to transit projects and are generally not exclusive but can be combined with other federal program sources within a project financial plan to enhance its viability. The state and local funding sources are similarly nonexclusive and should be included among the several funding sources proposed for each project's financial plan. The successful financial plan combines funding from multiple federal, state, local and nonfederal program sources into an integrated financial plan.

Federal Funding Options – The federal government has supported the development of transit projects since 1964 through the initial Urban Mass Transportation Act and subsequently through the more recent Federal Transit Act as updated and authorized. These acts have authorized the federal government to fund, among many programs, major transit capital projects. Under these programs the FTA reimburses expenditures on transportation infrastructure investment at federal matching proportions prescribed individually for each program, while the remainder of the project capital costs is borne by state and local project funding contributions.

The Section 5309 program provides three types of capital funding including (1) fixed guideway modernization funds (formula), (2) new starts funds (discretionary) and (3) bus allocations (discretionary). These capital assistance grants made to states and local agencies may fund up to 80 percent of net project costs. However, the more recent grants have reflected a new cap of 50 percent of funding from this source for New Starts program projects.

- **New Starts (http://www.fta.dot.gov/index_5221.html)** – Projects must compete for discretionary funding using criteria to justify the major investment involved. A more recent section of this program, Small Starts, was initiated for projects like this Pace ART project. The Small Starts program is provided for fixed guideway projects requesting $75 million or less of New Starts funds with a total cost less than $250 million. The project must also be the result of planning and Alternatives Analysis. A streamlined approval and oversight process for these smaller fixed guideway projects may make this a potential candidate for project funding. This program now includes a new project category called

"Very Small Starts." These projects are low-risk projects that qualify for a highly simplified project evaluation and rating process by FTA with a total cost not to exceed $50 million. The FTA elements for a Very Small Starts projects are:

- Transit Stations
- Signal Priority / Pre-emption
- Low Floor / Level Boarding Vehicles
- Special Branding of Service
- Frequent Service - 10 min peak/15 min off peak
- Span of Service offered at least 14 hours per day
- Existing corridor ridership exceeding 3,000/day
- Less than $50 million total cost
- Less than $3 million per mile (excluding vehicles)

FTA is currently reviewing the criteria for the Small Starts and Very Small Starts programs. The Milwaukee Corridor project meets most of these criteria. The Milwaukee ART capital cost excluding vehicles is estimated between $1.94 million and $3.17 million per mile. Based on these high-level capital cost estimates, the Milwaukee ART would meet the per mile cost criteria.

- **Bus** – This program provides discretionary funding to transit capital projects. The overall Bus Program includes Clean Fuels, Bus and Bus Related Facilities. The Bus and Bus Related sections of this program make this a potential candidate for project funding.

There are several additional discretionary FTA programs that may be candidates for selected elements of the Pace ART project. These can be identified through the FTA Regional Office and the FTA website. However, they are limited in scope and funding amounts. These will be examined in further detail as the project becomes more clearly defined.

The Congestion Mitigation/Air Quality (CMAQ) program is to aid in the management of traffic congestion and the improvement of air quality, which may be considered for this project funding. The funds are available to areas designated by the Environmental Protection Agency as "non-attainment" or "maintenance areas" based upon compliance with National Ambient Air Quality Standards for carbon monoxide and ozone. The Northeastern Illinois metropolitan area is a non attainment area. Eligible activities under the CMAQ program include transit system capital expansion and improvements that are projected to increase ridership, alternative fuel projects, public/private partnerships, travel demand strategies, and construction of high-occupancy vehicle lanes. The Milwaukee ART project meets several of these criteria. This program is a potential candidate for project capital funding.

The expanded decision making powers of states and regions in the usage of federally provided transportation funds allow the transfer of funds among federal program categories. Most notably, the legislation allows for the use of Federal Highway Administration (FHWA) programs to be used for transit purposes. These programs can be utilized in funding the Milwaukee ART project if they are transferred into the associated transit programs and then conform to those corresponding FTA eligibility requirements. FHWA program funds must be used on public access facilities, a requirement that is met by the Milwaukee ART project. The flexible funding

aspect of the Federal Highway Programs makes them a potential funding source for the Milwaukee ART Project. The major constraint for these funds is the time it takes to program these funds, have them transferred to the transit program and then make them available to Pace through the RTA transit capital funding in the Transportation Improvement Program (TIP).

State of Illinois Funding Options – The State of Illinois Department of Transportation funds transit operating expenses and, in the past, provided capital funds through the regional Metropolitan Planning Organizations (MPO). For Pace, the RTA is the associated MPO and, state transit capital funds flowed through this regional agency. According to the RTA Capital Budget, the following highlights a constrained capital funding outlook. The State has historically provided capital support of public transportation in northeastern Illinois. This funding was provided through IDOT's Series B Bond program and RTA's Strategic Capital Improvement Program (SCIP) Bonds. All of these funds have been programmed to the Service Boards in prior TIPs. There has been no commitment on the part of the State to fund a major new capital program for public transportation.

The RTA, CTA, Metra and Pace, as well as other supportive partners, are working with members of the General Assembly and the Governor's Administration to secure funding through legislation for the Chicago metropolitan area. The 2009-2013 Capital Program includes $2.4 billion in state funding for the four-year portion. These funds are distributed among the Service Boards in the same proportion as has been historically used for RTA bond programs: 50% to the CTA, 45% to Metra and 5% to Pace. This allocation represents a distribution for planning purposes at this time and not a commitment for the future.

Regional Funding Options – In January 2009, Illinois Public Act 95-0708 increased the RTA sales tax rate throughout the region, increased the Real Estate Transfer Tax (RETT) in the City of Chicago, and raised the portion of RTA tax revenues matched by PTF (sometimes identified in this document as "New" or Part II Taxes). The RTA sales tax rate was increased 0.25% in Cook County and 0.50% in the collar counties effective April 1, 2008. Proceeds of the sales tax increase in the collar counties are divided evenly between the RTA and the county where the tax is collected. While the 25% PTF match of the RETT funds only the CTA, the proceeds of the other increases in both the PTF match and the RTA portion of the sales tax fund all three Service Boards as follows: In 2008, $100 million will fund Pace ADA Paratransit Service, $20 million will fund the Suburban Community Mobility Fund for Pace Suburban Service, and $10 million will fund the RTA Innovation, Coordination, and Enhancement (ICE) Fund. In future years, these amounts will vary in proportion to sales tax receipts. The remaining proceeds of the increases in the sales tax and PTF match are allocated 48% to the CTA, 39% to Metra, and 13% to Pace.

As required by the amended RTA Act, the RTA is working with the Service Boards on the development of a new system for prioritizing projects based on regional goals that are intended eventually to replace fixed allocation percentages. Proposed evaluation criteria include customer and employee safety, reductions to travel time, increased comfort and convenience, system security, impact on system reliability, compliance with regulations and community impact. The development of a regional criteria-based capital investment evaluation process is currently underway by the RTA.

Innovative Funding Options – There have been various concepts for innovative project capital funding; most of which have lost their status or would not be appropriate for this project. Two in particular may offer some promise. Federal DOT provides that toll revenues on public roads and bridges expended for capital investment may count as local match (soft match) for Federal grant funds in a specific year. This capability allows the local matching share that would otherwise be required to match a transit grant to be used for other projects. Capital expenditures to reduce congestion in a particular corridor benefit all modes in that corridor, i.e., automobiles, transit buses, or rail systems. The toll revenues must be used for transportation capital investments, not operating expenses. Value capture is an innovative funding approach that utilizes several alternative financial approaches to direct the financial benefit of a public infrastructure investment back to the public entity to fund that public investment.

The Milwaukee ART project does not have the facility significance to create much additional land value that could be captured and diverted back to the project. Toll credits might be an appropriate option since Illinois DOT includes tolls on the highway network and toll credits can be used to divert FHWA funds to the ART network.

ART Project Delivery Options

This section presents the project delivery options available to the development of the Pace Milwaukee Corridor project and the strengths and weaknesses of each.

Design-Bid-Build – This development option is the more traditional method that involves the complete design of the project and then the contracting of individual elements to construct or install. This method is most commonly used to deliver public transportation projects. The processes are transparent, and generally result in predictable outcomes. It is characterized by low bid awards intended to ensure the lowest construction costs, but generally can result in higher project development and construction costs. Projects are executed through a highly structured and sequential process, beginning with alternatives analysis, environmental assessment and concept development, proceeding to preliminary engineering, then to final design, and finally to construction, with each element of project work needing its own procurement cycle.

Pace would serve as the project manager for the design, procurement and construction processes, and more importantly, the systems integration efforts that are at the center of the project success. Pace has the recent experience with the design and construction of several bus maintenance facilities, but the addition of pertinent development expertise would certainly be a benefit to Pace. Pace could contract directly for specialty design, construction management and/or project management expertise that it may want to add to the ART development team.

Public Private Partnerships – The Report to Congress on Public-Private Partnerships (PPPs) was intended to stimulate consideration by state, regional, and local sponsors of transportation infrastructure projects of the potential advantages offered by these PPP project delivery approaches. PPPs offer public sector project sponsors access to private sector assistance to finance, deliver, operate, maintain, or preserve these long-lived assets. These benefits include the opportunity to reduce project costs, attract private capital to advance project initiation, shorten project delivery schedules, improve life-cycle stewardship of the resulting infrastructure

assets, expedite the application of more productive technology and innovative methods, and improve accountability for the delivery of transportation infrastructure projects in a timely and cost-effective manner. The risks of PPPs include the potential to reduce competition, accountability and transparency in the project delivery and service delivery processes.

Much of the reason that PPPs have not been implemented for public transit projects is the general lack of a financial return for private investment in these facilities. In the case of public transportation, it is only when there is a proactive effort to tap the economic development benefits of enhanced accessibility provided by transit systems, particularly near larger stations, that the private sector can be attracted as an equity-funding partner in the project. Examples include mainly joint development or transit-oriented development involving cost sharing or lease arrangements negotiated with private developers of commercial, retail, or multi-unit housing structures located near transit-accessible facilities as part of the financial planning for the transit facilities. Alternatively, private sector management of the project cash flow can help facilitate project development schedules. The Milwaukee ART Project does not include large enough station areas for the project-level joint development opportunities. Since the Milwaukee ART project has little opportunity for these development benefits, PPPs offer little benefit for Pace. More limited PPP applications should be considered as the project continues through the development process. Opportunities for expanded contractor roles without the financing aspects should be considered such as the following Design-Build and Design-Build-Operate-Maintain.

Design Build Operate Maintain (DBOM) - The Turnkey or DBOM project delivery process is one where the project engineers, constructors and/or project management consortium undertake to design, build, operate and maintain for a certain time period, and then transfer the facility to the grantee at a later date. As a result, construction delays, start-up difficulties, disagreements about change orders and project timing are better organized, resulting in faster schedules, likely lower project costs and preferably reduced litigation. The combination of civil construction with the installation of systems may offer an opportunity to develop this project with the combination with the operations and maintenance of these facilities and systems. This approach to project development, in combining design and construction with operations and maintenance, has the added benefit of designing and constructing with an interest in higher quality to improve the maintainability of the project afterward. The challenge will be the number of qualified contractors and bus service operators available and interested in the project that will prepare qualified project proposal teams to ensure a competitive cost estimate.

