Inverness Office Park

Transit Circulation Study

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I. Executive Summary

The T-REX project will bring two light rail stations to the Inverness Office Park beginning December 2006. This provides an excellent opportunity to provide first rate transit service to the employees of Inverness. Unfortunately, there is poor pedestrian access from the light rail station to the office buildings. Distances are long and the environment is not pedestrian supportive.

This report looks at potential distribution systems that would make light rail more attractive to Inverness employees. These systems include RTD's proposed Call and Ride service, a fixed-route circulator, and van services. Each service has different characteristics with different advantages and disadvantages.

Section two of this report creates estimates of the number of people that will use the light rail to get to work. These estimates are important as it will determine how much, if any, additional investment is needed. Section three provides a detailed analysis of the three proposed services and the time passengers will need to get from the LRT platform to their offices. Included in this section is an evaluation of passenger pick-up on the west side of the Interstate. Section four provides information on other factors that will influence the ridership projections including the mixed use development and the pedestrian environment adjacent to the pedestrian bridge. Lastly, section five lays out a transportation demand management program that could be created at Inverness to increase transit use.

II. Employees Using Transit

The first task when analyzing a transit circulation system is to create ridership estimates for the proposed service. The number employees using transit to Inverness will determine what type of vehicles to use, the frequency needed, and the hours of operation. Furthermore, ridership estimates will determine if additional funding for transit infrastructure is warranted. This document uses estimates from Nelson Nygaard and RTD to create unique ridership projections.

The second task is to determine the final destinations of the employees using transit. Final destinations will help to determine which service is most appropriate. Maps are an excellent method to spatially represent the distance between the light rail station and the front doors of offices.

1. Ridership Estimates

Summary of Employees Using Light Rail to Inverness

Suzanne O'Neill
- Dry Creek: 91 employees per day
- County Line: 21 employees per day
- **Total: 112 employees per day**

RTD
- Dry Creek: 236 employees per day
- County Line: 119 employees per day
- **Total: 356 employees per day**

Charlier Associates Inc.
- Dry Creek: 184 employees per day
- County Line: 79 employees per day
- **Total: 263 employees per day**

Suzanne O'Neill of Nelson Nygaard

Ms. O'Neill created a trip generation model using land use data, trip generation rates, and mode splits. She found the number of employees located within three different walking zones: less than 5 minutes, less than 10 minutes and more than 10 minutes. A mode split was applied to these numbers to arrive at daily patrons of the light rail. Using a mode split of 0.8 % and 0.3% for the two stations respectively, she found 91 and 21 daily boardings access Inverness Office Park from LRT.

- **Dry Creek: 91 employees per day**
- **County Line: 21 employees per day**

FIGURE 1: MS. O' NEILL'S METHODOLOGY

	Within 5 Minutes	Within 10 Minutes	More than 10 Minutes	Total	LRT Split	Numbers Accessing Inverness Office Park
Dry Creek	1,137	1,954	9,214	11,168	0.8%	91
County Line	1,432	1,432	5,088	6,520	0.3%	21

RTD

RTD used the DRCOG TransCAD model to predict ridership along the new light rail line. The SE Corridor Service Plan presents daily boarding estimates for each of the new LRT stations in 2010. Daily boardings for Dry Creek and County Line stations are 750 and 550 respectively. Not all of these boardings are employees of Inverness. Many of these boardings are people boarding the station in the morning to head to downtown. Inverness Office Park is only concerned in the reverse commute numbers; these are people accessing other stations in the morning and alighting at the Dry Creek and County Line stations.

RTD has estimated that 50% of the boardings at this station will be reverse commuters. This equates to 375 people getting off at the Dry Creek station to reach a day-time destination. The number s of people coming to Inverness are reduced, however, when we consider that many final destinations are not in the Inverness Office Park. According to Suzanne's research, 63 % of all employees with destinations of 15-minutes or less of the Dry Creek Station are in Inverness. Similarly, 43% of employees with destinations of 15-minutes or less of the County Line Station are in Inverness. Applying these splits to the projections, RTD predicts the following people accessing Inverness Office Park:

- **Dry Creek: 236 employees per day**
- **County Line: 119 employees per day**

FIGURE 2: RTD'S METHODOLOGY

	Projected Daily Activity 2010	Reverse Commute Boardings	Split Accessing Inverness Office Park	Numbers Accessing Inverness Office Park
Dry Creek	1500	375	63%	236
County Line	1100	275	43%	119
Total	2600			356

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The ridership projections by Ms. O'Neill and RTD are an excellent starting point, but they have limitations. First, projections were made before a service plan had been established for collector service to and from the stations. Ms. O'Neill used walking radii to estimate an employee shed. Due to the low density nature of this area and poor walking environment, the quality and quantity of connecting transit service to patrons' final destination is crucial.

Secondly, the estimated reverse commute split that RTD has used is high. A 50% commute split means that the same number of people end their trip around the two stations as those that start their trip there. This seems unlikely given the high numbers of people that use the light rail lines to access downtown and the low density development around the station.

Finally, both estimates were made without including the mixed use development planed for Lot 25. This development will add between 2.5 and 3 million square feet of office, residential, restaurant and retail space within 2500 feet of the Dry Creek Station. Given adequate connecting service, or a high quality walking environment, this mixed use development could have a huge impact on station use.

Charlier Associates Inc. (CAI) has the ability to make an estimate of transit ridership by synthesizing estimations from multiple sources. These include DRCOG's TransCAD model, current transit ridership, The Southeast Light Rail Pedestrian and Bike Accessibility Study,

Suzanne O'Neil's projections, trip generation data for the mixed use project, and our own professional experience.

Once the light rail station is operational, there will be significant travel savings for transit users. Currently, the travel time from the Broadway/ I-25 intersection to the Dry Creek/ Inverness intersection on the 25X bus is 62 minutes. Travel times on light rail with the identical origins and destinations will be approximately 20 minutes. Experience from other transit districts has shown that decreasing travel time in half doubles the ridership. Thus, travel time improvements would increase expected ridership dramatically. The light rail line will also increase reliability and on time performance because it has exclusive right of way. Reliability is one of the most important considerations for patrons of light rail- especially professional employees like those in Inverness.

According to projections established by Inverness Office Park, there will be 17,500 employees in the office park in December 2006 when the LRT opens. Given current transit use, the increase seen in transit use in response to the factors listed above, and the understanding of RTD proposed feeder service, CAI predicts a 1.5 % mode split for transit. This means that for every 1,000 employees arriving at Inverness, 15 of them will arrive by transit. The 1.5 % mode split creates an estimation of ridership between the above two estimations.

To estimate which station these employees will use, the office space located in the north and south loops was calculated. It was found that 70% of the Inverness Park square footage is accessed by the north loop and 30% is accessed from the south loop. Transit service will be segregated into north and south sectors with the north sector serving the Dry Creek station and the south sector serving County Line. Given these assumptions, CAI predicts the following:

- **Dry Creek: 184 employees per day**
- **County Line: 79 employees per day**

FIGURE 3: CAI'S METHODOLOGY

	Estimated Mode Split	Employees 2010	North/ South Loop Split	Numbers Accessing Inverness Office Park
Dry Creek	1.5%	17,100	70%	184
County Line	1.5%	17,100	30%	79
Total				263

FIGURE 4: THE DRY CREEK STATION PEDESTRIAN BRIDGE CONSTRUCTION

2. Accessing Light Rail Line

Employees arriving to Inverness by light rail used some mode to access the light rail line near their home. Thus any type of transit system in Inverness will represent the *second* transfer and the *third* mode for employees arriving to work. It is therefore doubly important that the transfer from light rail to a circulator be as seamless as possible.

The Southeast Corridor Service Plan lists the expected access mode to light rail stations in this corridor in the table below. Interestingly, 50.3% of all RTD trips involve one at least one transfer.

FIGURE 5: LRT ACCESS MODE

Access Mode	Weekday
Drove alone	48%
RTD bus	29%
Walked	12%
Carpooled	7%
Bicycle	2%
Other	2%

