

# Smart Travel Options

ORNL COMMUTE REPORT: SURVEY RESULTS AND RECOMMENDATIONS

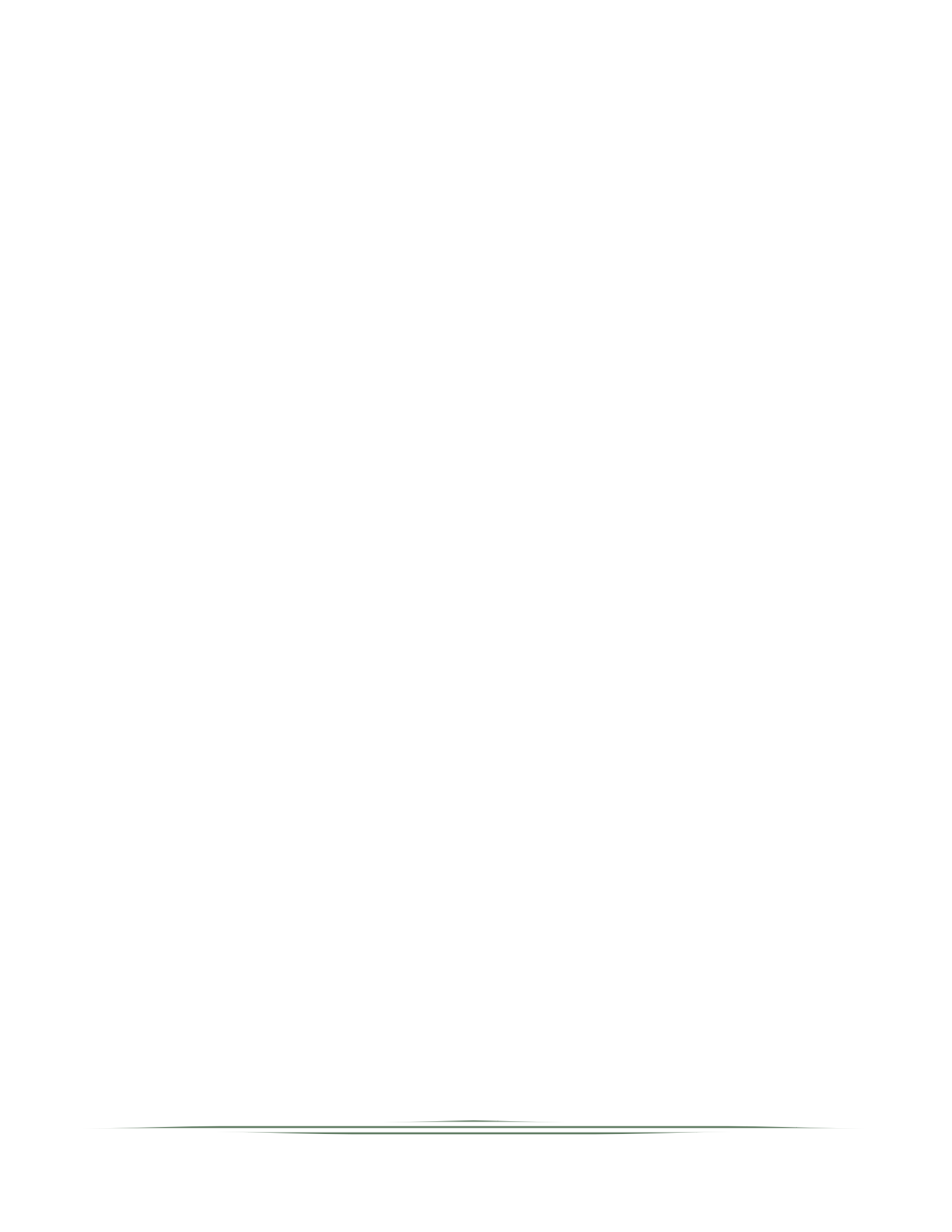


Oak Ridge National Laboratory



Smart Travel Options

April 2010



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# SUMMARY

The process of establishing a Sustainable Campus Program at the Oak Ridge National Laboratory (ORNL) will include the creation and implementation of transportation action programs, including smarter employee commute options as well as conversion of the ORNL vehicle fleets to clean fuels and use of electric vehicles.