Design-Build – This process is where a single contractor or a limited number of contractors is given responsibility for both design and construction. A design-build contract includes both construction services and engineering services. The owner agency defines the project in more performance terms and takes the project development process only as far as required to design out the higher risk aspects of certain elements. The contractor provides direct input into the constructability of the design and the designer is maintained as the construction manager. With the combined roles within the same development team, there is little room for contractor claims. Awards are generally based on “Best Value” and not “Low Bid”. It has been a popular model for the construction of complex buildings and facilities, and large-scale civil works like rail transit, tunnels and major bridges. Design-Build is also the norm for heavy industrial projects that require a considerable amount of engineering integration and complex construction scheduling.

Design-build project delivery approach can be used to attract the full range of project development expertise when the owner agency, such as Pace, has only limited civil and system project development expertise. Although it is becoming more common today, Design-Build has not been widely used in bus rapid transit projects. This may be due more to the greater agency experience of the recently completed BRT projects rather than the smaller size of the projects in construction cost. With Pace's lack of experience with this type of project, design-build would offer measurable benefits.

Supplier Installation and Maintenance Contracts – Vendor financing is a loosely defined term used to describe arrangements in which transit operators' contract with vendors of transit related infrastructure to provide and share in the cost and/or operation and maintenance of a particular transit asset. Vendor financing can be used to describe portions of turnkey projects or joint development lease arrangements, however it is most commonly used when referring to arrangements in which a single equipment or service vendor retains a long term interest in a facility provided explicitly for transit use. Examples for this project include the TSP system, enhanced station shelters, and the standard buses.

Summary of Implementation Strategy for the Milwaukee ART Route

The estimated capital costs for the Milwaukee ART project is $17.9 to $27.8 million. The per mile capital cost of the Milwaukee ART, excluding vehicles is estimated at between $1.94 million per mile and $3.17 million per mile.

Possible project delivery strategies could be either design-build or DBOM or traditional separate contracts for design, build and operate. These project delivery approaches can be used to attract project development and integration capabilities that Pace does not have within its organizational capabilities. A variant to these approaches could be the more traditional design-bid-build approach for the more standard civil facilities combined with the opportunity to apply more design-build-operate-maintain supplier installation and maintenance contracts to selected project elements such as the transit signal priority system, enhanced station shelters, and the standard buses. These elements add a new asset type to Pace's inventory and this acquisition method offers some distinct quality and delivery advantages for these new elements. This approach could be used if the viable competitive marketplace for ART operations or the installation of the preferred systems is limited in number so as not to support a competitive bid environment.

The next steps in the project development process are dependent upon the sources of funding proposed for the project. If federal funds are planned, a planning study that includes alternatives analysis will be a requirement for consideration. This is followed with engineering and final design of the project. The Milwaukee ART meets the FTA selection criteria for a Very Small Starts Project. Project funding through the FTA Programs requires a non-federal match of funding sources at proportions that are dependent upon the FTA program. The New Starts Program has a maximum federal funding proportion of 80% and a more typical proportion closer to 50%. The FTA Bus Program has similar matching requirements with federal funding at 80%. The remaining funding need is filled with state and local funds. If the project is developed with only State of Illinois and other RTA regional funds, Pace may proceed more quickly toward design and construction. An environmental impact assessment will be a requirement with either

funding strategy. With the project priority to implement this initial ART project quickly, funding should be requested from the RTA regional and state sources and the FTA New Starts Program, Very Small Starts section. Development of the subsequent ART projects should be continued through the federal planning process to keep this funding source viable for the next ART projects.

The Pace first ART Project is proposed as a seven-mile arterial rapid transit project. There are no smaller segments that could be developed as a smaller operationally feasible project segment.

Chapter 7
Study Summary and Recommendations

Pace's strategic plan, Vision 2020, calls for the strengthening of the service on key travel corridors in its service area. Line-haul routes on these corridors will provide the backbone of a high-speed inter-suburban transit network connecting critical transportation centers. An Arterial Bus Rapid Transit (ART) is the ideal choice to provide high service level at a low cost.

This Study has:

1. Identified Milwaukee Avenue as the corridor where the initial ART route could be implemented
2. Defined the short, medium and long term ART networks
3. Determined the preliminary characteristics of the ART system, the ART concept
4. Identified funding options and the project delivery strategy for the Milwaukee ART route

In Vision 2020 Pace identified 24 key travel corridors in its service area. In this study these 24 corridors were analyzed to identify the corridor with the highest potential for successful ART service. Successful BRT routes share common characteristics, including that they: serve existing transit markets, generate new transit riders, directly connect to the larger transit network, provide rider benefits in terms of reduced travel time and enjoy the support of the local communities and regional agencies. Based on these characteristics, this study evaluated the 24 corridors for successful ART service by the following criteria:

- Support
    - Regional institutional support
    - Community support
    - Divisions support
    - Divisions technical / management capabilities

- Travel Time Savings
    - At stops (dwell time)
    - At signals (queue jump /TSP)
    - ROW characteristics / RR grade crossings

- Connectivity
    - Regional connectivity
    - Connecting Pace's sub-regions

- Transit Ridership
    - Current
    - Potential to generate new ridership

The list of 24 candidate corridors was reduced to one initial ART route through the application of these criteria through a 4-Phase process.

It is the recommendation of this study to begin ART network implementation of the Milwaukee ART – from the CTA's Jefferson Park Station to Golf Mill Mall (7 miles).

Followed by additional five ART routes within 10 years:

- Dempster ART – from the CTA's Davis Street Station in Evanston to O'Hare K-N-F (15 miles)
- Oak Brook ART – from the CTA's Forest Park Station to Yorktown (12 miles)
- Harlem ART – from Milwaukee Avenue to 95th Street (28 miles)
- 95th Street ART – from the CTA's 95th Street Station to Harlem Avenue (9 miles)
- Halsted ART – from the CTA's 95th Street Station to 159th Street (16 miles)

These six ART routes would form the short-term ART Network.

The medium-term network would be an expansion of the short-term network: some of the short-term ART routes would be extended further into the suburbs and segments of the remaining seven corridors would be added.

Four of the short-term ART routes would be extended:

- Milwaukee extension – from Golf Mill Mall to Dundee Road (8 miles)
- Harlem extension – from 95th Street to 159th Street (8 miles)
- 95th Street extension – from Harlem Avenue to LaGrange Road (3 miles)
- Halsted extension – from 159th Street to US 30 (7 miles)

These extension segments, however, are expected to be operated at lower frequency and have wider station spacing than the ART core segments.

The remaining seven corridors will further expand the ART network:

- Touhy ART – from the CTA's Howard Street Station to Mannheim Road (12 miles), extension – from Mannheim Road to Elk Grove Village (5 miles)
- Cicero ART – from Midway Airport CTA Station to 95th Street (4 miles), extension – from 95th Street to 159th Street (8 miles)
- 159th Street ART – from River Oaks Mall, Calumet City to Orland Square, Orland Park (17 miles)
- Golf Road extension – from Evanston to Woodfield Mall, Schaumburg (15 miles)
- US 30 extension – from Dyer, Indiana to Cicero (11 miles)
- Route 83 extension – from Harvey to Golf Road (45 miles)
- Mannheim Road / LaGrange Road ART – from O'Hare K-N-F Station to Oak Brook ART (11 miles), extension – from Oak Brook ART to Orland Square, Orland Park (17 miles)

The future long-term network would be an expansion of the medium-term network and would include all remaining segments of the 13 corridors and all the other corridors identified in Pace's Vision 2020 to form a 24-corridor network. While some lower frequency extension segments of the medium-term network may warrant increase in frequency by this time, all new segments are

added as low frequency extensions to the medium-term network. The only exception is the J-Line whose planning may commence independently of the ART network.

The study has developed the preliminary characteristics of the ART system elements, the ART concept. For each ART system element relevant options were identified and characterized by their effect on agency practices and achieving the ART system goals. Pace has selected the following preliminary characteristics for the ART system:

- Running way will be on arterial streets, operation in mixed traffic. Queue jump lanes could be implemented where applicable.
- Vehicles will be a sub-fleet of low-floor standard 40-foot vehicles that will be branded.
- Stations will be branded and specifically designed for ART. Shelters will be owned by Pace and will be electrified for heating, lighting and to provide real-time bus arrival information. Station spacing and location will be defined during service planning.
- The fare collection system would be mostly on-board augmented with off-board fare collection at peak times at peak volume stations. The fare structure will be defined during service planning.
- ITS will include Transit Signal Priority and Real Time Information systems with LED signs at stations.
- Branding will be applied to the vehicles, stations, specialty bus stop poles, and drivers' uniform. Flags and signs may mark the route between stations. A specialty marketing campaign could be employed to generate public understanding and support for the system.
- Operation of the ART will be supported by supervisors dedicated to the ART service. Dynamic dispatch has the potential to improve transfer connections.
- Maintenance of ART vehicles will be given priority.

Finally, the study estimated the capital and operating costs for the Milwaukee ART in order to identify possible project funding and delivery strategies for implementation. Capital costs were estimated using the ART concept and data from similar BRT systems in North America; operating cost was estimated using operating data for route 270 and assuming about 15% travel time improvement. The capital cost of the Milwaukee ART project was estimated at between $17.9 and $27.8 million (including vehicles), or $1.94 to $3.17 million per mile (excluding vehicles). Operating cost was estimated at $5.87 million per year. Such a project cost range, in addition to the selected ART concept and current ridership level, would allow the Milwaukee ART project to apply for federal funding in the Very Small Starts category of the New Start / Small Starts Program.

Project Follow-up

On May 6, 2009, the Pace Board authorized Pace to proceed with not only the Milwaukee ART route, but also with the Dempster and Oak Brook ART routes. The Pace Board has expressed a desire for an accelerated implementation of the top three ART corridors. Developing the accelerated implementation delivery strategy for the top three corridors is the next step toward implementing Pace's first ART route.

Sources of Information

- Pace 2007 Average Monthly Ridership
- Pace – existing service routes
- Pace - location of bus maintenance and other facilities
- 2000 population, housing, income, and journey-to-work data from the 2000 US Census of Population and Housing, Sample Data (Long Form).
- 2007 population, employment, and income data from the "P Census Database", published by Tetrad Computer Applications, Inc. and incorporating data sources including Claritas 2007 Business Facts.
- The accuracy of the 2007 population data was checked by comparing the above source for 2006 with the 2006 population estimated by Minor Civil Division, in the State of Illinois, as published by the US Bureau of the Census, Population Division, Table: Sub-Est 2006-05-17.
- 2000 employment data estimated by ACG: The al Chalabi Group, Ltd. From "P Census Database" and the Claritas 2002 Business Facts and the 2000 employment data from the Chicago Metropolitan Agency for Planning (CMAP).
- Current street and telephone directories, "Street Atlas USA 2009 Plus" - DVD, published by DeLorme, 2008.
- Aerial and Satellite Photography, "Google Earth - Pro", 4.3 Release, Google, Inc., April 2008
- CATS / CMAP 2030 Regional Transportation Plan
- Illinois DOT FY 2009 - 2014 Highway Improvement Program
- Milwaukee Avenue Plan
- Cook - DuPage Corridor Travel Market Analysis
- FTA's Small Starts Guidelines
- Pace Route Profile by Service Day
- Pace Automatic Passenger Counter
- Pace 2004 Customer Satisfaction Survey

Sources of Information

- Pace 2006 Market Analysis
- Pace Average Weekday Ridership
- RTA Strategic Plan
- Transit Capacity and Quality of Service Manual, (TCQSM), Transit Cooperative Research Program (TCRP) Report 100
- Bus Rapid Transit Practitioner's Guide, Transit Cooperative Research Program (TCRP) Report 118
- Characteristics of Bus Rapid Transit for Decision-Making
- Pace TSP Initiative Report
- 2003 and 2007 National Transit Database

APPENDIX A

Characteristics of Successful BRT Systems

Purpose of this Technical Memo

As part of a feasibility study to identify the most feasible initial Arterial Rapid Transit (ART) corridor for Pace, STV researched other successful BRT's. STV's research focused on determining the risk of implementing a BRT in an established corridor that already hosts good bus transit service versus implementing BRT in a corridor with currently no bus service.