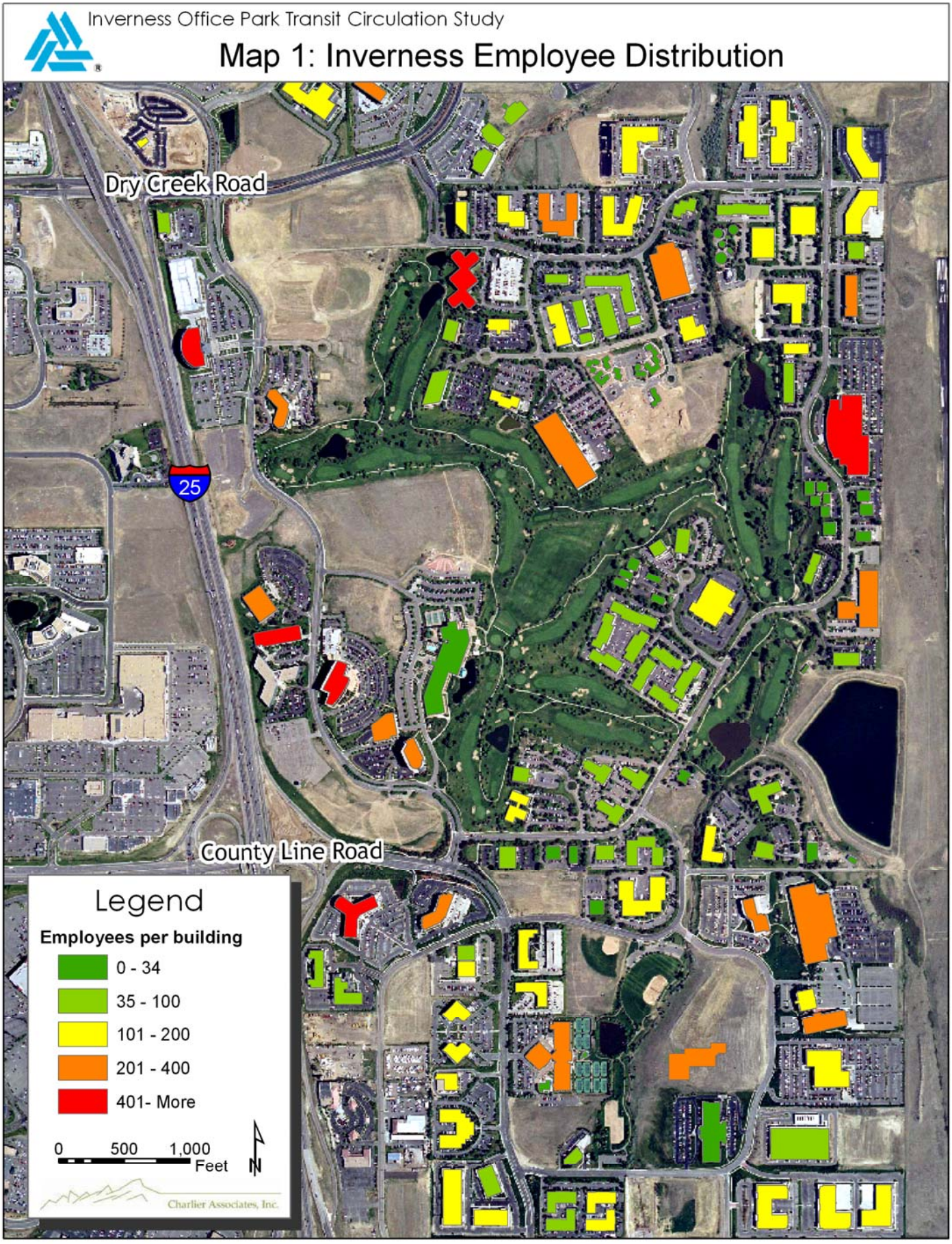
3. Inverness Employee Destinations

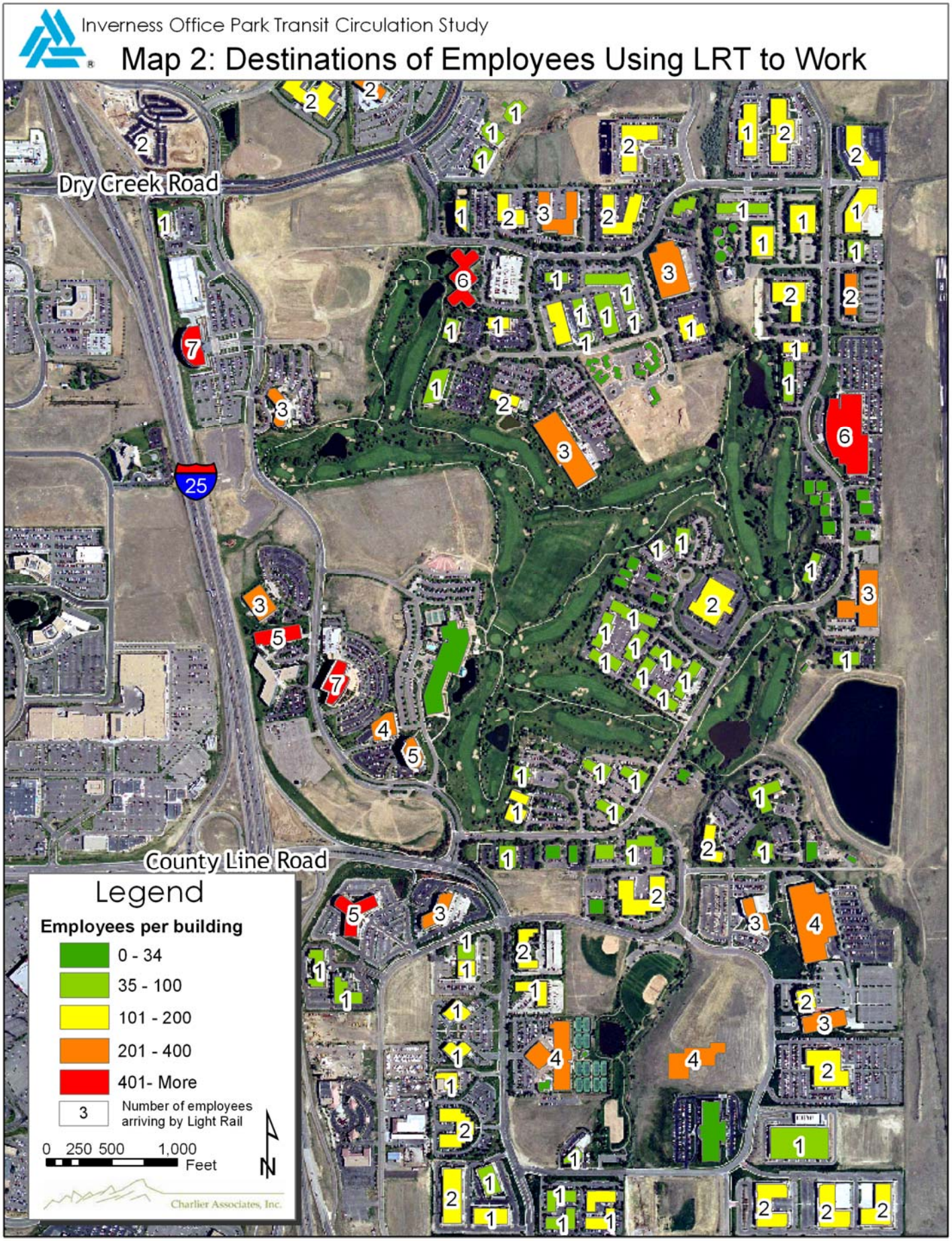
Now that an estimation of the number of patrons has been established, final destinations of all transit riders can be estimated. This can be done with a few assumptions and some calculations. It is important to note that residents of the mixed use development are not included in the transit services section. These residents, although important, were omitted from this analysis because they will not be seen for several years.

It is assumed that all 85% of all employees using transit arrive in the morning peak period between 7:00 AM and 9:00 AM. This represents 200 employees during this peak period. There is not a gradual arrival of employees, however, because employees arrive in bunches with the train arrival. In this regard, there is peak passenger arrival within a peak arrival period. Although there are both southbound and northbound trains, it can be assumed that almost all morning commuters will be arriving on southbound trains. This is because all but two stations lie to the north of Inverness. Assuming that almost all passengers arrive on southbound trains allows for the transit service to make timed transfers. This reduces expected passenger delay significantly. Although very few employees will be arriving from the south two stations, it is not zero. There will be between 3 and 4 employees an hour arriving on northbound trains. Without timed transfers, these employees will likely wait longer for a connecting transit vehicle. Due to the low numbers, however, this analysis will predict level of service only for southbound travelers.

According to RTD, southbound trains will arrive every fifteen minutes. Given these parameters, 24 employees will be arriving at Inverness every 15 minutes on southbound trains in the 2-hour morning commute.

The final destinations for the transit employees are crucial to understanding which station passengers will use and what type of service there should be. Map 1 shows the number of total employees for every building in Inverness. This map shows the density of employees thought the office park. It is assumed that the employees using transit will have a similar distribution throughout the office park. Map 2 shows the expected final locations of employees using transit each day. This map will be used extensively in the next three sections to analyze which service works best.


Inverness Office Park Transit Circulation Study
Map 1: Inverness Employee Distribution
Dry Creek Road
25
County Line Road
Legend
Employees per building
0 - 34
35 - 100
101 - 200
201 - 400
401- More
0 500 1,000
Feet
N
Charlier Associates, Inc.


Inverness Office Park Transit Circulation Study
Map 2: Destinations of Employees Using LRT to Work
Dry Creek Road
County Line Road
25
Legend
Employees per building
0 - 34
35 - 100
101 - 200
201 - 400
401- More
3
Number of employees arriving by Light Rail
0 250 500 1,000
Feet
N
Charlier Associates, Inc.

III. Proposed Services

There are three types of services proposed for Inverness: Call and Ride, Fixed-Route Circulators, and Demand Responsive Vans. Each service uses different vehicles, with different passenger capacities and different average speeds.

The two most important criteria for determining which service to use is the access time it takes for passengers to get from the light rail station to their offices, or access time, and costs per hour. The access time depends on the frequency, average speed and travel time of the vehicles, as well as the walk time from the light rail to the vehicles and walk time from vehicle drop-off points to the office doors.

1. Call and Ride

The current plan by RTD is to establish two Call and Ride services in Inverness Office Park. One service will cover the north loop of Inverness, and a separate service will cover the south loop. See Map 3 for the planned boundaries of this service.

Call and Rides are demand responsive services. Persons wanting to use the service must call the driver to arrange a pick-up. RTD has set a standard that no person will wait more than 10 minutes between calling and being picked up during the peak periods. Many users of the Call and Rides will be subscription based customers. These customers pledge to the driver that they will always be in a certain location at a certain time. The driver schedules the pick up without needing a phone call.