An Employee Transportation survey was conducted in fall of 2009 to collect information on the commuting habits of employees, as well as to gain an understanding of the commute changes they would be willing to make as part of the Sustainable Campus Initiative. The collected “market data” included current modes of commute; commute characteristics, such as distance, commute origins, and work times; future modes that staff would consider using; and measures that would motivate staff to try different modes in the future. ORNL employees and subcontractors were invited via a cover letter from the Laboratory Director, Thom Mason, to participate in the on-line survey. There was a 30 percent response rate to the survey, with over 2,400 respondents.

Single-occupant trips made up a significant portion of the daily arrivals to the ORNL Campus (90 percent), which is higher than both the regional (85%) and the national drive-alone rate (75%). The total average weekly rideshare (carpooling) percentage was 4.6 percent, with an additional 1 percent who bicycle to work, for a total alternate mode rate of 5.59 percent. The primary reason that ORNL employees currently rideshare is to reduce the financial cost of commuting (49 percent). Another 2 percent of the survey respondents worked remotely the week of the survey. Employees are driving their cars in order to run errands before, during, and after the workday (44 percent) and to conduct ORNL business (11 percent).

In terms of carbon footprinting, for every mile it travels, the average car in the United States emits about 1 pound of carbon dioxide. Given typical driving distances and fuel-economy numbers, this translates into about 5 tons of carbon dioxide per car per year. Greenhouse gases are estimated by using survey-derived averages of total commute miles (20,239,340 miles), dividing by average fuel economy (21 MPG), and multiplying by the DOE-provided default parameter for estimating CO<sub>2</sub> emissions (19.564). After converting the amount to metric tons, it is estimated that the ORNL annual commute-related CO<sub>2</sub> emission is 8,551 metric tons. This report recommends that ORNL implement an aggressive strategy to shift travel from single-occupant gasoline vehicles to high-occupancy modes, telework, and electric vehicles.

The survey results indicated that work-related trips and vehicle miles traveled (VMT) can be reduced by the development and promotion of an integrated program of clean commute modes and replacing older vehicles with cleaner ones. ORNL employees are motivated by a desire to reduce global warming. Responses indicate that if effective alternatives to driving alone are developed, over half of the employees will use them: 11 percent would carpool, 9 percent would vanpool, and 4 percent would like to bike to work in the future. Employees indicated that the following incentives would help them make a mode shift: a guaranteed ride home (GRH) — 57 percent; bus fare subsidy — 36 percent; vanpool fare subsidy — 35 percent; assistance in finding a carpool — 32 percent; and a priority carpool parking space — 26 percent. The availability of park and ride lots, at which to meet a vanpool, express bus, or carpool, appealed to over half of the respondents.

Over 40 percent of the respondents who currently drive alone in single occupant vehicles reported that they would be very likely to shift to a higher occupancy mode of travel if gasoline prices exceed \$4.00 per gallon. Seventeen percent of the respondents will be motivated to change their commute behavior simply to reduce their carbon footprint. Another 16 percent rideshare because they find it to be convenient. The reduction of the wear and tear and commensurate maintenance is also a motivating factor in making the decision to rideshare for 16 percent.

Respondents expressed a strong interest in greener personal vehicles, as one-third of the survey respondents indicated that their next vehicle purchase is very likely to be electric and another 45 percent feel that such a purchase is somewhat likely. Free charging would enable such a purchase for 65 percent or 1,608 employees, and a preferred parking space would leverage a clean car purchase for 30 percent. Free charging was perceived as being more important than attractive interest rates.