Factors Defining a Successful BRT

Success has many definitions, depending upon user, stakeholder and even within an agency.

Drawing upon other BRT planning and implementation studies that STV has performed, and based upon our working knowledge with Pace, we envision that success would encompass most or all of the following elements:

- ART attracts good ridership
- ART attracts new customers who may otherwise never have tried Pace before
- ART further improves the public perception towards Pace services
- ART is perceived by the public as a higher quality transit service than a regular bus
- ART becomes a highly visible means of travel which will improve Pace's image with local communities and the public
- ART fosters strong support for Pace service from elected officials and the public
- A successful ART will be the first step in advancing other premium ART service throughout Pace's service area

STV's Analysis

STV is providing Pace with our analysis of this issue based on our experience with other BRT's nationwide and research of other related studies on this topic.

By design, BRT is intended to be a highly visible, highly public endeavor. In a suburban setting there are considerable challenges for making ART attractive and time competitive in an auto-centric land use setting.

The risks of starting ART service in a corridor with suburban land use densities and without current bus service include:

- **Lack of transit riding tradition**: Unlike living in Chicago where residents may grow up with experience in using public transit, in suburban settings, learning to use public transit is an acquired skill. If the candidate corridor does not have this culture and experience in using bus transit, then developing ridership will be that much more challenging.

- **Lack of local or express service**: Many successful BRT services operate in corridors where there was local or express bus service before the BRT and local service continues in the corridor to compliment the BRT. As BRT is typically a limited stop or express service that bypasses local stops, the local bus routes fulfill a valuable need by providing service to such bypassed stops. This duality of service allows customers greater choice: local or limited/express service and more frequent service. A BRT service that operates in a corridor without other services will have to grow the market on its own. BRT service that does not have complimentary local service serves a different market connecting specific transit generators and destinations.

- **Corridors with high existing transit ridership have features that attract ridership**. Though this may seem to state the obvious, the Pace corridors that have good ridership also have attributes that attract ridership. This could include:

    - Major traffic generators (i.e. airports, universities, hospitals, shopping centers, business districts, major employers, etc.)

    - Commercial and residential density along the corridor

    - Transit friendly land uses that make it convenient to use transit

    - Connections to other modes (i.e. CTA rapid transit, Metra, etc.)

    - Strong community and elected official support for transit

The following are examples of what many transit professionals consider successful BRT systems operating in the United States and Canada. These BRT systems are products of extensive planning analysis, have strong local support, were able to secure funding from various sources, and generated additional ridership.

- **Los Angeles Orange Line** (San Fernando Valley). Prior to the Orange Line, this corridor had arterial bus service on adjacent, parallel streets. (The Orange Line runs in a dedicated busway for the majority of the route.) Today, there is still parallel bus service using the adjacent parallel streets to provide local bus service to areas skipped by the limited stop Orange Line BRT. The Orange Line provides a suburb to suburban transit link and also connects with the North Hollywood Station for transfers to the Red Line Metro (subway).

- **Los Angeles Wilshire Metro Rapid BRT.** BRT along this corridor—one of Los Angeles's busiest bus corridors—operates as a limited stop overlay service. Local bus routes on this corridor continue to provide service to bus stops skipped by the Wilshire Metro Rapid BRT.

- **Phoenix Rapid BRT.** Phoenix's four route BRT service operates "express style" from suburban arterial streets and park and ride lots to Downtown Phoenix using HOV lanes.

Prior to BRT, these four corridors had express bus service. Today, some of the BRT routes have parallel local routes to serve local intermediate trips.

- **Boston Silver Line – waterfront segment.** The Silver Line currently operates as two disjointed segments (the connecting middle segment has not yet been constructed). The northern segment runs for a portion in a newly constructed bus-only tunnel along the waterfront and connects Boston's South Station (intercity and commuter trains plus intercity bus terminal) to Logan Airport. This segment did not have prior transit service and is considered to be a moderate BRT success. It is however located in a downtown city setting (as opposed to a lower density suburban setting) providing connections between two major transportation hubs: 1) South Station (with Amtrak, MBTA commuter rail service and several major rail transit lines) and 2) Boston's Logan International Airport.

- **York Region – VIVA BRT**. VIVA is the first BRT system in the greater Toronto suburban area and consists of five routes of which two are peak period service only. Four of the five VIVA BRT routes (2 full time, 2 part time routes) connect to three subway lines—thus VIVA serves as an extension into lower density suburban areas for these three subway lines. The 5th BRT route—the Purple Line—is a "cross town" route along busy Highway 7, a principal arterial street that is now the focus for new Transit Oriented Developments.

- **Boston Silver Line – southern Washington Street segment**
  The Silver Line replaced the venerable Orange Line elevated subway line and serves a heavily transit dependent neighborhood. This corridor in Boston has been served by the Orange Line subway since 1901.

STV's analysis shows that BRT's that are in operation and are considered a success are in corridors that had existing transit ridership and / or connect with other well used transit modes (such as a subway line). Those BRT lines that provide such connections, such as Los Angeles's Orange Line and Boston's Silver Line, serve as an extension of those rail lines.

Other Studies

The question of whether BRT service over "new" corridors (those without any transit service) and "established" corridors (those with transit service) would yield different ridership growth was investigated in an APTA presentation *Cross-Sectional Comparison of BRT Performance in Established & New Corridors* by Jessica Hector and Duncan Allen, Transportation Engineers with the IBI Group in Boston. The study examined some of the same BRTs as STV discussed above and the VIVA system as well. This study concluded that inaugurating new BRT service over corridors without prior transit service required "more patience" for ridership to materialize and "early growth" (< 1 year) may not be evident. Specifically, the study learned that for "New Corridors" ridership growth maturity may require at least two years, while in "Established Corridors" the study found that ridership reached maturity within a year. The study found that

"confidence intervals" for "Established Corridors" were generally predictable after the first year, whereas for "New Corridors" it was more uncertain after the first year.

These are important points to consider as the public and elected officials often have a desire to see quick proof of success (as in good ridership for a new BRT service). If corridor ridership increases slower for new corridors, they may be at a disadvantage in terms of public perception. Whereas a BRT service that has a strong start will generate positive perceptions and provide the avenue for other future ART projects.

The authors concluded that ridership growth prospects for BRT in new corridors is less certain than for BRT service in established corridors. Their findings are congruent with STV's BRT planning experience.

Funding

The first Pace ART project must be able to attract funding. Assuming that Pace will need funding from various levels of government and stakeholders, it is imperative that the first corridor is able to gain the necessary support. FTA's New Starts / Small Start Program is an arduous process requiring detailed cost/effectiveness analysis that is based on sound ridership forecasts. A BRT in a corridor without existing transit service is less likely to be successful in securing funding needed. FTA places a strong emphasis on existing ridership in a corridor in evaluating projects submitted to the New Starts / Small Start Program. According to FTA's proposed Small Start Guidance, "current ridership patterns are the basis for checking the accuracy of the travel forecasting methods that will be used to predict future travel times, ridership, and other key evaluation measures. Therefore, data on current ridership patterns are essential to the development of reliable forecasts for transit alternatives."

Without proven existing ridership and validation of travel forecast, a project is unlikely to receive funding from FTA's New Starts / Small Start Program. Without a reasonable chance of receiving FTA funding, support from the other stakeholders (IDOT, RTA) is doubtful, thus adding risk to developing the first ART in a corridor with unproven ridership at this time.

Conclusions

STV's analysis shows that ridership increase is more likely to materialize sooner on routes with prior services. In many cases, the BRT connects with other transit modes such as existing rail service. An established, existing transit corridor will significantly improve the chances for obtaining funding and implementing a successful Pace ART.

APPENDIX B

Evaluation of the 24 Corridors

Appendix B provides a description of data collected, maps displaying data, and analysis performed in Phase 1: Preliminary Screening to identify corridors to be carried forward for further analysis.

The STV team collected various socio-economic / land use and Pace ridership data for analyzing the 24 corridors as discussed in Chapter 2, Phase 1. The following discusses the data collected and the evaluation process of the corridors. The data was collected from the U.S. Census, existing regional forecasts from the Chicago Metropolitan Agency for Planning (CMAP) Model, and from Pace. Computerized street atlases, telephone directories and aerial / satellite photographs were used to identify specific land uses within a corridor to define major traffic generators and termini for bus routes. The composite use of these resources allowed the STV team to evaluate the corridors using the various data.

Data Collection

The data collected included:

Current level of service

- Routes currently served by Pace
- Pace bus facilities
- Ridership per route

Potential to generate ridership

- Population density per square mile
- Employment density per square mile
- Population / employment changes (2000-2007)
- Retail density
- Job-household balance
- Transportation generators (hospitals, colleges, retail centers)
- Work-trip by transit and by bus
- Car ownership by households

All maps and exhibits for this phase of the study are contained in Appendix C.

Graphic Presentation of the Data

A series of exhibits (maps) are included in Appendix C that document the data collected. The maps show the important factors that STV considered in selecting the corridors to be studied further.

The exhibits illustrating the data in this report are shown below:

- **Exhibit 1** shows the 24 key corridors identified in Pace's Vision 2020.

- **Exhibit 2** shows the ART routes superimposed on the Pace existing routes and facilities.

- **Exhibit 3** shows the ART and existing Pace bus routes superimposed on the 2007 population density map. Population density is a major factor in identifying areas suitable for public transit. FTA recognizes higher density in metropolitan areas as a factor in distributing formula funds. Most of the existing Pace bus routes serve land use densities in excess of 4,000 persons per square mile. There are a few Pace routes serving very low residential densities (fewer than 250); however, as will be seen on a subsequent map (Exhibit 4), these areas have high concentrations of jobs.

- **Exhibit 3a** shows the 2000-2007 population change per square mile. As is evident in this map, most of the recent population growth has been occurring along the urban fringe in Will, Kendall, Kane, McHenry and Lake Counties. Two of these counties, Kendall and Will, are designated by the U.S. Bureau of the Census as being among the fastest-growing counties in the nation. (Kendall is the fastest growing.) Although the collar counties are growing, they do not have high density at this time. Most of the residential development in the outer counties is low-density, single-family housing units. Higher density development usually follows in subsequent decades. The core counties, Cook and DuPage, are approaching full development; therefore, new residential development is restricted to pockets of available land. Most of the loss of population in Suburban Cook and DuPage is due to the decline in average household size in the mature communities. The Chicago Consolidated Statistical Area (CSA), during the period 2000-2007, gained 426,058 persons– ranking it among the ten fastest-growing metropolitan regions in the nation. The official forecasts, prepared by CMAP, reflect continuation of the trends presented in this map.