ADVANTAGES

- RTD purchases, operates, maintains, and coordinates fleet
- Repeat customers will develop a schedule for increased level of service
- Successful in other office parks

DISADVANTAGES

- Many employees will be unfamiliar with this type of service
- No timed transfers from the station
- Poor service during off-peak

At this point RTD service planners have anticipated that 3 vehicles will be needed during peak periods in the north service area, and 1 vehicle during off-peak. For the south service area, 2 vehicles will be in service during peak periods and 1 vehicle for off-peak periods. Currently RTD is unsure which side of Interstate 25 it will collect and drop-off passengers. Although the west side will act as the main transfer location, there is significant delay associated with taking passengers from this side to Inverness.

Call and Ride services work well in low-density areas where fixed route services would not see enough patrons. The chart below shows boardings per hour at the other Call and Rides in the district. Typically, Call and Ride vehicles board 3-5 passengers an hour. Interestingly, Inverness Office Park currently has two fixed route services, the 25X and the 6X. RTD has assumed that these transit users will use the Call and Ride service to access the light rail.

FIGURE 6: SERVICE CHARACTERISTICS OF OTHER CALL AND RIDES

Service	Average Boardings per Hour, 2004
Brighton CnR	4.7
Broomfield CnR	3.7
Evergreen CnR	3.8
Gateway CnR	12.4
Interlocken /Westmoor CnR	5.3
Lone Tree CnR	1.9
Longmont CnR	2.3
Louisville CnR	5.1
Superior CnR	4.1
Thornton/Northglenn CnR	2.8
LINK*	8.0

*The LINK is a fixed route service, not a Call and Ride

Inverness Office Park Transit Circulation Study

Map 3: RTD Call and Ride Service Boundaries

2. Fixed-Route Circulators

Fixed route circulators are the most common form of transit service in most transit districts. These vehicles operate on a pre-determined schedule and pre-determined route. Passengers board and alight only at specified bus stops. This section examines the service quality of potential circulators in Inverness Office Park.

The north loop of the Inverness Office Park is about 4 miles in circumference. If there were no stops signs, no passengers to pick up, and no forms of congestion, a transit vehicle could cover this distance in approximately **9 minutes**. There are several sources of delay, however, some that are unique to transit vehicles.

Intersection delay: Most passengers will be using the circulator service just when the roads are experiencing peak congestion. A study conducted by Felsburg Holt and Ullevig in April of 2005 predicts intersection delay at the major intersections at peak periods. All signalized intersections are anticipated to operate under level of service (LOS) C during both AM and PM peak periods. The one exception is the Dry Creek/ Inverness Drive West intersection with anticipated level of service E. Stop sign controlled intersections were assumed to create 10 seconds of additional delay. Map 4 shows estimated delays at signalized intersections along the north loop. Total delay due to intersections: **5 minutes**

Passenger Boarding and Alighting: The number and placement of stops in the route is a critical to overall service. Increased numbers of stops creates better access to office buildings, but increases the delay due to stopping. Map 5 shows the potential locations of circulator stops. The map also shows 1 and 2 minute walk distances from the stops assuming a walking rate of 200 feet per minute. The number of stops was chosen to maximize access to buildings without creating excessive delay. In this model, there are 14 stop locations. Under this scenario, 5,938 employees will be within a 1-minute walk of a stop, and 10,604 employees will be within a 2-minute walk.

There are fixed and variable delays associated with letting passengers on and off. If there is at least one person getting on or off, the bus must come to a complete stop. This takes approximately 20 seconds. Each passenger getting on or off adds an additional 3 seconds of delay, also known as dwell time. Using estimated numbers of passengers per hour peak period delay for boarding and alighting: **5 ½ minutes**

Buffer: To maintain high levels of timetable reliability, RTD programs extra time between successive routes. Route delay is cumulative and once a bus is late, it can be difficult for it to return to schedule. Programming time to allow for occasional excessive delays can avoid this problem and assure maximum on-time performance. Buffer delay: **1 minute**

Total time for one loop in peak period: **20½ minutes**

Delay witnessed by the patrons

The above analysis describes the delay of the shuttle itself. Patrons incur additional delays.

Schedule Delay: Schedule delay is the time between when a passenger wants to be picked up and when the shuttle actually arrives. Given random passenger arrivals and uniform headways, schedule delay is half the headway. Thus, if a bus comes every 20 minutes, a person randomly arriving at the pick-up point can be expected to wait 10 minutes.

Most commuters become familiar with bus schedules and attempt to arrive close to the bus departure. Still, transfers are rarely seamless and additional delays will occur.

Timed transfers from the LRT station will prove very important in Inverness Office Park to reduce expected schedule delay. At this point, it is assumed a shuttle will meet the arrival of each LRT vehicle. Expected delay: **4 minutes**

Access to and from Shuttle: Passengers are required to walk up a flight of stairs, across a pedestrian bridge, down a flight of stairs and to the bus stop. Estimated time for this is 3-4 minutes depending on walk speed. On the other end, patrons must walk from the bus stop to the front door of their building. As mentioned above there are 14 stops considered. Expected walk time on this end is ½ to 2 minutes. Total access delay: **3 ½ to 6 minutes**

The total expected time for passengers to access office buildings from the light rail is a function of the number of shuttles that are in service. As the number of shuttles increases, several reductions in delay occur. Note that the reduction is not purely linear because as service levels increase, more people will use the service. These parameters, however, are outweighed by the time reductions listed below:

1. **Reduction in passenger boarding and alighting time** Fewer people on each bus means less time at bus stops. Some stops may be skipped all together.

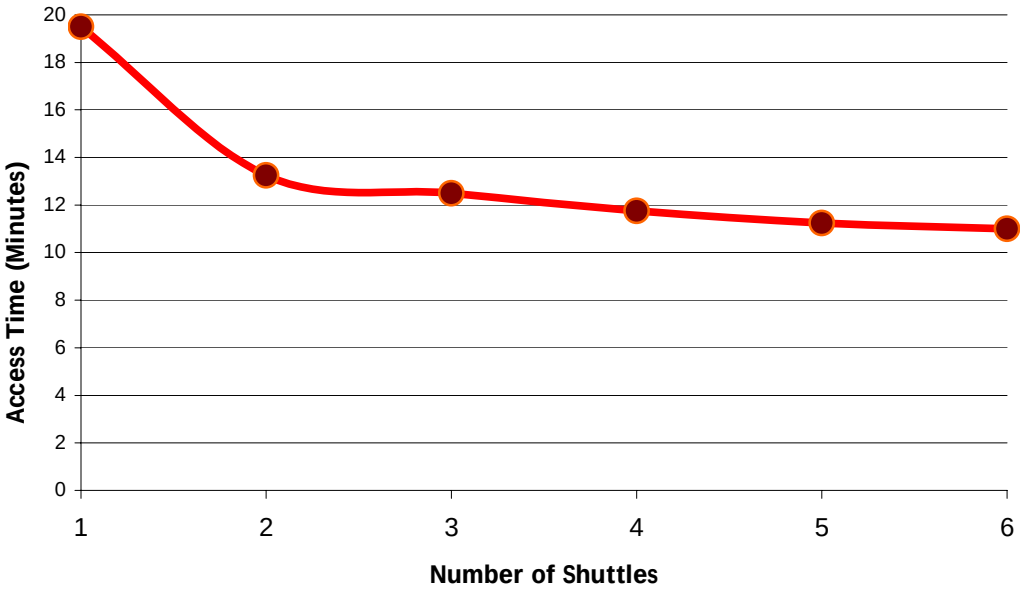
2. **Reduction in buffer requirement** It will be less likely to need a buffer because the potential for buses to get behind schedule decreases.

3. **Reduction in schedule delay** Smaller headways mean less expected wait time.

FIGURE 7: TIME FROM LIGHT RAIL TO DESTINATIONS (MINUTES, PEAK PERIOD)

Total Number of Shuttles	Clockwise Shuttles	Counter-Clockwise Shuttles	Total Shuttle Delay	Additional Access Delay	Maximum Delay	Total Expected Delay
1	1	0	10.5	9	28	**19.5**
2	1	1	5.25	8	19	**13.25**
3	2	1	5	7.5	18	**12.5**
4	2	2	4.75	7	16.75	**11.75**
5	3	2	4.5	6.75	16.25	**11.25**
6	3	3	4.5	6.5	16	**11**

Figure 8:Expected access time, LRT platform to office buildings



Cost of Fixed Route Circulator Service

Transit costs are generally separated into two different categories: capital costs and operating/ maintenance. Capital costs cover the cost of the vehicles, cost of bus stop signage and any other one-time, up front costs. Vehicle costs for the proposed service in Inverness range from $200,000 to $250,000 per vehicle. Public transit agencies usually share costs with federal funds. Section 5303 of the Federal Transit Administration provides funding for capital costs on a 80/20 local match.

After LRT is established in the corridor, RTD will eliminate several of its fixed route services. It is possible that several vehicles will be available for new service. Communication with RTD should continue to assess this potential. In this cost analysis, it will be assumed that the only costs incurred to Inverness Office Park is operations and maintenance.

Operation and maintenance costs vary depending on the number of hours of use. These costs include, driver compensation, fuel, vehicle cleaning, and other vehicle maintenance. This model uses RTD's rates of $85 per hour of operation. Notice that there are fewer buses in the off-peak period.

FIGURE 9: CIRCULATOR COST PER DAY (DOLLARS)

Total Number of Vehicles	Peak Period (7-9AM, 4-6PM)	Off-Peak (9AM-4PM, 6PM-8PM)	Total Hours/ Day	Cost/Day ($)
1	1	1	10	**$ 850**
2	2	1	14	**$1,190**
3	3	1	18	**$1,530**
4	4	2	28	**$2,380**
5	5	2	32	**$2,720**
6	6	2	36	**$3,060**


Inverness Office Park Transit Circulation Study
Map 4: Intersection Delay for the North Circulator
Dry Creek Road
If Signalized
25
Legend
Circulator Delay, Peak Period
10 Seconds
11 - 15 Seconds
16 - 45 Seconds
46 - 90 Seconds
0 250 500 1,000 Feet
N
Charlier Associates, Inc.