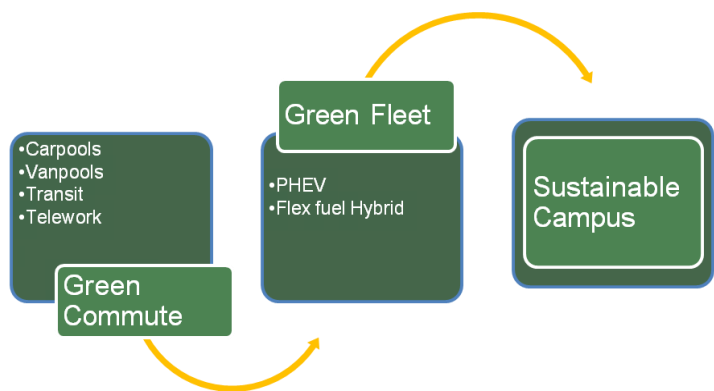


There are multiple reasons for following up on the survey with the implementation of an integrated package of effective low carbon travel measures. Foremost, it will respond to the desire by ORNL staff to have smarter travel choices. It will also assist ORNL in meeting the requirements of Executive Order 13514 to (1) implement transit, travel training, and conferencing strategies to support low-carbon commuting and (2) participate in regional transportation planning, as well Scope 3 greenhouse gas reduction requirements of Executive Order 135143. In addition, roads leading into the campus are becoming congested, so a reduction in the number of vehicles will lead to less congestion and safer operations. The 2008 Average Daily Traffic (ADT) prepared by the Tennessee Department of Transportation for State Route 95 shows 6,666 peak-hour vehicles, while the east portal shows 8,000 ADT and the merge of Bethel Valley Road with Highway 62 shows an ADT of 32,157 vehicles.

Therefore, it is recommended that ORNL develop a Transportation Management Plan (TMP) that will contain the following features. Organizational activities in advancing a TMP through the Sustainable Campus Program will include the following actions:

- Appoint a Transportation Coordinator whose responsibility will be to engage staff and other decision makers and guide overall program implementation.
- In addition to the coordinator, convene an Employee Transportation Council (ETC) composed of representatives from Human Resources, Facilities, and Finance as well as employees who will represent the interests of carpoolers, bicyclists, teleworkers, etc.
- Develop a 10 Year Roadmap for Implementation based on an integrated package of measures. This report documents the measures that will be successful, based on survey response. The survey results also serve as baseline data for benchmarking purposes. The TMP should contain specific, measurable, attainable, realistic, and time-bound targets. The ETC and coordinator will guide the implementation of the STMP and will establish a systematic approach to measuring performance, and thus the impact of the plan on travel behavior and trip-making.
- Commit adequate resources, financial and non-financial, for the implementation of the various strategies.

Given adequate resources and the support of management, it is possible to eliminate up to 1000 vehicles from the campus by the year 2015. The greatest reductions will be achieved through a Green Commute concern shifting of trips from single-occupant vehicles to high-occupant vehicles and teleworking. On-site services, financial commute benefits, priority parking places, guaranteed ride home services, and a continuous marketing program will be required to accomplish this level of reduction. By 2015, many employees will be in the market



to replace their primary commute vehicles, and a high number have indicated that their next vehicle purchase will be either a hybrid vehicle or a plug-in hybrid electric vehicle (PHEV). The greatest gains can be made through the development of incentives that support a Green Commute Fleet in these later years.

By FY 2015		By FY 2020	
Goal: Vehicle Reduction of 1400 Vehicles (28% reduction)		Goal: Vehicle Reduction of 2500 Vehicles (50% reduction)	
STRATEGY	VEHICLE REDUCTION	STRATEGY	VEHICLE REDUCTION
<b>GREEN FLEET</b>		<b>GREEN FLEET</b>	
Hybrid Vehicles	80	Hybrid Vehicles	200
PHEV or all Electric	35	PHEV or all Electric	525
<b>GREEN COMMUTE</b>		<b>GREEN COMMUTE</b>	
Telework	650	Telework	1000
Carpool (430 + 90)	275	Carpool	300
Vanpools (11 full; 28 mini)	290	Vanpools (11 full; 28 mini)	290
Transit (Farragut Express)	40	Transit (Farragut & Oak Ridge)	185
Bicycle	30	Bicycle	50
Supported by financial incentives, priority parking, and strong marketing programs. Other greenhouse gas reductions through on-campus walking, biking, teleconferencing, and eco-driving.		Supported by financial incentives, guaranteed ride home, priority parking and strong marketing programs. Other greenhouse gas reductions through on-campus walking, biking, teleconferencing, and eco-driving.	