- **Exhibit 4** shows the ART and existing Pace bus routes, superimposed on the 2007 total employment density map. Employment is a significant factor in generating trips and has been evident in implementing successful BRT / LRT throughout the nation.

- **Exhibit 4a** shows the 2000-2007 total employment change per square mile. The period 2000-2007 represented a period of slow economic growth in the Chicago area. Many large corporations or concentrations of offices reduced their employment. However, even during this period of slow growth, the employment of the Chicago CSA increased by approximately 150,000; most of this growth occurred in the core of the region. Employment development outbids residential development for scarce land, ensuring a compact concentration of jobs at the regional core, whereas residential development is pushed to the outer rings of the

region. Again, the CMAP forecast of jobs through 2030 reflects a continuation of such trends.

- **Exhibit 5** combines Exhibits 3 and 4 by showing the 2007 job/household balance per square mile. Blue areas are the block groups (blkgrps) with job deficits (more workers than jobs); and the red areas are those with excess jobs (more jobs than workers). There is a demand for transportation services that conveniently link these blue and red block groups (blkgrps). The highest concentrations of excess jobs are: the Chicago Central Business Area (more than 500,000 jobs in 57 blkgrps – 4.5 sq.mi); O'Hare and environs (125,000 jobs in 16 blkgrps – 25 sq.mi); Schaumburg (60,000 jobs in 6 blkgrps – 6.5 sq.mi.); Lake-Cook Road/Deerfield (55,000 jobs in 6 blkgrps – 10 sq.mi) and Oak Brook (50,000 jobs in 5 blkgrps – 7 sq.mi.). Other concentrations of excess jobs are located along I-88, in DuPage County, and along Milwaukee Road in north Cook and southern Lake Counties. The areas of job deficit are in the City of Chicago, southern parts of the Northeastern Illinois region (south of 55th Street and its westerly extension), as well as in scattered pockets. The job/household balance data is used to determine travel demand between various parts of the region. There is more travel demand between job deficit areas and job excess areas. This is an important factor in analyzing travel demand for Pace service.

- **Exhibit 6** shows the locations of suburban hospitals (2007). Pace bus routes serve most of the hospitals and, in many cases, these hospitals act as the termini of the Pace routes. Hospitals are very good ridership generators because of the number and type of employees who are often transit dependent. Hospitals also operate 24 hour shifts that generate trips outside of the normal peak periods.

- **Exhibits 7** and **8** show the distribution of 2007 retail and government employment, respectively. These employment concentrations represent potential non-work, as well as work transit destinations. Government services attract patrons throughout the day.

- **Exhibit 9** shows the location of suburban colleges and universities. Pace buses currently serve most of these institutions. Colleges and universities are also good generators of ridership given that students may not always have access to an automobile and that many universities have policies in place to discourage or reduce auto travel. Universities generate trips throughout the day and outside of traditional peak hours.

- **Exhibit 10** shows the 2000 work-trips by transit (all transit modes) per square mile (latest available data). The highest concentrations of transit work-trips are in the City of Chicago and its adjacent suburbs. However, there are significant numbers of transit commuters throughout the region that are served by Pace. This exhibit demonstrates the presence of transit acceptance throughout the developed parts of the region.

- **Exhibit 11** shows the 2000 work-trips by bus. In comparing this exhibit with its predecessor, please note the different density-scale of the legend. As the source for this map is the 2000 Census, linked transit work-trips are assigned to the priority mode, meaning that a work-trip that uses both Pace and Metra would be considered as a commuter train trip. The commuter train is considered the priority mode. It is for this reason that a large number of Pace routes in central DuPage County, south and northwest Cook County, and the satellite cities, appear to have few or no transit riders. This is because these bus lines are acting as feeder service to Metra trains. The 2000 Census data does not provide the detail for mapping Pace segments of linked trips or Pace specific trips.

- **Exhibit 12** shows the 2000 distribution of households (per square mile) with no vehicles. The highest concentrations of such households are within the City of Chicago and adjacent suburbs. Households with no vehicles are highly transit dependent.

- **Exhibit 13** shows the 2000 distribution of households with one vehicle. Within the Chicago CSA, there are 1.77 jobs per household (2007 average). Accordingly, one-vehicle households reflect partial transit dependency to access a second job or to undertake non-work trips.

- **Exhibit 14** shows the 2007 average weekday ridership for the existing Pace bus routes. The table for this map identifies 161 Pace routes which represent primary Pace routes. The presented total daily ridership for 2007 is 75,246 -- 39,929 (or 53%) of which occurs on 18 routes, each with a daily average in excess of 1,000 riders per day. All of these 18 routes are located in northeast, west and south sections of Cook County: one of these (Cermak Road Route 322) extends into DuPage County; a second (Green Bay Road Route 213) extends into Lake County. All the routes with no ridership data are feeder or contract routes with few riders. A more-detailed analysis of ridership trends are discussed in other phases of the study.

- **Exhibit 15** shows the recommendations of this first phase of the ART study.

Analysis of the Data

STV used socio-economic/ridership data included in the exhibits along with analysis of existing Pace bus routes, Pace's 2007 average monthly ridership and our knowledge of the region when analyzing the 24 corridors to finalize the ART network and to determine the connectivity of the routes. The 24 corridors were superimposed on the various data maps to evaluate each corridor as shown in Appendix C.

STV researched other successful BRT's to evaluate implementing a BRT in an established corridor that already hosts good bus transit service versus implementing BRT in a corridor with currently no bus service. STV's analysis (Appendix A) shows that ridership increase is more

likely to materialize sooner on BRT routes where bus service existed prior to BRT implementation.

STV evaluated the location of Pace Divisions in relationship to the strategic corridors. Vehicles servicing the future ART route will have to be stationed at a garage with minimal deadheading. Pace's Divisions are distributed in Pace's service area such that all of the strategic corridors are within 2-3 miles from garages. Therefore, the route distance from garages was not a factor in analyzing corridors for this phase of the study.

The STV team examined each corridor using the above data to identify corridors that have characteristics, such as existing Pace service, potential to generate new ridership and regional connectivity, indicating potential for ART service in the near future. The STV team separated the corridors into three groups.

Group 1 – The corridors in this group run along routes that already have Pace service with high levels of ridership and / or have higher employment/land use densities. The selection of any of the corridors in this set represents an upgrading of existing service. All of the strategic corridors in Group 1, directly or indirectly, link job-poor residential areas with job-rich areas. Several of these routes go through alternating sub-areas of job-poor and job-rich areas. Such corridors may constitute the most-desirable bus routes, as they would ensure reasonable work-trip distance and duration.

Corridors in Group 1 display all or most of the following characteristics:

- Are currently served by Pace
- Have good ridership levels
- Serve areas with dense residential/land use
- Serve areas with high employment densities
- Have alternating of job poor areas with job rich areas
- Contain traffic generators such as hospitals, colleges, airports and retail centers
- Connect with the regional public transportation modes such as the CTA and Metra
- Support regional connectivity within Pace's service area and to other public transit services

Group 2 – The corridors in this group have limited (mostly local) or no Pace service. There are pockets of higher employment/land use densities along these corridors. Portions of these corridors go through alternating sub-areas of job-poor and job-rich areas. However, because there is no Pace service currently on these corridors, future ART route alignment is not defined.

The corridors in Group 2 have the following characteristics:

- Serves areas with dense land use/populations
- Serves areas with high employment densities
- Has potential for further growth and development

Corridors in Group 2 are lacking some important characteristics:

- A well defined alignment
- Significant Pace service at this time
- Connectivity with other transit modes

Group 3 – The corridors in this group mainly serve the exurban areas of Pace's service area. The corridors in Group 3 lack the mix of high density residential areas and high density employment areas that are found in Groups 1 and 2. The corridors in Group 3 have the following characteristics:

- Although experiencing growth and development, they do not have significant residential / employment densities at this time
- The areas that have higher density are largely residential single family dwellings
- There are very few significant employment centers that are within a reasonable distance of residential areas suitable for ART
- Have very little job deficit areas
- No significant Pace service at this time or connectivity with other Pace service
- Little connectivity with other transit modes

Exhibit 15 shows the original 24 strategic corridors divided into the 3 groups.

Results of the Analysis

Group 1

Corridors to be analyzed further in Phase 2 are:

- Three east-west corridors in north Cook County (Golf, Dempster and Touhy)

- Three east-west corridors in south Cook County (95th Street, 159th Street, and US Route 30)

- Five north-south corridors: three north-south corridors connecting the above two sets of east-west routes (Harlem Avenue, Mannheim/ LaGrange and Route 83); and two in the South region (Cicero Avenue from CTA's Midway Airport Station, and Halsted Street from CTA's 95th Street Station)

- Two radial corridors connecting to CTA stations (Milwaukee Avenue from Jefferson Park Station, Oak Brook corridor from CTA's Forest Park Station). These radial corridors provide access for Chicago residents to the jobs in north Cook/south Lake Counties and DuPage County, respectively

All of the corridors in Group 1 have significant existing Pace service except for Route 83. Route 83, however, has alternating high employment and high density characteristics making it a potential candidate for ART. It is also a route that could provide regional connectivity between the north – south corridors.

Regional Connectivity

The corridors in Group 1 comprise a regional network connecting the routes in the north with the routes in the south via the north-south connecting routes. The travel demand regional patterns are from job deficit areas to job surplus areas (Exhibit 5). The corridors in Group 1 link the regions job deficit and job surplus areas to meet the regional travel demands.

In north Cook County, Golf, Dempster and Touhy corridors are running east-west from Evanston / Chicago to the O'Hare region. Each of these corridors connects with the regional transit network and serves the job surplus region near O'Hare. All three of the east – west corridors connect with the Milwaukee Avenue corridor providing access to the CTA's Blue Line station at Jefferson Park.

There are three east – west corridors in southern Cook County (95th Street, 159th Street and US Route 30). All three of the east – west corridors connect with the regional transit network. Halsted, which is a north – south corridor, connects with the CTA's rapid transit line at 95th Street. Cicero Avenue, also a north – south corridor, connects with the CTA's rapid transit station at Midway. All three of the east – west corridors connect with Halsted and Cicero Avenue.

The ART Network includes three north – south corridors (Harlem, Mannheim and Route 83) connecting the southern corridors and northern corridors.

There is also one corridor (Oak Brook) that travels west from the CTA's Forest Park rapid transit station to the Oak Brook and Yorktown Shopping Centers. This corridor connects with the north – south Mannheim and Route 83 corridors and serves the job surplus areas in Oak Brook.

APPENDIX C

Socio-Economic / Transit Ridership Data Maps and Exhibits

The following exhibits and maps illustrate the various socio-economic and transit ridership data used to evaluate the 24 corridors in Chapter 2, Phase 1. A series of exhibits (maps) were developed using a Geographic Information System (GIS) that documents the data collected. The exhibits and maps show the important factors that STV considered in selecting the corridors to be further evaluated in Phase 2 of the screening process. A detailed description of how the exhibits and maps were used is contained in Appendix B.

APPENDIX D

Evaluation of the 13 Group 1 Corridors

Appendix D provides the support data for evaluating the 13 Group 1 Corridors in Phase 2.