Inverness Office Park Transit Circulation Study
Map 5: Potential Circulator Stop Locations
Legend
Potential Stops
Two-Minute Walk Radius
One-Minute Walk Radius
North Circulator
0
500
1,000 Feet
N
Charlier Associates, Inc.

3. Van Service

Van service is an excellent way to distribute low volumes of passengers in a low-density environment. Van services generally do not operate on a fixed schedule, allowing the service to respond in real time to the demand. This presents several advantages. First, costs per hour of operation are less than fixed route circulators. During off-peak periods when demand for service is low, vans can sit idle, reducing fuel and maintenance costs. Another big advantage of van services for Inverness Properties would be the ability for vans to drop passengers off at the front entrances of buildings. Large distances often separate the front entrances of buildings and the roadway where fixed services would drop people off. Furthermore, this space is often an unfriendly pedestrian environment: a car parking lot.

Front door drop-off would decrease total access time from LRT station to buildings. Fixed route services could in fact drop passengers off at front door locations, just like a van. This, however, would require the route to drive to front doors even if there is no one there to pick up. This would add excessive delay to the route. Front door service only works in a demand responsive environment such as a van service.

A final advantage of vans is that they could be more useful during off-peak periods. One factor that discourages people form using transit is the lack of personal mobility during the day. Vans could help circulate transit users to meetings, the athletic club and lunch destinations within the office park. Vans could also perform mail courier duties during the day as well as provide a shuttle service to the airport.

ADVANTAGES

- Lower costs per hour of operation
- Can provide front door drop off service
- Higher vehicle speeds
- In off-peak vans could be used for other campus duties (courier, airport shuttle, etc)

DISADVANTAGES

- Public funding is questionable
- No ADA access
- Can be more difficult to board
- Potential capacity limitations

Case Studies

One example of a van service in the Denver Metropolitan region is the NCAR service in Boulder. NCAR has three vans operating during the peak periods and two vans during off-peak that connect transit with office buildings. The vans operate on a fixed route schedule with headways of 30 minutes. The schedules are programmed to meet bus arrival at the Table Mesa Park and Ride. There are more bus arrivals than vans, but NCAR employees know which buses to take in the morning to reach a timed transfer. Interestingly, NCAR drivers will wait for a late bus with transferring passengers. NCAR shuttles have 200 boardings per day, approximately the number of boardings predicted for Inverness. Seven percent of all NCAR employees take transit to work.

Another example is the Microsoft van service in Redmond, Washington. This is a hybrid service of fixed-route and demand-responsive services. During peak periods, the service has evolved into a fixed route service. Employees can expect to meet the shuttle at specific locations at specific times of the day. During off peak, employees can call the service to get picked-up and brought to another location on the campus. The wait time for this call-in service is less than 10 minutes. During the off-peak period, Microsoft uses these van to distribute people to meetings and cafeterias throughout the campus.

WHEN VAN SERVICES WORK BEST

- Relatively low boardings (Fewer than 30 per peak hour)
- One-point to many-point distribution (LRT station to office buildings)
- Long distances between the travel arterial and front doors of buildings
- Patrons will not be carrying large loads, such as in retail areas
- Predictable scheduling

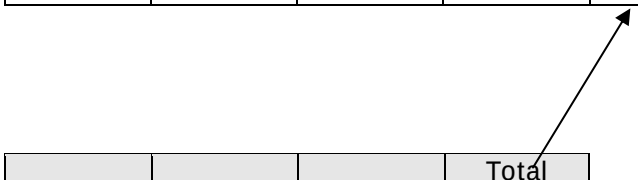
Service Characteristics

Two important questions to answer are how many vans will be needed in the morning peak period, and what will the passenger delay be. As estimated above, there will 24 employees alighting the train every fifteen minutes in the peak period. Although the distribution of employee destinations is known for the entire day, each load of 24 passengers will be unique. Thus, each van route will be unique, depending upon which passengers board. Maps 6 and 7 show two scenarios of passenger distribution in the peak period.

The sources of van delay are similar to the fixed route circulator. Delays include access to and from pick-up points, vehicle travel time, intersection delay, and passenger boarding delay. In general, vans have less overall expected delay because of front door drop-off. Van routes change depending on passenger destinations. Each passenger group transferring from the LRT will have unique routing. To understand the average, or expected, delay of a typical passenger, several scenarios were run. The chart below shows expected delay from 4 routes.

FIGURE 10: EXPECTED DELAY FOR PASSENGERS USING VANS

Van Route	Expected Access from LRT to Van	Expected Schedule Delay	Total Intersection Delay	Total Travel Time	Total Alighting Delay	Expected Access from Van to Door	Maximum Delay	Total Expected Delay (Minutes)
1	210	90	225	210	140	30	905	**10.3**
2	210	90	55	251	140	30	776	**9.3**
3	210	90	215	210	140	30	895	**10.3**
4	210	90	65	278	140	30	813	**9.6**



Van Route	Miles Traveled	Free-flow Speed (MPH)	Total Travel Time (Seconds)
1	1.9	35	210
2	2.4	35	251
3	1.9	35	210
4	2.7	35	278