# STATE OF THE ORNL COMMUTE

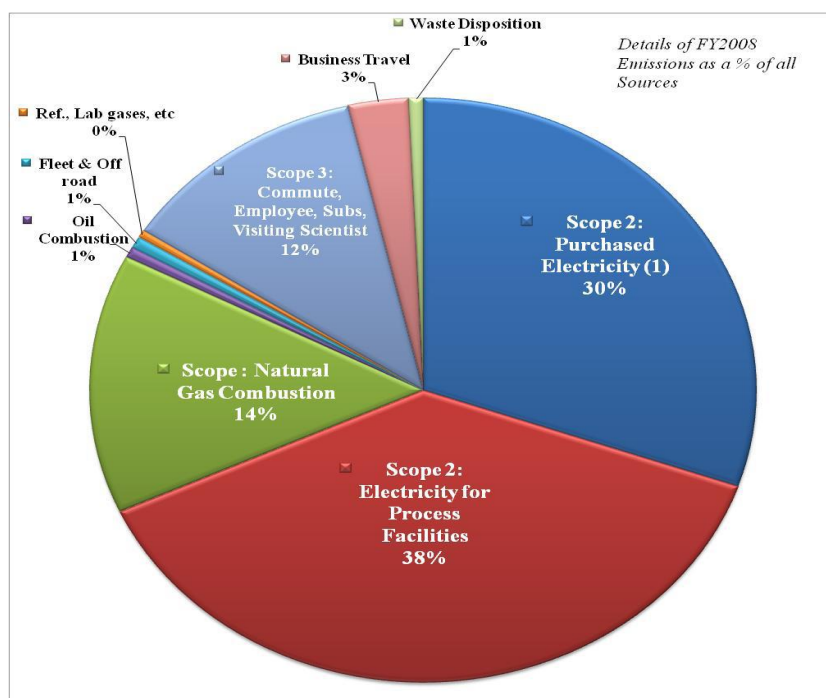
## SECTION 1: PROFILE OF COMMUTE TRAVEL AND CURRENT TRENDS

An immense and ever-growing body of scientific evidence concludes that overreliance on fossil fuels is destabilizing the climate and causing the planet to warm at dangerous rates. The environmental impact of over 4,500 commuting employees of the Oak Ridge National Laboratory (ORNL) includes fuel consumption, greenhouse gas (GHG) emissions, and land consumed for parking and road infrastructure, which is substantial. In recognition of this, ORNL has embarked on a 10 year Sustainable Campus Initiative to minimize global warming emissions, with transportation as a key element in the initiative. As part of this initiative, an inventory of ORNL's annual GHG emissions was conducted which revealed that the transport sector comprises 16 percent of the Laboratory's total GHG emissions.

Commuting to and from work has an immense impact on both the environment and on people's quality of life. Figure 1 shows the total estimated ORNL-generated GHGs, 12 percent of which is commuter-related Scope 3 GHG. The ORNL fleet and off-road equipment account for an additional 1 percent and employee-related business travel accounts for 3 percent, for a total transportation GHG count of 16 percent.

The process of establishing and maintaining a Sustainable Campus will include the establishment of

**Figure 1. Details of FY 2008 Emissions as a Percent of All Sources.**



commute options for the employees and the conversion of employer vehicle fleets to clean fuels, as well as the establishment of a regional consumer market for electric vehicles. As a foundation for the creation of new programs and services, an Employee Travel Survey was conducted in September 2009 to collect "market data" on current modes used to commute; commute characteristics, such as distance, commute origins, and work times; attitudes; future modes that staff would consider using; and measures that would motivate staff to try different modes in the future. ORNL employees and subcontractors were invited via a cover letter from the Laboratory Director, Thom Mason, to participate in an on-line survey. There was a 30 percent response rate to the survey, with over 2,400 respondents. A copy of the on-line survey questionnaire is attached as Appendix A. Survey results will guide the development of a long-term (10 Year) tiered strategy for Sustainable Transportation. Progress will be tracked through periodic follow-up surveys so that longitudinal results can assist in fine-tuning and improving the

commute program. Survey results assisted in the development of Recommendations, which are presented in Part 2 of this report. As background, Figure 2 describes the various alternatives to driving alone.