The 13 corridors identified in Chapter 2, Phase 1: Preliminary Screening that have the characteristics to support ART service in the near future (Group 1) were examined further in Phase 2 in order to determine the initial "short-term" network of ART routes that will connect Pace's service area.

Pace's strategic goals align with the characteristics for a successful BRT and go further by valuing regional connectivity highly. Therefore, corridors were evaluated based upon the following criteria:

- Existing ridership
- Potential ridership
- Regional connectivity

The following process was used for screening the preliminary list of the 13 corridors:

- Developed route segments for each of the 13 corridors to conduct a more detailed analysis of the corridors
- Analysis of socio-economic criteria to determine potential ridership
- Analysis of current transit service to gain understanding of the current transit market
- Developed scoring process for the segments
- Combined socio-economic and transit service evaluation
- Rated the segments for each corridor
- Linked viable segments into routes with termini
- Connected the six routes into an initial short-term network of ART routes
- Recommended 6 routes most suited for the first ART project

The result of the evaluation process is displayed in maps and tables in Appendix E.

Route Segmentation

The 13 corridors were divided into a total of 52 segments. The termini for these segments were selected by logical connections to other major transit facilities (e.g. CTA/Metra train stations and airports), other potential ART routes, and major transit generators such as retail facilities and hospitals. The termini for some of the corridors were changed from Phase 1: Preliminary Screening to reflect the logical connections selected by the STV team. Most of these segments (40) ranged in length between 3 and 8 miles. The shortest segment was 1.2 miles in length while the longest segment was 10 miles long.

With identification of the individual route segments, two evaluations of the corridors were initiated. The first evaluation concentrated on the socio-economic characteristics of the corridor, while the second evaluation focused on existing transit characteristics of the corridor.

Two evaluations of the corridors were conducted: socio-economic analysis to make inference about potential travel demand and existing transit analysis to evaluate current transit ridership.

Socio-Economic Analysis

Socio-economic variables include demographic characteristics such as population, employment and vehicle availability. Geographic variables include spatial characteristics such as land area. Socio-economic and geographic characteristics were provided by census 2000 block group data. The census blocks provide the geographical border for each segment. This method of analysis was used because there was insufficient funding to conduct a regional forecast, or a forecast for each corridor. Therefore, the socio-economic data was used to approximate the corridors' potential for ART ridership.

The viability of a fixed route transit service is partially determined by the socio-economic data within ½ mile on either side of a corridor. Several of the census blocks for the corridors in Group 1 were large and extend beyond the primary route (½ mile) corridor. For the most part, these larger block groups have low residential density and often include forest preserves and vacant land. Judgment was used to include or exclude the larger block groups on an individual basis for a particular segment. (See Appendix E)

Using the census block groups identified for each corridor, the socio-economic and geographic data were summarized for each segment in Table 1. Exhibit 16 visually maps the Census block groups associated with each east-west (E-W) segment. Exhibit 17 shows the Census block groups associated with each north-south (N-S) segment. It should be noted, that several block groups appear in both Exhibits 16 and 17; and are counted as being within the impact area of both the E-W and N-S corridor.

The rows in Table 1 provide a listing of the route segments, grouped by corridor. The first and second columns identify the two-digit route number (as initially provided by Pace) and the three-digit segment number added by the STV Team. The "Route Name" column describes the termini of each segment. The other columns provide the following data:

Miles: The segment length in miles.

Direction: The E-W or N-S designation of a route segment.

Land Area: In square miles, derived by adding the land area of block groups as presented in the 2000 Census.

Total 2007 Population: The sum of 2007 population by block group. The source of this data and all subsequent 2007 variables is: Claritas 2007 Business Facts, as compiled by Tetrad Computer Applications, Inc. for its, "Chicago Combined Statistical Area – PCensus Data- base", for The al Chalabi Group, Ltd., November 13, 2007.

Total 2007 Employment: The number of full- and part-time jobs by place of work. Total employment from this source (referred above) corresponds to employment definitions as used by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. A person holding two jobs would be counted twice. The employment from this source is higher than that used by CMAP, whose source is the Bureau of Labor Statistics (BLS). The BLS data do not include proprietors or household, agricultural, military and miscellaneous employment.

Retail Employment 2007: The sum of all workers employed in the retail industry (full- and part-time, local and regional retail).

Government Employment 2007: This category includes, in addition to employment at Federal, State, County and local government offices, employment at public schools, public community colleges, and public institutions. The retail and government employment represent, not only work-trip destinations, but also destinations for the non-work trips that may benefit from the availability of public transportation.

Excess Jobs 2007: Within the socio-economic GIS, the job/household balance for each block group was calculated. Each block group was designated as either having excess jobs (more jobs than workers) or having job deficits (more workers than jobs). Excess jobs appear as positive numbers; job deficits are negative numbers. The data in this column is the sum of excess jobs for the block group, in each segment, designated as such (i.e. sum of the positive numbers).

Job Deficits 2007: The sum of job deficits for the block groups designated as such (i.e. sum of negative numbers of the job/household balance, as described above).

Commuting by Bus 2000: The source for this data is the 2000 Census of Population and Housing, Summary File 3, as reformatted and published by Geolytics, Inc., "Census CD 2000, Long Form SF3, Region 2 Midwest, Release 2.0". The data in this column is the sum of 2000 work-trips by bus. As noted in Task 1, the 2000 Census assigned linked transit work-trips to the "priority" mode. Consequently, Pace-Metra trips are counted, by the Census, as commuter train trips. The 2000 census data was the most recent data source available.

Commuting By Public Transit 2000:	The sum of all transit trips for each route segment. This data demonstrates the presence of transit acceptance and compensates for the undercounting of bus utilization resulting from assigning work-trips, in the Census, to a "priority" mode.
Households with 0 Vehicles 2000:	The sum of households with zero (0) vehicles. Households with zero vehicles are transit-dependent.
Households with 1 Vehicle 2000:	The sum of households with 1 vehicle. Within the Chicago CSA, there are 1.77 jobs per household (2007 average). Accordingly, one-vehicle households reflect partial transit-dependency – to access a second job or to undertake non-work trips.

The above criteria includes the socio-economic/geographic variables identified for a successful ART. The variables include population/employment densities, excess jobs-job deficit balance, households with zero or 1 vehicle and areas that currently use transit.

Table 1 presents the data for the various variables as the sums of the block groups within each segment. However, these combined block groups, and their route segments, were of differing areas and lengths. To normalize these variations, two additional tables were created.

Table 2 presents the data per square mile by route segment. The population density (Pop Per Sq Mile) ranges from a minimum of 689 to a maximum of 10,887 persons per square mile. As noted in Phase 1: Preliminary Screening, most of the existing Pace bus service covers areas with residential densities of approximately 4,000 persons per square mile. The areas currently served by Pace with lower residential densities have high employment densities. Pace's current service reflects the importance of high residential/employment densities for transit service. This relationship is clearly demonstrated in Table 2. The segment with the minimum population density (e.g. segment 215) has an employment density of 4,967. Almost all the segments recommended, using socio-economic data, have the needed densities for transit service.

Table 3 presents the socio-economic data, by segment, per linear mile. The population per linear mile ranges from 1,093 to 12,388. If the transit corridor were exactly 0.5 mile wide on either side of the segment (1.0 mile total width), the data in Tables 2 and 3 would be identical. However, as noted earlier, several of the block groups have large areas extending beyond the 0.5 mile limit; these large block groups have low population per square mile as they include non-residential or vacant land. These large block groups introduce a distortion into the analysis, which requires the consideration of data per linear mile. A better evaluation is secured using per linear mile data. However, most of the transit service standards are based on per square mile data. The per linear mile data was normalized to develop per square mile. For comprehensiveness, both evaluations (per square mile and per linear mile) are undertaken; the conclusions are not significantly different.

Evaluation Results: Socio-Economic Criteria

Summary statistics of all the segments are shown at the bottom of the Tables 2 & 3. The summary statistics include:

- Sum – meaningful for "miles" and "land area" only.
- Minimum, average and maximum values.
- Two mid-points – between minimum and average, and between average and maximum.
- Count of segments – 52, three of which are duplicates and one designated as an express bus; no socio-economic data are provided for the express bus segment.

The summary statistics for minimum, average, maximum and the two mid-points were used to develop data for each criterion. The data for each column is summarized at the bottom on the Tables 2 and 3 as follows:

- 0 - if the cell data equals the minimum
- 1 - if the cell data is greater than the minimum, but is less or equal to the mid-point between minimum and average
- 2 - if the cell data is greater than the above mid-point, but is less or equal to the average.
- 3 - if the cell data is greater than the average, but is less or equal to the mid-point between the average and maximum value.
- 4 - if the cell data is greater than the above mid-point, but is less than the maximum.
- 5 - if the cell data is equal to the maximum.

Table 4 presents the socio-economic ranking values, by segment, resulting from applying the above to the evaluation data per square mile.

Table 5 presents the socio-economic ranking values, by segment, resulting from applying the above to the evaluation data per linear mile.

Table 6 presents the sum total of the numeric rankings for the socio-economic results. The first colored column gives per square mile data; and the second colored column gives per linear mile data. As noted earlier, the per linear mile data represents a better evaluation of the viability of the routes based on socio-economic considerations. However, the conclusion reached, using the per linear mile data, would not be significantly different than an analysis based on per square mile data.

Exhibit 18 shows the evaluated ART route segments and the results of the socio-economic evaluation.

Transit Analysis

An evaluation of current transit service characteristics that are important in implementing an ART project were evaluated in addition to the socio-economic evaluation. Transit service evaluation criteria are shown in Table 7 and described below.

Passengers per Revenue Hour: A performance indicator that measures service utilization. Total passengers are divided by the number of revenue hours of service provided. This measure is impacted by the speed of service. A low passenger per revenue hour statistic may indicate travel through a congested area with low bus speeds.

Passengers per Revenue Mile: A performance indicator that measures service utilization. Total passengers are divided by the number of revenue miles of service provided. This measure is impacted by service design. Circuitous routes or routes with high mileage and low density result in a low passenger per revenue mile statistic.

Frequency of Service: A measure of the time between vehicles. Service frequency can be an indication of route ridership because as ridership on a route increases, more buses are added to the route and this improves the frequency. Average frequency is used in this iteration of corridor selection as a surrogate for ridership by segment. Automatic Passenger Count (APC) data was analyzed to obtain ridership by segment for the final corridors evaluated in the next phase of the study.

Transit Connectivity: Measures the level of connection with other transit services including CTA bus, CTA rail, Metra rail and other Pace bus routes.

Criteria Description

Passengers per Revenue Hour / Passengers per Revenue Mile

Statistics on Passengers per Revenue Hour and per Revenue Mile were obtained from the First Quarter 2008, "Pace Route Profile by Service Day" report. Passengers per revenue hour and passengers per revenue mile are measures that are typically calculated for the route as a whole and are not produced at the segment level. For this reason and because data such as revenue hours per segment were unavailable, the entire route's performance measure was applied to each route segment. Segments with no Pace service were given a value of "0".

Frequency of Service

The analysis of service frequency included the following general guidelines and assumptions:

- Major cross-town, line-haul routes were included in the frequency calculation. Feeder and community services were not included because the functions of these routes differ from the function of BRT service.