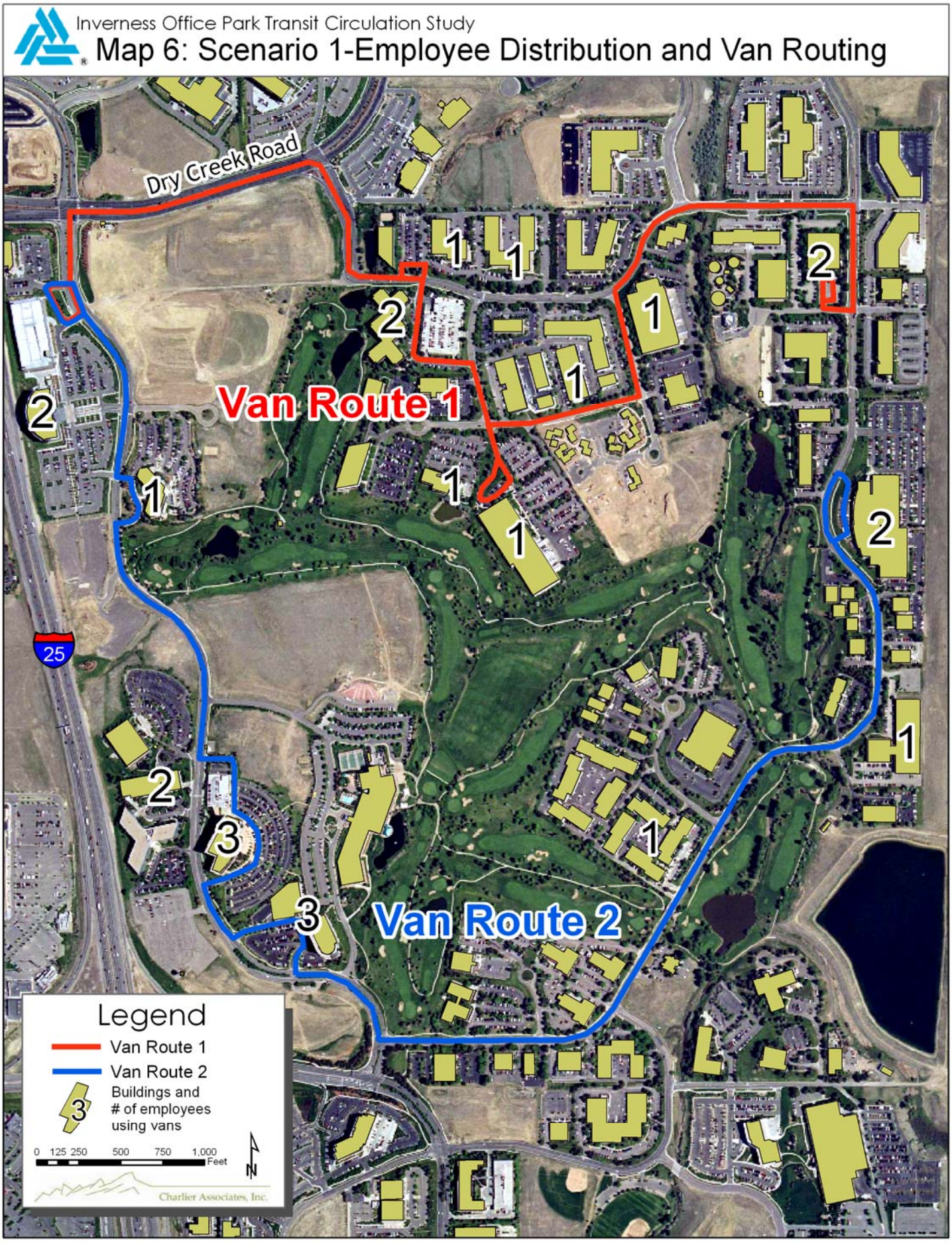
Costs

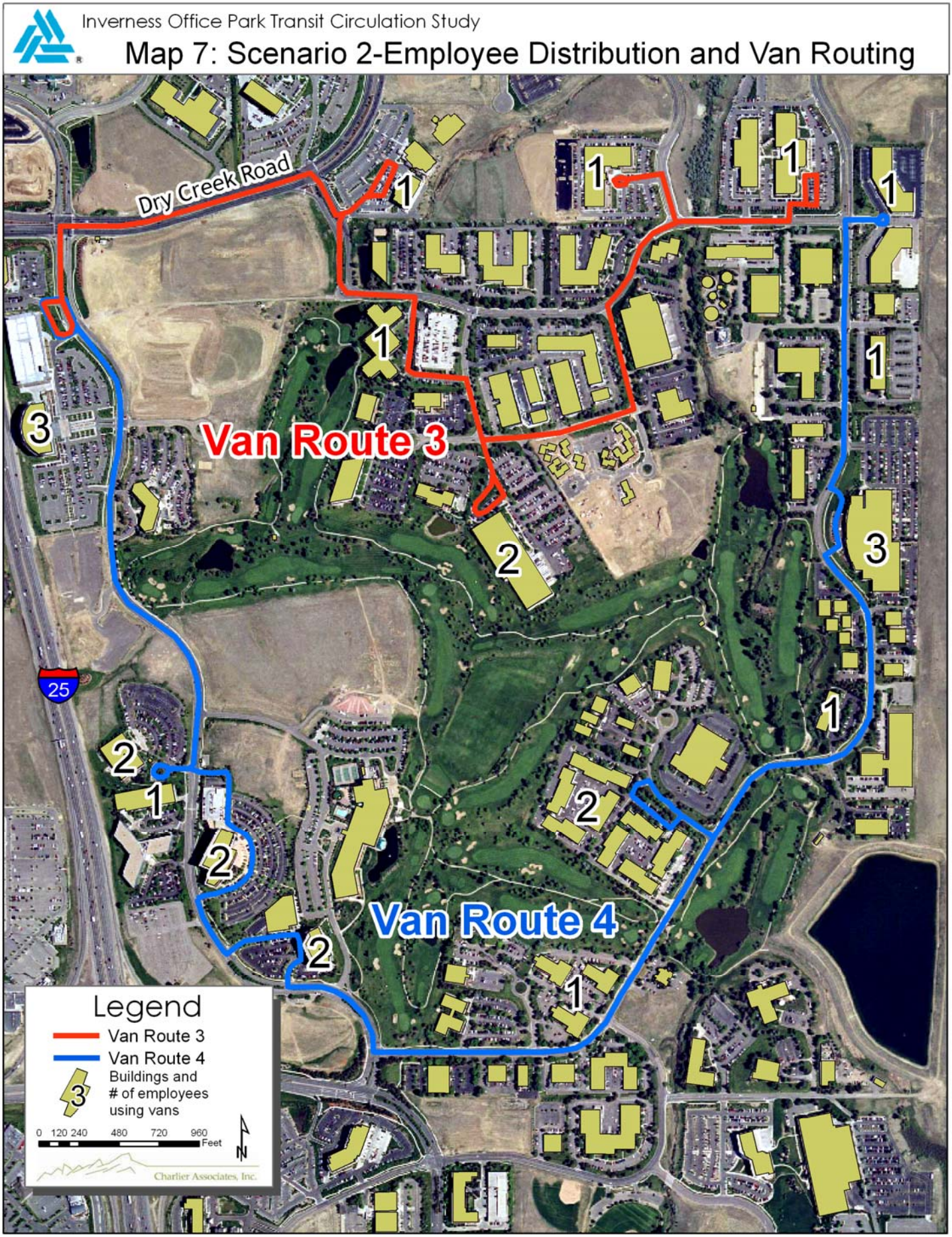
As mentioned above, van services are less expensive than fixed route services for several reasons. First, van services only operate when there is a passenger demand. Users will call the van service or will have contacted van drives in advance informing them of a desired pick-up-time. Secondly, due to the smaller size of the vehicle, operating costs per hour are less expensive. Finally, there are no bus stops to build or maintain.

A review of 12 demand-responsive van services in Colorado found that average operating costs were $18 per hour, well below fixed routes shuttles.

FIGURE 11: DAILY COSTS OF VAN SERVICES (OPERATION AND MAINTENANCE)

Total Number of Vehicles	Peak Period (7-9AM, 4-6PM)	Off-Peak (9AM-4PM, 6PM-8PM)	Total Hours/ Day	Cost/Day ($)
2	2	1	14	**$252**
3	3	1	18	**$324**
4	4	2	28	**$504**
5	5	2	32	**$576**
6	6	2	36	**$648**


Inverness Office Park Transit Circulation Study
Map 6: Scenario 1-Employee Distribution and Van Routing
Dry Creek Road
Van Route 1
Van Route 2
25
Legend
Van Route 1
Van Route 2
Buildings and
# of employees
using vans
0 125 250 500 750 1,000
Feet
N
Charlier Associates, Inc.


Inverness Office Park Transit Circulation Study
Map 7: Scenario 2-Employee Distribution and Van Routing
Dry Creek Road
Van Route 3
Van Route 4
25
Legend
Van Route 3
Van Route 4
Buildings and
# of employees
using vans
0 120 240 480 720 960
Feet
N
Charlier Associates, Inc.

4. West Side Pick-Up

The above analysis assumed that Inverness Office Park employees will use the pedestrian bridge to access the transit vehicles. Currently this is the intent of RTD as described in the Southeast Corridor Service plan. Pedestrian walk times were included in the overall access time. To improve access environment, it is possible that the transit vehicles could meet passengers directly at the station on the west side of the interstate.

The purpose of offering west side passenger pick-up is to provide employees the with better transit service. There are two advantages of a west side pick-up location. First, west side pick-up saves pedestrians from the need to walk up two flights of stairs, across a 500 foot bridge, and back down two flights of stairs. In addition to the physical requirements, this is an unpleasant walking environment. There is little for pedestrians to look at, the stairways are exposed to inclement weather, and there is noise and pollution form the interstate below. The second benefit is that the west side pick-up allows for timed transfers from LRT to a distribution service, be it vans or RTD's Call and Ride. Due to various passenger walk speeds, timed transfers on the east side of the interstate would be difficult.

There are some issues, however, with west side pick-up. West side pick-up increases vehicle drive time, and may be difficult due to station design. The analysis below addresses the pros and cons of west side pick-up for both County Line and Dry Creek.

County Line Station

There are several obstacles with passenger pick up on the west side of the Interstate at County Line. The first concern is if there will be enough space for the vehicles to dwell next to the station without resting in the existing travel lanes. Figure 12 is a satellite photograph that shows the location of the County Line station and the spatial constraints. Given the estimated ridership for the two stations station, there needs to be space for two parked vehicles. This would require an additional lane for parking to be established parallel to the exiting lanes of traffic.

The second concern is if the station design will allow for pedestrians to exit the station on west side. Currently there is no pedestrian exit on this side and a west side pick up would require new design and construction. RTD is in discussion with Park Meadows Mall management about providing a west side access, assuming this is even physically possible.

FIGURE 12: SATELLITE IMAGE OF COUNTY LINE STATION LOCATION

The third concern is how the vans will access this pedestrian platform. Vans will approach the platform heading south and will leave the platform heading north. Turn around locations are limited and inconvenient. It is unclear if the vans be able to turn directly into the station form a center turn lane. Figures 13 and 14 depict the difficulties vehicles would have accessing the station.

FIGURE 13: LACK OF VAN TURN-AROUND LOCATIONS

FIGURE 14: SPATIAL CONSTRAINTS NEAR STATION

As mentioned above, the parking at County Line station will be at capacity. RTD patrons wishing to park here but finding no spaces may look for alternatives in adjacent lots. Plentiful and free parking at Park Meadows Mall may become an attractive alternative. Although this is not currently a problem, adding a west side pedestrian access could create an issue. Parking management with time constraints could prevent downtown employees form using these spaces.

Access Time

Pedestrian access time from the light rail station to an office building can be broken down into the following segments:

- **Walk time** from LRT to transit vehicles
- **Boarding time** onto vehicles
- **Travel time** to the Inverness Office Park entry point
- **Distribution time** from entry point to office front door

Walk Time The walk time from the light rail station to the east side of the interstate takes considerable time. This access time is similar to the Dry Creek Station which is estimated to take 3-5 minutes. Due to the large distance, differing passenger walk speeds will make timed transfer difficult. Fast walking passengers will be waiting in the transit vehicles until all slow walkers have arrived. This adds approximately a minute and a half to the access time. There is essentially no access time for pick-up on the west side.

Boarding Time It takes time for passengers to board transit vehicles and this must be represented in the overall access time. On the west side it will take approximately a minute for passengers to board. On the east side, however, the boarding time is absorbed in the walk variation time noted above. Thus, there is essentially no boarding time on the east side.

Travel Time The travel time is defined by the time it takes transit vehicles to drive from the passenger pick-up point to the entry point of Inverness. Travel time is a combination of distance traveled and intersection delay. The west side travel distance is extensive because there is not a direct route between the station and Inverness. Due to a no left turn off of Dry Creek Road, vehicles must drive through the Park Meadows Mall to access

the station. The distance from the station to the entry point of Inverness is 4000 feet, or ¾ mile and the return trip is 5200 feet, or about a mile.
During non-congested periods, this distance takes 3 and a half minutes. The traffic coming from the mall, however, can clog this exit point and increase this travel time to up to ten minutes. Most employees using the west side pick-up will be using the service right at the time when it is most congested. Expected travel time, therefore increases dramatically to about 8 minutes.

For the east side, the passenger pick-up point is the entry point so the travel time is zero. See map 6 for visual representation of the walk, board and travel times.