Figure 2.

## ALTERNATE MODE CHOICES

**TRANSIT** — Examples of transit include: public transit service along fixed routes; public commuter express service that is designed to bring employees from centralized pick-up points in or near residential areas to major employment centers; corporate-operated transit service which is customized to the needs of employees; and high-occupancy services, such as bus rapid transit or commuter rail.

**CARPOOLING** — Carpooling can be as simple as two employees or neighbors who live near one another sharing the ride to work on an informal basis. When two or more commuters share a ride in a car, they are carpooling. Employers can assist in the formation of carpools by matching employees who live near each other into groups that may be able to share a ride. Employer strategies to encourage carpooling include ride-matching, preferential parking, and parking cash-out. Conditions which foster ridesharing include not having an available car, a long commute, tight parking supply, limited transit service, high concentrations of employees in a general work area, and/or residential concentrations of employees.

**VANPOOLING** — A vanpool is a group of up to 15 employees riding together in a van on their daily commute to and from work. One member of the group volunteers to drive the other vanpool participants to and from work and their residences or a common pickup area, such as a Park and Ride lot. Vanpools are organized according to where commuters live and work, in order to most efficiently coordinate trips. Each passenger pays a monthly fare, which covers the cost of maintenance, insurance, and fuel. Employers or employees can own the van or lease the van from a “third party” vendor. The highest potential for successful implementation of a vanpool is among employees who live 20 or more miles from work and who have travel times of 30 minutes or greater.

**NON-MOTORIZED** — Walking or riding a bike to work is an option for employees who live close to their workplaces. Employer strategies to encourage bicycling and walking include safe and secure storage for bicycles, shower and locker facilities, and parking cash-out. There are three important ways in which bicycle and pedestrian facility improvements may be implemented: as a primary mode of access to the worksite; as a feeder mode to connect with transit or ridesharing modes for longer trips; and as circulation within a worksite.

## ALTERNATE LOCATION CHOICES

**"LIVE NEAR YOUR WORK"** — Programs providing incentives for employees to live near their place of employment, which reduces vehicle miles of travel. This is also known as Jobs-Housing Balance. Examples of employer assistance include down payment assistance, location-efficient mortgages, and rent subsidies.

**ON-SITE SERVICES** — Provision of services for employees on-site to eliminate the need for employees to have their cars at work every day. Examples include cafes, daycare, banking/ATM, dry cleaning, and more.

**TELEWORK** — Telework brings the job to the person rather than bringing the person to the job. In addition to eliminating the daily commute, it can reduce the demand for office space and parking facilities. Telework or telecommuting is the substitution of communications technology for travel to a work location. Location is not critical to job performance, and communications technology can replace the commute trip.

## COMMUTE MODE

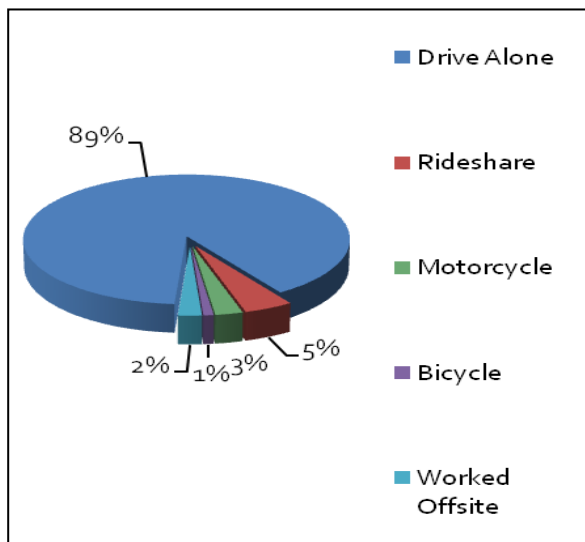
The majority (89.6 percent) of the ORNL respondents drove alone to work the week of the survey. About 4.6 percent used some form of alternative ridesharing, such as carpooling and vanpooling. Less than 1 percent bicycled to work. The total average weekly rideshare (carpooling) percentage was 4.6 percent, and 1 percent bicycling to work, for a total alternate mode rate of 5.59 percent. As shown below, another 2 percent of the respondents worked remotely the week of the survey. Workers were most likely to rideshare mid-week, drive alone on Monday, and to work off-site on Friday.