- Routes were not considered in the frequency calculation if they entered the corridor for one mile or less.
- CTA routes were not included in the frequency calculation.
- School trips that operated off-route were not included in the frequency calculation.

Public timetables available on the Pace website supplied information on the number of trips provided along the corridor. The timetable was divided into four time periods:

AM Peak: 6 a.m. to 9 a.m.
Mid-day: 9 a.m. to 3 p.m.
PM Peak: 3 p.m. to 6 p.m.
Evening: 6 p.m. to 8 p.m.

Average frequencies for each route segment in each of the four time periods were calculated by dividing the total number of minutes in the time period by the number of weekday trips in the peak direction.

The actual frequencies were then converted into a numerical score for each segment. The process used to convert the frequencies is the same process used to evaluate the socio-economic data using summary statistics. Summary statistics of the frequencies, (the minimum, average, maximum, and two mid-points), were developed for each time period. Using these summary statistics, rankings were assigned to the frequency of each corridor segment for each time period. The four time periods were then averaged to obtain one rating for each route segment.

In cases where bus frequencies did not match the segment end points, the frequency for the segment was calculated based on the mileage percentage. For example, route 381 on 95th Street has a midday service frequency of 21 minutes between Cicero and Oak Park, but the frequency increases to 28 minutes between Oak Park and Harlem. Since the ART segment between Cicero and Harlem must have only one frequency statistic, the frequency for the segment was calculated using the distance between Cicero and Oak Park (83% of total segment mileage) and the distance between Oak Park and Harlem (17% of total). Averaging 17% at 28 minutes and 83% at 21 minutes produces an average midday frequency of 22 minutes for the Cicero to Harlem segment.

Transit Connectivity

Connections to existing transit services is an important feature for Pace services. According to the 2004 Customer Satisfaction Survey, only 22% of Pace customers do not transfer to another vehicle to complete their trip. The percentages below reflect the Pace rider response to the question, "What other vehicles do you ride during your trip?" (Note that the percentages total more than 100% due to multiple answers.)

CTA train: 37%
Pace bus: 19%
CTA bus: 31%
Metra train: 21%
None: 22%

Additionally, the Pace 2006 Market Analysis found that CTA Connector routes, (those that connect to CTA services) carry 72% of Pace weekday trips. It is clear that connections to CTA services are very important to Pace customers and the ratings developed below reflect this. Based on the results of the 2004 Customer Satisfaction Survey and the 2006 Market Analysis, the following rating system was applied to the connection in each segment:

0 = No service or <3 Pace or CTA bus route connections at one location
1 = 3 - 4 Pace/CTA bus routes at one location
2 = 5 - 7 Pace/CTA bus routes at one location
3 = Metra station
4 = >7 Pace/CTA bus routes at one location
5 = CTA station

Two general guidelines were applied in assigning the ratings:

- The mainline bus route in the corridor was not counted as one of the bus routes to determine the number of transit connections. For example, at intersections along 95th Street, Pace route 381 was not counted towards the number of connecting bus routes.
- Transit connections located at the juncture of two segments were attributed to the segment with the higher density. This was done under the assumption that the transit connection is there primarily to serve the segment with the higher density. This method also afforded the opportunity of having two segments with transit connection scores contiguous to each other. For example, the 159th Street corridor is composed of five segments: River Oaks to Halsted; Halsted to Cicero; Cicero to Harlem; Harlem to LaGrange and LaGrange to 151st Street. The transit connectivity score for the Oak Forest Rock Island station was included in the Halsted to Cicero segment even though the station is located one block west of Cicero. Doing so provided two strong contiguous segments in the corridor with the possibility of operating ART between River Oaks and the Oak Forest station.

Each ART route segment was reviewed to identify the transit connections. For each of the types of connections made, each segment received the corresponding rating. For example, the "CTA station to Cicero" segment of the 95th Street corridor connects with a CTA Red Line station (rating of 5), a bus terminal containing over seven bus routes (rating of 4), the Metra Longwood/Rock Island station (rating of 3), and the Metra 95th/Rock Island station (rating of 3), for a total connectivity score of 15.

Evaluation Results: Transit Data

Summary statistics for all the transit criteria are shown at the bottom of Table 7 (Appendix E) for each column. Table 8 shows the combined socio-economic and transit criteria evaluation for the segments. The top scored segments are marked in red, the next highest segments are marked in orange and the third highest segments are marked in yellow. The remaining lowest segments are in white. This allowed STV to illustrate the numeric scoring using a color scheme in identifying the corridors or portions of corridors with the higher scored segments and contiguous segments that have the transit service characteristics to support an ART.

APPENDIX E

Socio-Economic / Transit Data Tables and Maps

The following tables and maps display the socio-economic and transit service data used to evaluate the 13 remaining corridors in Chapter 2, Phase 2. The STV team initiated the screening process by subdividing the 13 corridors into a total of 52 route segments. Using segments allowed STV to evaluate the segments of corridors to identify portions of corridors that could support an ART. Various socio-economic / land use and transit service data was developed for each segment – using census blocks ½ mile on either side of the corridor. This provided a more detailed analysis of each corridor segment that allowed the STV team to evaluate individual segments for an entire corridor. Each segment was characterized with a socio-economic score representing the segment's ridership generating potential; and a transit service score representing the segment's productivity and connectivity. Appendix D provides a detailed description as to how the tables and maps were used in evaluating the 13 corridors.

APPENDIX F

Evaluation of the Six Short-Term ART Routes by Institutional Support Criteria

Appendix F provides the institutional sources for Phase 3: Evaluation of the Six Short-Term ART Routes.

Chapter 2, Phase 3 examined the following criteria that would affect the success of implementing an ART in the short-term:

- Institutional Issues – regional plans, programs or funding sources
- Traffic Flow
  - Right-Of-Way (ROW) – traffic lanes
  - Railroad (RR) grade crossings

The implementation of a successful ART requires consensus and conformity with local and regional plans and programs. Appendix F provides additional information on the sources used to evaluate institutional issues discussed in Phase 3.

Institutional Evaluation Sources

The STV team discussed with Pace and RTA officials existing regional plans / programs relating to the six corridors. As a result, the STV team reviewed CATS / CMAP 2030 Regional Transportation Plan, the Illinois DOT FY 2009-2014 Highway Improvement Program, the Milwaukee Avenue Plan and the Cook-DuPage Corridor Travel Market Analysis. These studies were reviewed as well as interviews with RTA officials. The following is a summary of our findings.

CATS / CMAP 2030 Plan - The CATS / CMAP's 2030 Plan noted the need to provide additional transit choices for travelers, relieve congestion and establish new opportunities for transit-oriented development along the I-290 and I-88 corridor. The plan recommends the extension of the Blue Line west from the existing CTA's Forest Park station to Oak Brook. This is consistent with the Oak Brook corridor for the possibility of ART service from Forest Park to Oak Brook.

The Plan also discussed the need to extend the Red Line south from the CTA's 95th Street station to 130th Street, extending the Orange Line south from Midway to Ford City and extending the Yellow Line north from the Skokie Swift to the Old Orchard shopping center. All of these corridors are currently under FTA's Alternative Analysis (AA) by the CTA.

Illinois DOT FY 2009-2014 Highway Improvement Program - All of the remaining six corridors are part of the Illinois State Highway System. The STV team reviewed major projects on the Illinois DOT FY 2009-2014 Highway Improvement Program for these corridors. There are no major highway projects that affect the ROW along the six corridors or impede the implementation of the first ART project.

Cook-DuPage Corridor Study - The Cook-DuPage Corridor Study noted significant congestion traveling east to west from DuPage County to Cook County. Specifically, the study cited the recurring congestion on the Eisenhower Expressway (I-290) and the need for improved transit along the corridor to reduce mobility problems. This analysis supports the need for transportation mobility improvements along the Oak Brook corridor. The Cook-DuPage Study also cited the need for reverse commute work trips. There are over 120,000 reverse commute trips daily from the eastern / central portion of Cook County to the western portion of Cook County and DuPage County. Within the Cook-DuPage corridor, the Oak Brook and Yorktown areas have the most destinations with approximately 9,000 daily trips.

Milwaukee Area Plan – The Milwaukee Area Plan studied various transportation and land use alternatives along the Milwaukee corridor. A BRT was highlighted in the plan for the corridor along with streetscape improvements. The concept of a BRT was general, however, the recommendation of a BRT shows institutional support for a BRT along this corridor.

RTA - The RTA officials interviewed provided information as to the status of projects that could affect the selection of the first ART project. The extension of the Red Line is currently in FTA's AA process. This is a multi-year study that makes it impossible to implement an ART in the near future on the Halsted corridor. The RTA and FTA would not support an ART while the AA is being conducted.

The RTA stated that in 2009, the RTA will be conducting a transit study along the Harlem corridor that will include the possibility of a BRT. This study will take between 12 and 18 months. An ART in the Harlem corridor should not be implemented until this study is completed. Funding for an ART by the RTA in this corridor would have to wait until the study was completed.

APPENDIX G

Travel Time Savings / ROW Data for the Three Final Routes

Appendix G provides additional travel time savings (signals) and ROW information to support Phase 4: Evaluation of the Final Three Routes.

Chapter 2, Phase 4 evaluates the support for a route, regional connectivity, transit ridership, travel time savings and traffic flow. Appendix G provides additional travel time savings (signals) and ROW information. A ROW data table for each of the three routes is provided showing the number of lanes, traffic signals, parking, sidewalks, etc. This travel time savings and ROW information was used to evaluate the final three routes in Phase 4.

Travel Time Savings

Signals / Mile of the Top 3 Routes

Dempster
The Dempster corridor is 15.1 miles long with 52 traffic signals (3.44 traffic signals per mile). The segments with the most traffic signals are from Greenwood to the Skokie Swift (3.47 signals per mile) and from the Skokie Swift to Chicago Avenue in Evanston (4.21 signals per mile).

Dempster Corridor – Signals / Mile

Corridor Segment	Miles	Signals	Signals / Mile
K-N-F to River Road	4.4	14	3.18
River Road to Greenwood	2.3	6	2.61
Greenwood to Skokie Swift	4.6	16	3.47
Skokie Swift to Chicago Ave.	3.7	16	4.21
TOTAL	15	52	3.44

Milwaukee
The Milwaukee corridor is 7 miles long with 17 traffic signals (2.43 traffic signals per mile).

Milwaukee Corridor – Signals / Mile

Corridor	Miles	Signals	Signals/Mile
Jefferson Park to Golf Mill	7	17	2.43

Oak Brook
The Oak Brook corridor is approximately 12.8 miles long using the Roosevelt Road alternative with 33 traffic signals (2.58 traffic signals per mile). There are less traffic signals using the Expressway alternative. STV used the alternative with the most traffic signals.

Oak Brook Corridor – Signals / Mile (via Roosevelt Road)

Corridor Segment	Miles	Signals	Signals / Mile
Forest Park CTA Station to Oak Brook Mall	9	21	2.33

Corridor Segment	Miles	Signals	Signals / Mile
Oak Brook Mall to Yorktown Center	3.8	12	4.0
TOTAL	12.8	33	2.58

The following charts provide ROW information for each corridor including the number of lanes, signals, turn lanes, signal conditions, distances to previous signal, street parking, sidewalks and room for a bus shelter.