FIGURE 15: WALK, BOARDING AND TRAVEL TIMES

	Walk Time		Boarding Time	Travel Time
	Walk Time	Variation in Walk Time	Passenger Board Time	Travel Time to Inverness
East Side pick-up	4:00	1:30	0	0
West Side pick-up	0	0	1:30	3:30-10:00

Distribution Time The distribution time is the time associated with accessing the office buildings. The County Line pedestrian bridge touches down farther away from many of the buildings than does the vehicle entrance from the west side. Thus, west side pick-up will have slightly lower distribution time than the east side pick-up.

It is difficult to arrive at an estimated distribution time as employees are scattered all over the office park. Previous analysis made estimates for distribution time for fixed route vehicles and demand responsive vans. More important here is the comparison between the east and west side pick-up scenarios.

On the east side, the Inverness entry point is simply the location where passengers board the transit vehicles, or the County Line station. One analysis looked at the number of employees within ½ mile of the two entry points. There are 2050 employees within ½ mile of the east side entry point and there are 6036 employees within ½ mile of the west side entry point. (See map 7) The proximity of final destinations means that distribution time will be less for the west side pick-up than the east side pick-up. Estimations for this difference are based on the analysis provided in the previous section. The chart below shows expected total travel time for the east and west side pick-ups.

FIGURE 16: TOTAL ACCESS TIME FOR EAST AND WEST SIDE PICK UPS

	Walk Time		Boarding Time	Travel Time	Distribution Time	
	Walk Time	Variation in Walk Time	Passenger Board Time	Travel Time to Inverness	Distribution Time to Destination	**Total Time**
East Side pick-up	4:00	1:30	0	0	5:00	**10:30**
West Side pick-up	0	0	1:30	3:30-10:00	6:00	**11:00-17:30**

Conclusion

Although a west side pick up at first glance may seem practical, at this point there are too many obstacles to recommend implementation. Due to significant vehicle travel time, there would be no savings in access time for passengers. In fact, it will likely take longer overall for employees to access offices with a west side pick-up. Furthermore, station design characteristics make this even more difficult, if not impossible.

FIGURE 17: ARAPAHOE PEDESTRIAN BRIDGE
The bridges at Dry Creek and County Line will be similar to this one at Arapahoe


Inverness Office Park Transit Circulation Study
Map 8: Walk and Tavel Times for County Line East Side Pick-Up
25
Travel Time: 3:30- 10:00
County Line Road
Walk and Boarding Time: 1:30
Travel Time:0
Walk and Boarding Time: 5:30
Legend
West Side Entry Point
East Side Entry Point
West Side Route
East Side Walk Route
County Line Station
0 250 500 750 1,000 Feet
N
Charlier Associates, Inc.

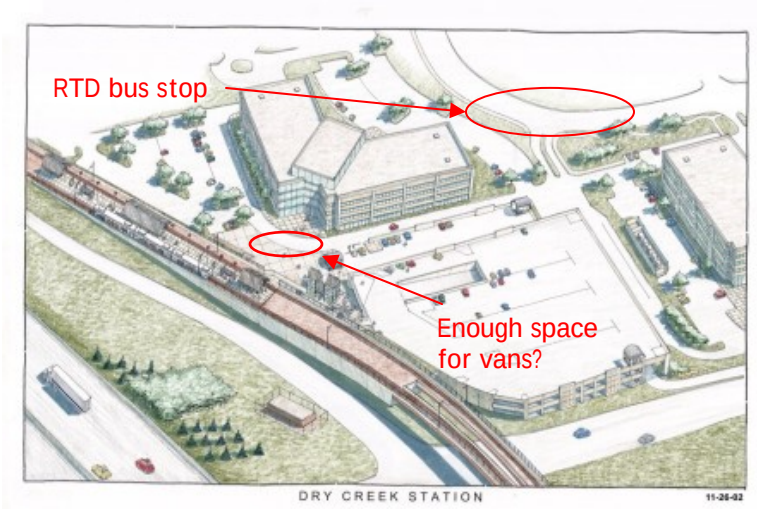

Inverness Office Park Transit Circulation Study
Map 9: Distribution Time to Buildings Near Entry Points
25
Distribution Time: 5:00
County Line Road
Distribution Time: 6:00
Legend
West Side Entry Point
East Side Entry Point
West Side Route
East Side Route
Buildings within 1/2 mile of West entry point
Buildings within 1/2 mile of both entry points
0 125 250 500 750 1,000 Feet
N
Charlier Associates, Inc.

Dry Creek Station

The Dry Creek station does not have many of the obstacles that the County Line Station does. Passengers can exit the station on the west side, there is designated kiss and ride drop-off lane, and travel times are much lower due to lack of mall traffic. Still, RTD's Southeast Corridor service plan requires all passengers to use the pedestrian bridge to access transit vehicles.

The main concern with a west side pick-up at Dry Creek is the station design. As mentioned above, there needs to be enough space for two vehicles to be parked as they wait for passengers. RTD has decided that there is not enough space for its buses or Call and Ride vehicles to use this right of way. Instead, RTD vehicles will board and alight passengers on E. Panorama Circle about 400 feet from the station. Figure 4 shows the current design of the station.

FIGURE 18: DRY CREEK STATION DESIGN



It is not clear if this driveway can be used for private shuttles. T-REX architects for this station have stated that the design work was contracted out, and they are not familiar with the particulars of the infrastructure. Field pictures show that there may in fact be enough space for vans to dwell here.

The charts below demonstrate the expected increased travel time of a west side pick up for transit vehicles. It is assumed in this analysis that vehicles are pulling up directly to the station, not Panorama Circle.

FIGURE 19: CHANGE IN TRAVEL TIME

	Travel Distance (Miles)	Travel speed (mph)	Total Travel Time (Seconds)	Intersection Delay (Seconds)	Total Travel Time (Minutes)
Call N Ride	0.8	25	115	160	4:36
Circulator	0.8	25	115	160	4:36
Van	0.8	35	82	160	4:00

	Reduction of passenger walk times (Minutes)	Increase in vehicle travel time (Minutes)	Observed increase (Minutes)
Call N Ride	3:30	4:36	**1:06**
Circulator	3:30	4:36	**1:06**
Van	3:30	4:00	**0:30**

Although overall access time to office buildings would increase by up to a minute, picking passengers up on the west side could improve the overall experience of the transit user. At this point, the pedestrian bridge is a poor pedestrian experience, especially in inclement weather. Transferring immediately into a vehicle could be more attractive to users. Furthermore, there would be less discrepancy between slow and fast walkers. If transit vehicles met passengers on the east side of the interstate, each day fast walkers would inevitably be waiting for slow walkers to meet the timed pick-up. One other consideration is that there would be some increased vehicle operation costs.

FIGURE 20: DRY CREEK STATION, LOOKING SOUTH

FIGURE 21: DRY CREEK STATION, LOOKING NORTH

Potential van dwelling locations

Conclusion

There is significant potential to pick passengers up on the west side of Dry Creek station, although more information about the station design is need before recommending this service. It is still unclear if there is sufficient space for vehicles to dwell in front of the station as depicted in the above diagram.

5. Projecting Ridership Based on Proposed Service

The above analysis describes three types of services, expected passenger wait times, and operating and maintenance costs. These estimates were based on predicted transit use outlined in the beginning of this document. In actuality, transit ridership *is dependent upon the type of service.* Better quality service will attract more users to the system. Thus, it's necessary to think about ridership and transit service simultaneously.
There are three types of passengers that will use the system.

LRT Peak - Passengers arriving to the stations on LRT during morning commute times
LRT Off-Peak - Arriving Passengers arriving to the stations on LRT during other times of the day
Other Access - Passengers arriving to the stations via walking, carpooling or RTD buses. Note that these numbers do not include residents from the mixed use development.

FIGURE 22: RIDERSHIP BASED ON SERVICE

	Arrival Type	Call and Ride	Fixed-Route Circulator (2 vehicles, north loop)	Fixed-Route Circulator (4 vehicles, north loop)	Demand Responsive Van (2 vehicles, north loop)	Demand Responsive Van (4 vehicles, north loop)
Dry Creek	LRT Peak	162	162	162	180	200
	LRT Off-Peak	22	22	22	40	55
	Other Access	3	3	3	3	3
County Line	LRT Peak	70	70	80	80	90
	LRT Off-Peak	9	9	9	20	30
	Other Access	1	1	1	1	1
Total		**267**	**267**	**277**	**324**	**379**

IV. Considerations

There are still other factors that will influence the number of people using transit at Inverness. The most important of these is the mixed use development that could almost double the number of riders each day. The development is close enough to the station to be considered a Transit Oriented Development.

The pedestrian environment between the light rail station and Inverness is important both for the new residents and the employees using transit to work. Walk environment is just as important as walk distance when it comes to generating new riders.

Two other considerations briefed in this section is parking and bus service to Inverness. Parking may be come a serious issue if downtown employees start using unused Inverness Office Park spaces during the day. The ICG parking structure has many open spaces and sit directly adjacent to the pedestrian bridge touchdown.

Some employees may still use buses to get to work. This section examines where and how these users will access Inverness.

1. Mixed Use Development

Significant transit use will develop form the mixed use development planned for Filling 25. The entire parcel is located within ½ mile of the Dry Creek LRT platform. This is widely considered the distance people are willing to walk to rail stations with frequent service. The number of residents that use this transit station depends on a variety of factors. The following are three of the most important.

- **Quantity of each land use**

The Institute of Engineers produces a Trip Generation Manual that estimates the rates of vehicle trips per land use. This provides an estimate of future vehicle and transit activity. The mixed used development has planned for 125,000 square feet of office, 62,500 square feet of retail, 3,000 square feet of restaurant, a gas station, and 1,125 residential dwelling units.