**Table 1. Current Commute Modes**

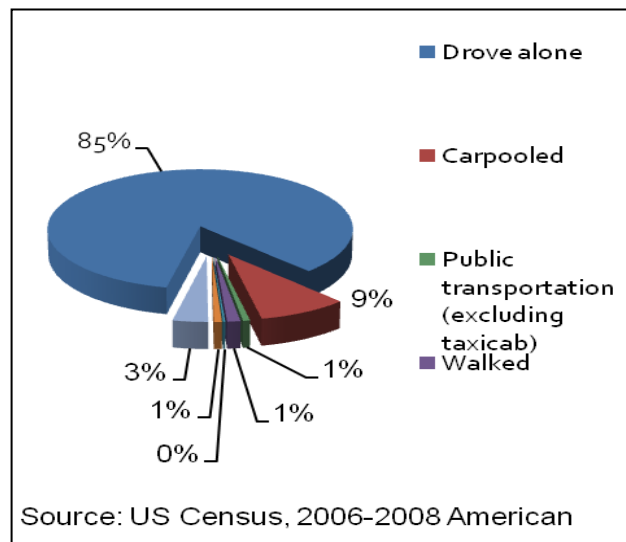
Mode	Mon.		Tues		Wed.		Thur.		Fri.		TOTAL
	N	%	N	%	N	%	N	%	N	%	
Drive Alone	2252	89.97%	2240	89.28%	2242	89.61%	2242	89.68%	2162	89.38%	89.58%
Rideshare	110	4.39%	119	4.74%	122	4.88%	117	4.68%	108	4.46%	4.63%
Motorcycle	57	2.28%	71	2.83%	65	2.60%	67	2.68%	63	2.60%	2.60%
Bicycle	26	1.04%	24	0.96%	20	0.80%	22	0.88%	27	1.12%	0.96%
Worked Offsite	58	2.32%	55	2.19%	53	2.12%	52	2.08%	59	2.44%	2.23%
<b>TOTAL</b>	<b>2503</b>		<b>2509</b>		<b>2502</b>		<b>2500</b>		<b>2419</b>		

ORNL employees are more likely than the regional commuter population to drive alone to work (89 percent vs. 85 percent). The regional rideshare population is almost double that of ORNL, although ORNL has higher participation in motorcycle and bicycling commuting. Both the Knoxville region and ORNL have higher percentages of single-occupancy vehicles (SOVs) and lower levels of ridesharing and transit use than the national average. The national drive-alone rate was 75.8 percent; two-person carpools make up 10.6 percent of the commute mix, 4 percent ride transit, 4 percent work at home, and 2.8 percent walk to work.

**Figure 3. Current ORNL Commute Modes**



**Figure 4. Knoxville Urbanized Area, Commute Modes**



## VEHICLE OCCUPANCY

In comparison to the 2,227 employees who were single-occupant commuters, only 149 rode in some combination of a high-occupancy mode the week of the survey. Over 90 percent of these were carpools, as shown in Table 2. The majority of the carpools are composed of two individuals.

1 Person	2 Person Carpool	3+ Carpool	Vanpool
2227	116	19	14

A proven measure for corporate support of carpooling is to provide preferential parking places for carpools and vanpools at desirable locations near building entrances and other convenient locations. ORNL provides 18 carpool spaces on the Main Campus, all of which are designated for 3+ person carpools. However, according to campus personnel, there are actually only a few current carpool permits, all of which will expire in June 2010. On any given day, at least half of the priority spaces are used by non-authorized single-occupant vehicles.