Right-of-Way
Dempster Avenue Corridor

Intersection	Lanes		Existing Traffic Signals			Street Parking	Sidewalk	Room for Bus Shelter	Remarks
	#	Turn Lane	Signal Type	Signal Condition	Distance to Previous Signal (feet)				
K-N-F Zemke	4	LT	Act	Modern	0	None	None	Yes	
Higgins Ave	4	LT/RT	Act	Modern	1200	None	Limited	Yes	Northbound Dual Left turn Lane
Lunt St	4	LT	Act	Modern	2800	None	West Side	Yes	Limited Sidewalk on East side
Touhy Ave	4	LT	Act	Modern	1350	None	West Side	Yes	
Prospect Ave	4	None	Act	Modern	3400	None	West Side	Yes	
Lee St	4	None	Act	Modern	2200	None	BS	Yes	
Oakton Ave	4	LT	Act	Modern	650	None	BS	Yes	
Algonquin	4	LT	Act	Modern	2200	None	BS	Limited	
Thacker Ave	4	RT	Act	Modern	2450	East Side	BS	Yes	One-way Freight RR Crossing
Prairie Ave	4	None	Act	Modern	1250	East Side	BS	Yes	One-way
Graceland Ave	4	None	Timed	Modern	650	None	BS	Yes	Metra RR station/ crossing bus parking area
Lee St – Metra	4	None	Timed	Modern	500	None	BS	Yes	
Pearson St.	4	None	Timed	Modern	650	Limited	BS	Yes	
River Road	4	LT/RT	Act	Modern	650	None	BS	Yes	
Rand Road	4	LT	Act	Modern	3500	None	BS	Yes	Limited sidewalk near JCT-294
Potter Road	4	LT	Act	Modern	3000	None	BS	Yes	Maine East High School
Dee Road	4	LT	Act	Fair	1300	None	BS	Yes	Maine East High School
Luther Lane	4	LT	Act	Modern	1500	None	BS	Yes	Lutheran General Hospital
Western Ave	4	LT	Act	Modern	1200	None	BS	Yes	
Greenwood Ave	4	LT	Act	Modern	1300	None	BS	Yes	
Cumberland Ave	4	LT	Act	Modern	1300	None	BS	Yes	
Milwaukee Ave	4	RT	Act	Modern	2500	None	BS	Yes	Grade Separation, Very Limited Parking
Ozark Ave	4-6	LT	Act	Modern	1800	None	BS	Yes	
Harlem Ave	6	LT	Act	Modern	3700	None	BS	Yes	
Shermer Rd	6	LT	Act	Modern	550	None	BS	Yes	
Waukegan Rd	6	LT	Act	Modern	1400	None	BS	Yes	
Prairie/ Athletic	4	LT	Act	Modern	650	None	BS	Yes	
Lehigh Ave	4	LT	Act	Modern	2300	None	BS	Yes	Metra RR Grade Crossing
Ferris Ave	4	LT	Act	Modern	950	None	BS	Yes	

Intersection	Lanes		Existing Traffic Signals			Street Parking	Sidewalk	Room for Bus Shelter	Remarks
	#	Turn	Signal Type	Signal Condition	Distance to Previous Signal (feet)				
Fernald Ave	4	LT	Act	Modern	650	None	BS	Yes	
Austin Ave	4	LT	Act	Modern	1650	Limited	BS	Yes	
Mernard Ave	4	None	Act	Modern	1350	Limited	BS	Yes	
Central Ave	4	LT	Act	Modern	1300	Limited	BS	Yes	Limited sidewalk near JCT-94
Lockwood Ave	4	LT	Act	Fair	2000	None	BS	Yes	Limited sidewalk near JCT-94
Gross Point Rd	4	LT	Act	Modern	750	None	BS	Yes	
Skokie Swift	4	LT	Act	Modern	1200	None	BS	Yes	Entrance to Skokie Swift
Bronx Ave	4	LT	Act	Fair	450	None	BS	Yes	
Niles Center Rd	4	LT	Act	Modern	700	None	BS	Yes	
Skokie Blvd	4	LT	Act	Modern	300	None	BS	Yes	
Keeler Ave	4	LT	Act	Modern	3900	None	BS	Yes	
Crawford Ave	4	LT	Act	Modern	1300	None	BS	Yes	
Hamlin Ave	4	LT	Act	Modern	1300	None	BS	Yes	
East Prairie Rd	4	LT	Act	Modern	800	None	BS	Yes	
Lincolnwood Drive	4	LT	Act	Modern	1200	None	BS	Yes	
McCormick Blvd	4	LT	Act	Modern	1350	None	BS	Yes	
Fowler Ave	4	None	Timed	Poor	1000	None	BS	Yes	Narrow Travel Lanes
Hartrey Ave	4	None	Timed	Poor	850	None	BS	Yes	Narrow Travel Lanes
Dodge Ave	4	LT	Timed	Fair	1300	None	BS	Yes	Narrow Travel Lanes
Ashbury Ave	4-2	LT	Timed	Modern	2400	BS	BS	Yes	
Ridge Ave	2	RT	Timed	Modern	500	North Side	BS	Yes	
Elmwood Ave	2	None	Timed	Fair	1300	North Side	BS	Yes	
CTA Chicago St.	2	None	Timed	Poor	500	BS	BS	Yes	

Legend

Lanes # - Number of lanes in both directions
LT – Left Turn Lane
RT – Right Turn Lane
Act – Actuated Traffic Signal
BS – Both sides
n/a– not applicable
Modern- Modernized Traffic Signals

Milwaukee Avenue Corridor

Intersection	Lanes		Existing Traffic Signals			Street Parking	Sidewalk	Room for Bus Shelter	Remarks
	#	Turn Lane	Signal Type	Signal Condition	Distance to Previous Signal (feet)				
Gale Street	4	None	Act	Modern	0	Limited	BS	Yes	Narrow Travel Lanes
Foster Ave	4	LT	Act	Modern	2200	BS	BS	Yes	
Central Ave	4	LT		Modern	350	BS	BS	Yes	
Bryn Mawr Ave	4	LT	Timed	Modern	2850	BS	BS	Yes	
Austin / Ardmore	4	LT	Timed	Modern	1750	BS	BS	Yes	
Elston Ave	4	LT	Timed	Modern	2450	BS	BS	Yes	Bike Path on both sides
Devon/Nagle	4	LT	Timed	Modern	2250	Limited	BS	Yes	Bike Path on both sides
Harts Rd	4	None	Timed	Modern	5000	None	BS	Yes	
Touhy Ave	4	LT	Act	Modern	1450	None	Yes	Yes	
Waukegan Rd	4	LT	Act	Modern	450	None	BS	Yes	
Harlem Ave	4	LT	Act	Modern	2100	None	BS	Yes	
Howard St	4	LT	Act	Modern	500	None	BS	Yes	
Oakton St	4	LT	Act	Modern	3100	Limited	BS	Yes	
Main St	4	LT	Act	Modern	3100	Limited	BS	Yes	
Dempster St	4	LT	Act	Modern	3100	None	BS	Yes	
Ballard Rd	4	LT	Act	Modern	1500	None	BS	Yes	
Maryland St	4	LT	Act	Modern	1800	None	BS	Yes	
Golf Mill Center	4	LT				None	BS	Yes	Left Turn into Mall

Legend

Lanes # - Number of lanes in both directions
LT – Left Turn Lane
RT – Right Turn Lane
Act – Actuated Traffic Signal
BS – Both sides
n/a– not applicable
Modern- Modernized Traffic Signals

Oak Brook Corridor

Intersection	Lanes		Existing Traffic Signals			Street Parking	Sidewalk	Room for Bus Shelter	Remarks
	#	Turn Lane	Signal Type	Signal Condition	Distance to Previous Signal (feet)				
Des Plaines St.	4	LT	Timed	Modern	0	None	BS	Yes	CTA Station going west
Dunlop Ave	4	LT	Timed	Modern	650	None	BS	No	
Roosevelt Ave	4	LT	Timed	Modern	2900	None	BS	Yes	Right turn on Roosevelt
1st Ave	4	LT	Timed	Modern	3950	None	BS	Yes	Medical Center, Eastbound Right turn lane
5th Ave	4	LT	Timed	Modern	1350	None	BS	Yes	Veterans Affairs
9th Ave	4	LT	Timed	Modern	1300	Limited	BS	Yes	Limited parking at 10th Avenue
17thAve	4	LT	Timed	Modern	2700	Limited	BS	Yes	Limited parking at 17th Ave to 23rd Ave
25th Ave	4	LT	Timed	Modern	2700	Limited	Limited	Yes	Limited parking at Manchester
Westchester	4	LT	Timed	Modern	4000	Limited	BS	Yes	
Mannheim Ave	4	Dual LT	Timed	Modern	1350	Limited	BS	Yes	
Fencl Ln/ Highride Pk	4	LT	Timed	Modern	4350	None	BS	Yes	
Wolf Rd	4	LT	Timed	Modern	1000	None	Limited	Yes	Cemetery
Harrison	4	LT	Timed	Modern	2700	None	Limited	Yes	Lanes west of JCT – 294
York Rd	4	LT	Timed	Modern	N/A	None	None	Yes	Ramp to York Rd South
Wood Glen Rd	4	None	Timed	Modern	N/A	None	None	Yes	
Business Center	4	LT/RT	Timed	Modern	1400	None	BS	Yes	
22nd St	4-6	Dual LT, RT	Act	Modern	1400	None	Limited	Yes	Right turn on 22nd going west
Jorie Blvd/ Enterprise Dr	6	Dual LT, RT	Act	Modern	2600	None	None	Yes	
McDonald Lane	6	LT	Act	Modern	1750	None	BS	Yes	
Spring Ave	6	Dual LT, RT	Act	Modern	750	None	Limited	Yes	Oak Brook Mall
Entrance to Mall	6	Dual LT	Act	Modern	800	None	None	Yes	
Oak Brook Center	6	Dual LT	Act	Modern	800	None	None	Yes	

Intersection	Lanes		Existing Traffic Signals			Street Parking	Sidewalk	Room for Bus Shelter	Remarks
	#	Turn Lane	Signal Type	Signal Condition	Distance to Previous Signal (feet)				
Rt 83/Kingery	6	Dual LT, RT	Act	Modern	1050	None	Limited	Yes	
Parkview Lane	6	LT	Act	Modern	900	None	Limited	Yes	
TL at shopping ctr	6	LT	Act	Modern	1900	None	None	Yes	
Midwest/ Summit	4	LT	Act	Modern	1200	None	Limited	Yes	
Butterfield Blvd	4-6	LT/RT	Act	Modern	2900	None	Limited	Yes	
Trans Am Plaza	6	LT	Act	Modern	800	None	None	Yes	
Meyers St	6	LT/RT	Act	Modern	1500	None	None	Yes	
Fountain Square Dr	6	LT/RT	Act	Modern	1100	None	None	Yes	
Technology Dr	6	LT	Act	Modern	1550	None	None	Yes	
Fairfield Ave	6	Dual LT, RT	Act	Modern	1250	None	None	Yes	
Highland Ave	6	LT	Act	Modern	1300	None	None	Yes	

Legend

Lanes # - Number of lanes in both directions
LT – Left Turn Lane
RT – Right Turn Lane
Act – Actuated Traffic Signal
BS – Both sides
n/a– not applicable
Modern- Modernized Traffic Signals

APPENDIX H

Municipal Outreach

Municipal Outreach

Key stakeholders' support is necessary for a successful ART implementation. Pace's community representatives identified transit supportive communities along the top 3 ART routes. As the corridor evaluation process progressed, Pace contacted the key stakeholders along the top two routes: Milwaukee and Dempster.