Although the office and retail will generate some new transit trips, the numbers are very low. Applying the rate of transit users established earlier in this document, the new office space will generate about 3 new trips a day. As for retail, it is unlikely unique trips will be made to this area with retail as the primary destination. This is especially true in light of the fact that Park Meadows Mall is one station away.

The residential units, on the other hand, will generate substantial transit ridership, especially during the perak period. Young urban professionals working in downtown will have a high likelyhood of using the LRT.

- **Distance to station**

As mentioned above, it is widely belived that people will walk ½ mile to a rail transit station with high frequency.

- **Quality of walk environment**

Transit patrons will be more likely to walk given good quality walking environments. Providing a better walk environment from the mixed use development to the LRT station is critical to overall transit use.

Although the quantity of land use and distance to the station is known, it is difficult to predict how many residents will access the transit station without knowing the quality of the walk environment. The pedestrian environment that is currently planned is poor. Transit users must cross a four lane road, navigate between a parking lot and a parking deck, climb a flight of stairs, cross over an 8 lane highway, and back down another flight of stairs. These are CAI's predictions of resident transit use.

Current plan: 168 residents accessing transit
Improved Pedestrian Environment: 400 residents accessing transit

2. Place Making

Improving the walking environment from the light rail to the transit vehicles will encourage employees to use transit. Currently the walking environment is a narrow strip of land sided by a parking lot and a parking deck. CAI has created a design that improves the pedestrian environment from the pedestrain bridge to the transit vehicles.

A good pedestrian environment creates visual intrest to pedestrian using the space. The percieved walking distance is reduced when pedestrians have interesting things to hold their attention. These things include water fountains, trees and plantings, building awnings, sculptures and other public artwork.

Good pedestrian environments also provide people with amenities that they can use. Amenities include street furniture such as benches and chairs, drinking fountains, public restrooms, wide sidewalks, lighting and even food and coffee carts. These amenities encourage people to access transit by helping people feel more comfortable and welcomed in the space.

Generally areas that prioritize the needs of cars are not good pedestrian environments. Currently, the touchdown area of the pedestrian bridge is dominated by a parking lot. It is recommended to remove this parking lot to create some of the pedestrian amenities described above. Although 34 parking spaces would be lost, there would be a net benefit to Inverness Office Park regrading increase transit ridership. Furthermore, there is an underutilized parking structure within 30 yards of this lot that may be used to replace lost parking.

The following graphics attempt to demonstrate the new environment that CAI desinged form multiple perspectives.

FIGURE 23: BIRD'S EYE VIEW LOOKING NORTHEAST

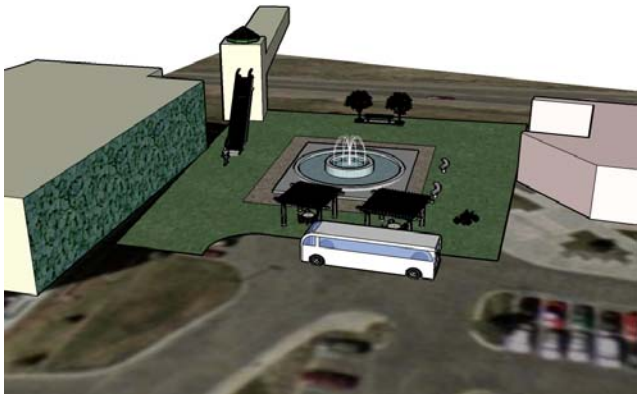


FIGURE 24: BIRD'S EYE VIEW LOOKING WEST

FIGURE 25: VIEW FROM TOP OF ESCALATOR

FIGURE 26: EYE LEVEL VIEW FROM MARK WEST BUILDING

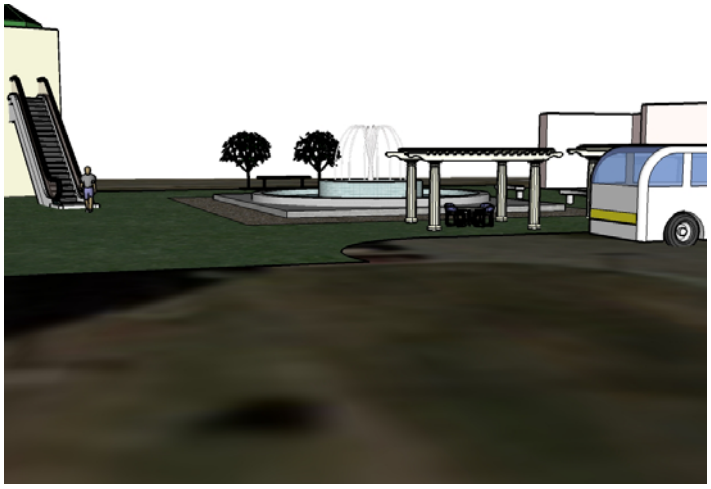


FIGURE 27: APPROACH FROM INVERNESS DRIVE WEST

3. Parking

RTD has a parking structure planned for both the Dry Creek and County Line stations. Dry Creek will have 235 spaces and County Line Road will have 388 spaces. In the RTD model, both parking lots will be at capacity during weekdays. The original SE Corridor Service Plan used a TransCAD model with unconstrained parking. In other words, the model predicted ridership based on unlimited parking at the stations. The SE Corridor Service Plan Addendum, created in January 2005, adjusts the model's predictions for each station based on the available parking at the stations. Daily ridership dropped dramatically after considering parking. Dry Creek activity (boardings and alightings) dropped from 3,500/day to 1,500/day. County line activity dropped from 1,300/day to 1,100/day. Clearly there is more demand for parking than what RTD is providing.

Although parking at the RTD parking lots is at capacity, parking is currently unconstrained in Inverness Office Park. Employees working downtown may be encouraged to park their cars in Inverness to access the LRT. Creating good connecting service between the office park and the LRT station may only further encourage downtown employees to park their car in free Inverness spaces.

The ICG parking deck is adjacent to the touch down of the pedestrian bridge at Dry Creek. Currently this parking deck has excess capacity and provides a nice alternative for people wanting to park their car and board the light rail. Illegal parking would create increased congestion at the Dry Creek/ Inverness West intersection and may cause ICG employees to search longer for an open space. Similar problems exist at the County Line station with surrounding employers.

FIGURE 28: UNUSED PARKING DECK SPACES

4. Proposed Bus Routes

Not all employees using transit to get to Inverness will be using the LRT. It is important not to forget about other transit users and ensure a high quality access for these employees. There are three bus routes that come near Inverness Office Park: 473, 77 and 402L. Unfortunately the access from these routes to the office park is poor. As seen on the map below, there the Interstate creates a barrier between west side bus routes and Inverness offices on the east side.

402L

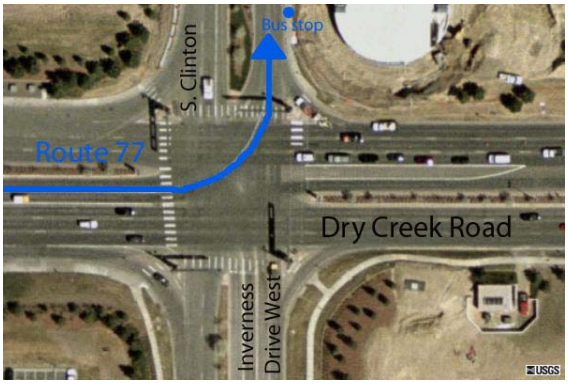
Although the 402L route goes right by the County Line Station, due to station design there is no pedestrian access to the east side of the interstate. RTD is currently in discussion with Park Meadows Mall owners regarding west side access. For now, the closest access point to Inverness is at the intersection of E. County Line Road and the north Mall entrance- almost ¾ mile form the nearest building in Inverness. Its unlikely that employees will use the 402L due to the poor access.

FIGURE 29: RTD'S PROPOSED BUS ROUTES

77

Route 77 comes closer to the office park, but the stop locations will not be convenient and transit users will have to cross Dry Creek Road on foot. Eastbound buses make a left turn onto S. Clinton Street immediately after passing underneath the highway. To prepare for this left turn, buses will need to be in the center lanes of the road eliminating the opportunity for passengers to board or alight on the south side of Dry Creek Road. Thus, the closest bus stop to Inverness will be on S. Clinton Road. From this point there are only 3 buildings within a ¾ mile walk.

FIGURE 30: CLOSET LOCATION FOR ROUTE 77 BUS STOP



System planners at RTD are considering changing this route slightly to drop down through Panorama Circle allowing passenger drop off near the light rail station. This adds about two minutes to the route, but look feasible in terms of present resources.

473

The closest that route 473 will come to Inverness is the Dry Creek LRT station. Inverness employees taking the 473 to work will merge with employees on the light rail. Due to the low number of projected riders on this route, no special provisions for this route is necessary.

Improvements

No bus routes actually enter into the Inverness Office Park jurisdiction, so making improvements to routes and bus stop environment is not feasible. Route 473 serves the Dry Creek light rail station and most likely route 77 will as well. This station will become the access point between the buses and the rest of Inverness. Providing good circulation service from here should be the highest priority.

VI. Transportation Demand Management

Transportation Demand Management (TDM) is a set of strategies used to reduce the number of employees driving alone to work. TDM programs solve congestion problems by reducing the demand placed on the transportation infrastructure and increasing the attractiveness of alternatives. Whereas many transportation plans focus on improving the physical characteristics of a system, such as lane widening, TDM programs focus on a more efficient use of the existing system.