## REASONS WHY EMPLOYEES DRIVE ALONE

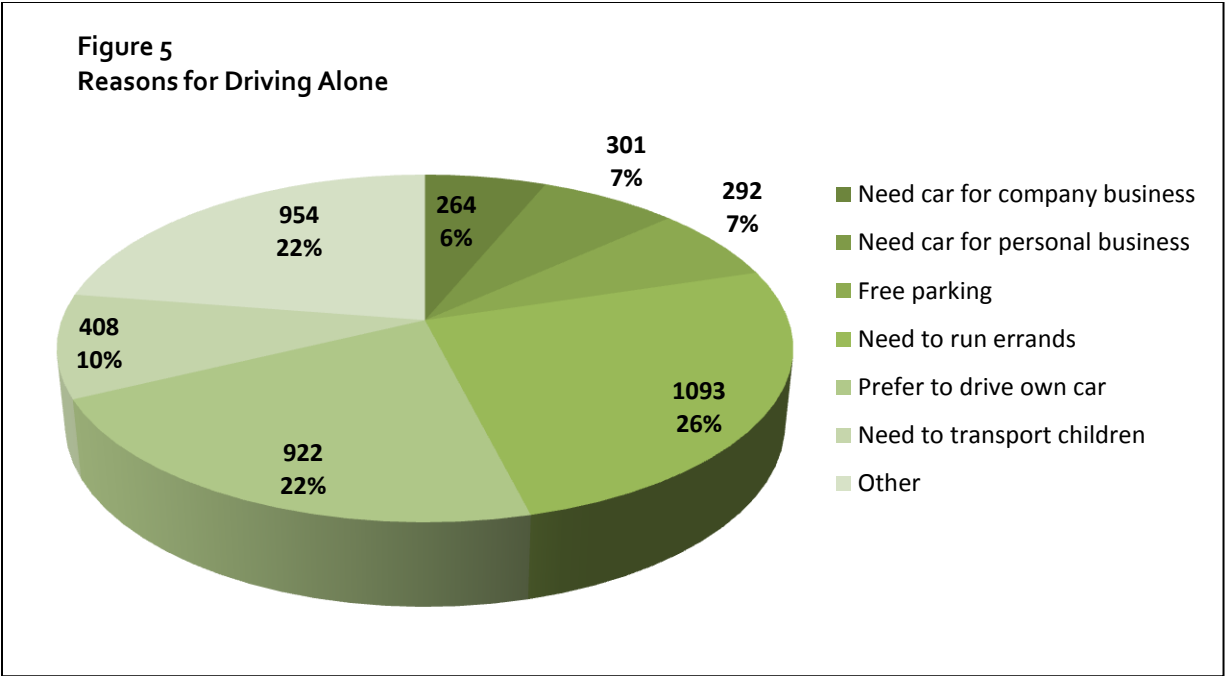
The primary reason given by respondents for driving alone in a single-occupancy vehicle is their need to have access to a personal vehicle with which to run errands before, during, and after the workday (44 percent). Child-related transport responsibilities accounted for 16.5 percent of commuting alone. Almost 11 percent of respondents drive alone in order to use their vehicle for ORNL business, while 12 percent need their vehicles to conduct personal business. The availability of free parking is an incentive for commuting alone for 12 percent of respondents. National research indicates that free parking is a key factor in enabling single-occupancy-vehicle use.

Write-in comments provided additional insight into why employees prefer to drive their personal vehicles to and from work. Inconvenient and irregular work schedules, in addition to wanting flexibility, were listed as write-in reasons by almost 15 percent of the respondents. Needing a vehicle in the event of an emergency due to caring for ill parents, spouses, or handicapped children was identified by 35 drive-alone commuters.

The lack of realistic, convenient, and reliable alternatives to driving alone and difficulty in finding someone with whom to carpool was cited by 9 percent. Several people also expressed disappointment in the lack of commute options.

Other respondents tried but have not been successful in finding a match through the current ORNL rideshare system. A handful of former carpools reported that they ceased to share rides after ORNL stopped recognizing two-person carpools as eligible for priority parking spaces.

Unpredictable work schedules, inability to find a vanpool or someone to carpool with, lack of any public transportation to ORNL, lack of convenience when pooling, greater flexibility of having immediate access to a vehicle, and lack of mode choice were frequent write-in comments.