Milwaukee ART Stakeholders
- Niles
- CTA
- CDOT

Dempster ART Stakeholders
- Des Plaines
- Park Ridge
- Skokie
- Niles
- Morton Grove
- Evanston

The purpose of the outreach effort was to gauge preliminary reaction to and elicit feedback about the proposed ART projects. These public outreach meetings were the first step in an open collaborative planning process. The result of the outreach was positive: all stakeholders supported the ART concept. Three of the communities, Niles, Morton Grove and Skokie have provided Pace with their redevelopment plans for coordination with Pace's ART plans for the Milwaukee and Dempster corridors.

Outreach Meetings

Each meeting was attended by representatives from Pace and STV including Pace's Department of Community Relations. Pace's Project Manager for the ART study and STV's Project Manager attended each meeting.

The meetings began with an introduction of the team and local officials. Ms. Tunde Balvanyos provided background information on the status of the Pace Arterial Rapid Transit Study. Ms. Balvanyos gave the power point presentation discussing the planning process for corridor selection, highlighted the benefits of ART service to the community, discussed what ART service is, and showed examples of other ART system elements and concepts and the results of the corridor selection process.

Pace staff indicated that the active engagement of the community is vital for the success of the first ART project for the following reasons:

- As input into the corridor selection process
- To initiate close collaboration with the community
- To apply for federal and state funding
- To showcase the state of the ART rapid transit mode in the region
- To develop the first suburban ART network

The communities were informed that Pace was not soliciting funds. Pace was holding these meetings to get feedback and to determine their informal support for an ART in their community.

Following the presentation, comments / issues of importance were raised by the municipal staff for consideration as the ART concept is advanced to the next phase of project development and implementation.

Illustrations and a map of the corridors were developed and displayed during meetings. Handouts of the presentation and illustrations were provided for each community.

The following are a summary of the outreach meetings with each stakeholder.

Des Plaines

A meeting of the municipal staff of Des Plaines, IL and the staff of Pace Suburban Bus Service was convened at 2:30 p.m. on Tuesday, February 17, 2009. After Pace's presentation the Des Plaines officials raised several questions / issues including:

- What was the nature of the ART study and selection criteria?
- Will Pace keep its regular bus service?
- There is already congestion in downtown Des Plaines with seventy Metra trains a day, six Pace routes and traffic congestion.
- What type of transit signal priority system will be used?
- Where will transit shelters be located?

Conclusion - Des Plaines municipal staff indicated interest in and support of the ART concept based upon the information that Pace provided the staff in attendance. This preliminary support of the project however is contingent upon the support of municipal elected officials.

The City also requested an electronic version of the power point presentation that was provided to the Traffic and Transportation Committee on Tuesday, February 17, 2009.

Post meeting – On February 26, 2009, the Village of Des Plaines Traffic and Transportation Committee voted to pass a recommendation to City Council to work with Pace on ART.

Niles

A meeting of the village staff of Niles, IL and the staff of Pace Suburban Bus Service was convened at 10:00 a.m. on Wednesday, February 18, 2009. After Pace's presentation the Niles officials raised several questions / issues including:

- How often will existing bus service run on the route?
- Will ART reduce the local service?
- Niles wants to continue its free bus program.
- What will be the impact of the ART on the free bus program?
- Niles felt that the Milwaukee corridor is better than the Dempster corridor for the first ART.
- Coordination of the ART with the ongoing Milwaukee Avenue improvement program is important.
- Niles is very interested in an ART on Milwaukee Avenue and wants to rally the community to support the ART project.

Conclusion - Prior to the conclusion of the meeting, the Acting Mayor, Village Manager and Assistant Village Manager ended the meeting pledging strong support of the Milwaukee ART project. In addition, the Acting Mayor indicated that if there is anything that the community can do to assist Pace with the successful implementation of this important project Pace should just ask.

The Acting Mayor continued by saying that this project will be great for the residents, businesses and the overall community. Lastly, the Acting Mayor concluded by requesting additional information to provide to the public and the local media on the ART concept.

Niles provided Pace with its redevelopment plan for the Milwaukee corridor, *Milwaukee Avenue Plan (2006)*, which already includes the Milwaukee ART.

Morton Grove

A meeting of the village staff of Morton Grove, IL and the staff of Pace Suburban Bus Service was convened at 10:00 a.m. on Friday, February 20, 2009. After Pace's presentation the Morton Grove officials raised several questions / issues including:

- Will the service have real time information?
- Pace already has good service on Dempster. Will the ART be faster and more reliable?
- Morton Grove has developed a plan along Dempster. Will the ART incorporate this plan?
- In the past, good transit plans have not been implemented because of citizen / communities opposition.
- There will be an issue with parking if there is long term parking in the community.
- Will you coordinate with IDOT on signal prioritization?
- Metra tracks at Lehigh are an issue.
- Transit Oriented Development at the Metra station should be coordinated with an ART.

Conclusion - The staff of the community was supportive and indicated that Pace should select Dempster over Milwaukee. The staff offered their services and facilities for future meetings to advance the ART project.

Morton Grove sent to Pace its redevelopment plan for Dempster Street, *Dempster Street Commercial Corridor*. This plan includes parking management on Dempster Street that will assist in ART operation. Pace will use this plan to coordinate future ART planning for the corridor.

Evanston

A meeting of the municipal staff of Evanston, IL and the staff of Pace Suburban Bus Service was convened at 10:00 a.m. on Friday, March 6, 2009. After Pace's presentation the Evanston officials raised several questions / issues including:

- How will ADA riders get on the bus?
- Will bus stops be far side stops?
- Evanston prefers to keep the existing bus service along with ART.
- City likes the idea of service to connect with O'Hare.
- There are concerns because congestion already exists on Dempster in Evanston.
- Prefer to coordinate traffic with TSP rather than speed traffic through Evanston.
- TSP is important given the congestion in Evanston.
- How will the ART affect connecting streets?
- What will the ART look like such as shelters, fare structure and vehicles?

Conclusion - The officials from the City of Evanston were positive about an ART project. They liked the concept of going from Evanston to O'Hare Airport faster. They do have many questions regarding the details as to how the ART will operate and the location / appearance of the shelters. Evanston supports the ART. However, they also indicated that they want the route 250 to remain for local service in conjunction with the ART.

Their main concern was with TSP. The officials want to make sure that the ART's TSP improves traffic flow on and around Dempster Street.

Skokie

A meeting of the municipal staff of Skokie, IL and the staff of Pace Suburban Bus Service was convened at 1:00 p.m. on Friday, March 6, 2009. After Pace's presentation the Skokie officials raised several questions / issues including:

- How many communities are affected by the Dempster corridor?
- Skokie is very supportive of public transit.
- Skokie has a Transit Oriented Development plan for Dempster.
- East-west traffic is worse than north-south traffic.
- ART should coordinate with CTA's yellow line.
- TSP is important.

Conclusion - The Skokie officials seemed favorable to the ART concept. Their only concern was with the TSP for an ART. The officials wanted to coordinate with their traffic engineers and reply to Pace at a later time.

Post Meeting - Skokie sent a letter of support for an ART and provided Pace with its community development study, Skokie Swift Station Location Feasibility Study.

Park Ridge

A meeting of the municipal staff of Park Ridge, IL and the staff of Pace Suburban Bus Service was convened at 10:00 a.m. on Tuesday, April 14, 2009. After Pace's presentation the Park Ridge officials raised several questions / issues including:

- Park Ridge is interested in Bus Oriented Development.
- Will ART coordinate with the planned O'Hare Tollway?
- How will ART deal with RR grade crossings?
- Does ridership increase with ART?
- There are a lot of riders at Maine East High School and Lutheran General Hospital.
- They prefer outdoor fare structure.
- Will an ART bring new business to Park Ridge?

Conclusion - The Park Ridge officials were favorable to the ART concept. The City indicated that they are willing to develop a letter endorsing the ART.

Pace responded to the issues raised during the meeting. Pace will incorporate their concerns and issues raised in future phases of the project.

Meetings with CTA and CDOT

The proposed ART project for Milwaukee Avenue would terminate at the CTA's Jefferson Park Station. Pace held meetings with the CTA and Chicago DOT to introduce the ART plans to the agencies.

CTA Meeting

On March 4, 2009, Pace and STV met with the CTA about the ART project. The following were issues / questions raised by CTA:

- Is the project seeking FTA Small Starts funding?
- What type of improvements will there be along the corridor?
- Will there be any additional Pace buses entering the Jefferson Park station?
- How will the ART service affect the current Pace service on Milwaukee?
- Comment: Infrastructure improvements have been developed for Jefferson Park that could be helpful to Pace.

Conclusion - The CTA officials were supportive of the ART concept. They indicated that coordination between the CTA and Pace is important in developing improvements at the Jefferson Park station. They said that they will have to discuss the ART concept with higher officials at the CTA and requested Pace to keep them informed.

CDOT Meeting

On March 13, 2009, Pace and STV met with the CDOT about the ART project. The following were issues / questions raised by CDOT:

- Can City (Chicago) residents use the Pace bus?
- Do City residents pay a higher fare? What is the fare to transfer?
- What are the 6 short term corridors?
- What is the terminus for the Dempster corridor?
- Will the federal funding include improvements to the Jefferson Park station?
- Will there be parking restrictions?
- Signals are based on pedestrian crossings.
- Signalization at 3 corner intersections will be an issue.
- Pace will have to involve the Office of Management and Coordination (OMC).
- Will there be signal priority?
- Will existing local Pace service remain?
- When will the details regarding Jefferson Park be completed?

Conclusion - CDOT was supportive of the ART concept. They felt that it was a win-win idea for Pace, the CTA and City of Chicago. CDOT did raise concerns with the signalization along Milwaukee Avenue. CDOT also requested to be kept informed as to the status of the project so that the local Aldermen along Milwaukee Avenue can be notified when needed.

APPENDIX I

Short, Medium and Long-Term ART Network

The short, medium, and long-term ART networks were developed using information generated as a result of Chapter 2, Phase 2 evaluation and Pace's goal of connecting all sub-regions of its service area. In Phase 2, the 13 corridors were segmented. Each segment was characterized with a socio-economic score representing the segment's ridership generating potential; and a transit criteria score representing the segment's productivity and connectivity.

Appendix I provides maps of Pace's short, medium and long-term ART network as discussed in Chapter 4. Exhibit 19 shows the Short-Term Development, Exhibit 20 shows the Medium-Term Development and Exhibit 21 shows Long-Term Development. A chart showing the short, medium and long term ART network with miles for each corridor and extensions is also provided.

APPENDIX J

ART Strategic Decision Matrix

BRT is more than the sum of its elements. It is a system whose benefits depend on the combination and coordination of its elements. These elements have options. Each option is a strategic decision for the agency because they have implications to Pace's practices. The strategic decision matrix that was used to assist Pace in making decisions in developing the conceptual plan for an ART (Chapter 5) is shown in Appendix J.