Take, for example, an intersection that is congested at peak periods. A traditional approach may be to widen the road to create a new turn lane, with the immediate effect of reducing delay, perhaps 10%. TDM programs, on the other hand, reduce delay by decreasing the total number of vehicles using the road. In this example, if one out of ten people used transit or carpooled, there would be an equal 10% reduction in delay. TDM programs create more sustainable congestion solutions because lane widening only encourages more trips to be made.

There are two main components of a successful TDM program. The first is to market and promote existing alternatives to driving alone to work. This includes promoting Bike to Work Week, providing employees with transit information, introducing telework programs, and creating programs that give recognition to transit users for reducing pollution and congestion. The second component is establishing policy changes and financial incentives that make alternative modes more attractive. This includes changes in free parking policies and providing price reductions in transit passes.

TDM PROJECTS IN THE UNITED STATES

- **SEATTLE, WA**
  When CH2M Hill moved offices, they offered employees $40 dollars a month if they walked, biked, carpooled, or took transit to work. Percentage of drive alone employees dropped from 89% to 54%.

- **VANCOUVER, BC**
  A property management company was able to eliminate 50 parking spaces after implementing a incentive program. Employees received one 'TavelBuck' each time they used alternative transportation that could be redeemed for goods.

- **ATLANTA**
  The Atlanta Regional Commission, the regional governing body in the Atlanta Metropolitan area, has committed $250 Million to TDM programs over the next 10 years.

1. Effectiveness of TDM Programs

TDM programs are most effective in geographic areas with high employment concentration, especially areas that have companies with over 250 employees. Large companies are often good starting points for TDM programs as coordination and information dissemination tends to be easier. Comprehensive TDM programs that combine amenities, marketing and financial incentives typically reduce SOV commute trips by 10%- 30%. The following chart shows TDM strategies and the corresponding trip reduction percentages.

Figure 31: TDM strategies

Effects of TDM Strategies

TDM Strategy	Automobile Trip Reduction
Financial incentives/subsidies (1997)	3-7% ($1 per day) 6-15% ($2 per day)
Parking cash-out (1997)	10-13% (worksite)
Compressed work weeks (1998)	7-10% (worksite)
Telework (1997)	1-4% (area wide)
Walking/Bicycling improvements (2000)	1-2% (area wide)
Carpooling/Vanpooling programs (1996)	1-3% (area wide)
Marketing and promotion (1996)	1-3% (with other strategies)

Source: Colorado TDM Toolkit

TDM programs are generally more cost effective at reducing SOV than constructing new infrastructure. For example, working with RTD to provide EcoPasses to all employees may produce the same increase in ridership as doubling circulator service at a much lower cost.

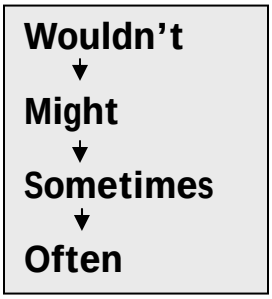
2. TDM Strategies for Inverness Office Park

Most TDM programs take a multi-faceted approach to reducing SOV use. This includes, increasing walking, biking, teleworking, vanpooling and carpooling to reduce congestion and alleviate parking problems. Inverness Office Park, however, does not have congestion and parking problems like many other areas. Instead, Inverness is only concerned with increasing the attractiveness of the new light rail system.

Employees at Inverness can be divided into four categories based on their likelihood of taking transit: Wouldn't, might, sometimes and often. The TDM programs proposed for Inverness are aimed to shift users up into a more likely category. Thus, the TDM program aims to get 'might' users to become 'sometimes' users.

The four strategies proposed are: tax incentives, recognition, marketing, and EcoPasses/ reduced transit fares. These strategies shift the balance to make transit more attractive. The following section describes each concept in more detail.

FOUR ATTITUDES INVERNESS EMPLOYEES CAN HAVE TOWARDS TAKING TRANSIT



Tax Incentives

When hiring employees, employers typically offer a number of benefits including health insurance, dental insurance and retirement accounts. These benefits are provided to the employee tax-free. In 1998, Congress passed TEA-21 which provided big tax incentives to using alternative transportation to work. Section 132 (f) of the Internal Revenue Code allows for an employer to allow for before-tax salary to go towards transit and vanpool expenses. Up to $105 per month can be deducted from an employees paycheck, tax free, to be spent on transit passes. The employer saves on payroll taxes and the employee saves on income taxes. The employee's W-2 reflects a reduction equal to the amount of the savings.

Another employee benefit that is often not considered is a free parking space. Employers pay for this space whether or not employees use this space. Furthermore, employees indirectly pay for the space whether or not they use it through a reduction in salary. One of the most effective TDM tools is reformatting this free parking space to become an elective benefit. Employers that currently offer free parking could instead offer a parking cash out. Here employees choose to take the free parking space, or receive an equivalent dollar amount added to their monthly salary. These programs are usually perceived as fair because it is a discretionary benefit and no one is being force not to drive. According to research done by Donald Shoup of UCLA, parking cash-out programs tend to reduce driving to work by 20%. A parking cash-out program would work best near office buildings that have constrained parking conditions. Even under ample parking conditions, such as in Inverness, a parking cash-out program could make transit more attractive.

Currently, the cash amount replacing the parking space is taxed as income. This money can, however, be used untaxed to purchase transit passes under the Internal Revenue Code 132. Many employers in other areas have established a Transportation Allowance that can be used for parking spaces, transit passes or vanpool fees, with all appropriate tax deductions. Both programs are employer elective. Inverness Office stakeholders should first contact large employees in Inverness Office Park about implementing such a system.

LEARN MORE

Learn all of the technical facts about tax savings through the EPA's parking Cash Out document.

Found on-online at: http://www.bwc.gov/pdf/parkingcash.pdf

Recognition

One of the least expensive TDM strategies is to recognize employees that regularly use transit. Most people, whether or not they use transit, understand the air quality and congestion benefits associated with it. Transit users should be seen by their colleagues as "Good Samaritans" contributing to the societal good. Public recognition could be given in monthly company newsletters, company emails, or announced at company meetings. Plaques hung in the foyer of buildings also area nice touch.

To quantify the benefit of colleagues using transit, NO_x and CO_2 reductions could be calculated and included in the recognition dialogue. Recognition can also be given privately to encourage those who use transit to continue to do so. Department managers could write letters thanking all workers who take transit to work. An appreciative letter form a boss can go a long way.

Marketing

An important part of marketing is distributing quality information to employees. In order for Inverness Office Park employees to use transit, they first must know how it works and where to use it. Employees will need to know details about the new light rail service including where it goes, the hours of operation, how to pay fares, how often trains arrive and how to access the stations. The proposed Call and Ride service to the light rail station is not a typical bus service and may be unfamiliar to many employees. RTD produced a brochure on the U.S. 36 Call and Ride services that explains the service and how to use it. A similar brochure should be produced for the Inverness area.

Besides providing nuts and bolts information on the proposed transit service, marketing can also provide information on the many benefits of using transit. Many people will be surprised to learn about the full costs of driving to work each day, and how much they could save by using transit. As gas prices continue to rise, transit becomes a real financial advantage. Similarly, information should be distributed on the reductions of NO_x and CO_2 by using transit. Other benefits that should be provided include the reduction in automobile crashes, reduced stress, and additional time to read or relax.

Another important part of marketing is promoting transit and shifting public opinions to view transit as more attractive. This type of marketing, called social marketing, attempts to change personal behavior in activities that people support but find difficult to personally follow. Some people may find this to be "brainwashing" but in actuality, several national campaigns have been established over the past two decades that shift public opinion for the greater social good. These campaigns include wearing seat belts while driving, eating a more balanced diet and reduction of tobacco consumption.

Marketing messages can be conveyed in multiple formats and are most effective when a variety of approaches are used. Media formats include brochures, flyers posters, newspaper articles, company emails and websites.

EcoPass

EcoPasses are annual bus passes that are purchased by employers and distributed to employees as a company benefit. The passes are plastic identification cards, similar to a driver's license, and are valid for unlimited rides on all RTD services. The employer is able to purchase these annual passes for much cheaper than individuals because they are purchasing them in bulk.

Research has shown that once passes are distributed, transit ridership increases 50%. Not only do transit passes save employees money, they are also more convenient. Employees do not have to be concerned with having correct change, or inserting coins and bills into fare boxes at each boarding. Furthermore, no transfer slips are needed. The RTD light rail system requires that paper transfers be validated at machines on the LRT platform, which is somewhat of an inconvenience. Almost all employees using the light rail at Inverness will transfer at least once between the Call and Ride service and the light rail and need to use these transfers. EcoPasses allow employees to flash the pass and board.

> FAST FACTS: When employees in downtown Ann Arbor, Michigan were provided a discounted or free transit pass (depending on the level of employer involvement), the estimated effect was a 9.2% increase in daily bus trips and a 3.5% daily decrease in the number of private vehicles coming into downtown between 2000 and 2001. (White,2002)

Source: 2004 FTA TDM Manual

3. Implementation

TDM programs work best with a few large employers in close proximity to each other. Unfortunately, Inverness is composed of dozens of employers that vary widely in size. This makes creating a TDM program more difficult. Despite this difficulty, however, many successful TDM programs have been implemented in areas just like Inverness.

Crucial to a successful implementation in Inverness is the creation of Employee Transportation Coordinators (ETC). These are employees who organize the marketing and outreach efforts at their places of work. Research shows that one hour of coordination per week for one ETC is sufficient to maintain a TDM program for 50 employees.

Primary duties of ETCs are to distribute EcoPasses or transit discounts, increase awareness of transportation options through marketing strategies listed above, and serve as a point of communication for those interested in tax benefits. The following chart describes a typical implementation plan.