**REASONS WHY EMPLOYEES RIDESHARE**

The high-occupancy-vehicle commuters were asked why they choose to carpool or vanpool. Primary reasons for using an alternate mode were to save money (49 percent); reduce wear and tear on the personal vehicle (16 percent); for its convenience (16 percent); and to save energy (12 percent). These survey results indicate that marketing messages and promotional literature should highlight the financial benefits of ridesharing and should not put too much emphasis on the reduction of commute-related stress or the avoidance of driving in congestion conditions. The staff who are currently sharing rides are not likely to do so in order to improve air quality, reduce stress, or for recognition from the company.

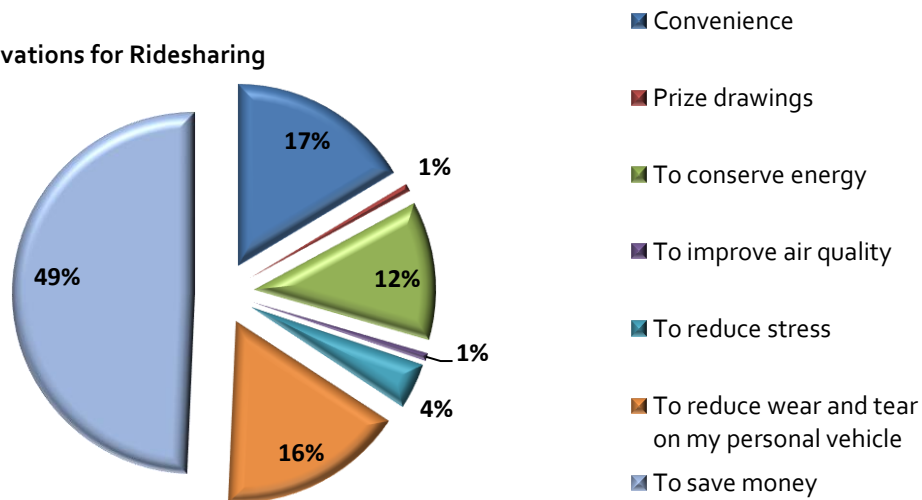
In most metropolitan areas, workers arrive at work as stressed as they will be all day. Therefore, they are motivated to rideshare in order to avoid driving in congested conditions and reduce congestion-related driving stress. Congestion and stress do not appear to be factors in the commute choice decisions made by ORNL employees. Virtually no one is motivated by prizes or recognition.

	No.	Percent
For the Convenience	24	16.44%
For the Prize drawings	1	0.68%
To conserve energy	18	12.33%
To improve air quality	1	0.68%
To reduce stress	6	4.11%
To reduce wear and tear on my personal vehicle	24	16.44%
To save money	72	49.32%



**Figure 6**

**Current Motivations for Ridesharing**



**LENGTH OF COMMUTE**

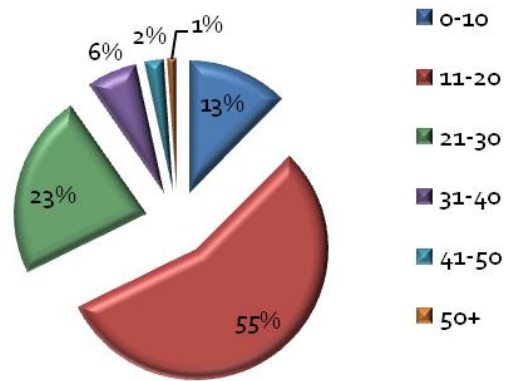
Distance/Miles

Over half of the respondents (55 percent) have a one-way commute between 11 to 20 miles. Another fifth have a one-way commute of 21 to 30 miles. Thirteen percent travel between 1 and 10 miles to or from work. Three percent are long-distance commuters, with one-way commutes of over 40 miles each day.

**Table 4. One-Way Commute Distance**

Commute Miles (One Way)	Number
0-10	307
11-20	1367
21-30	559
31-40	154
41-50	58
50+	27

**Figure 7. Commute Distance One-Way Miles.**

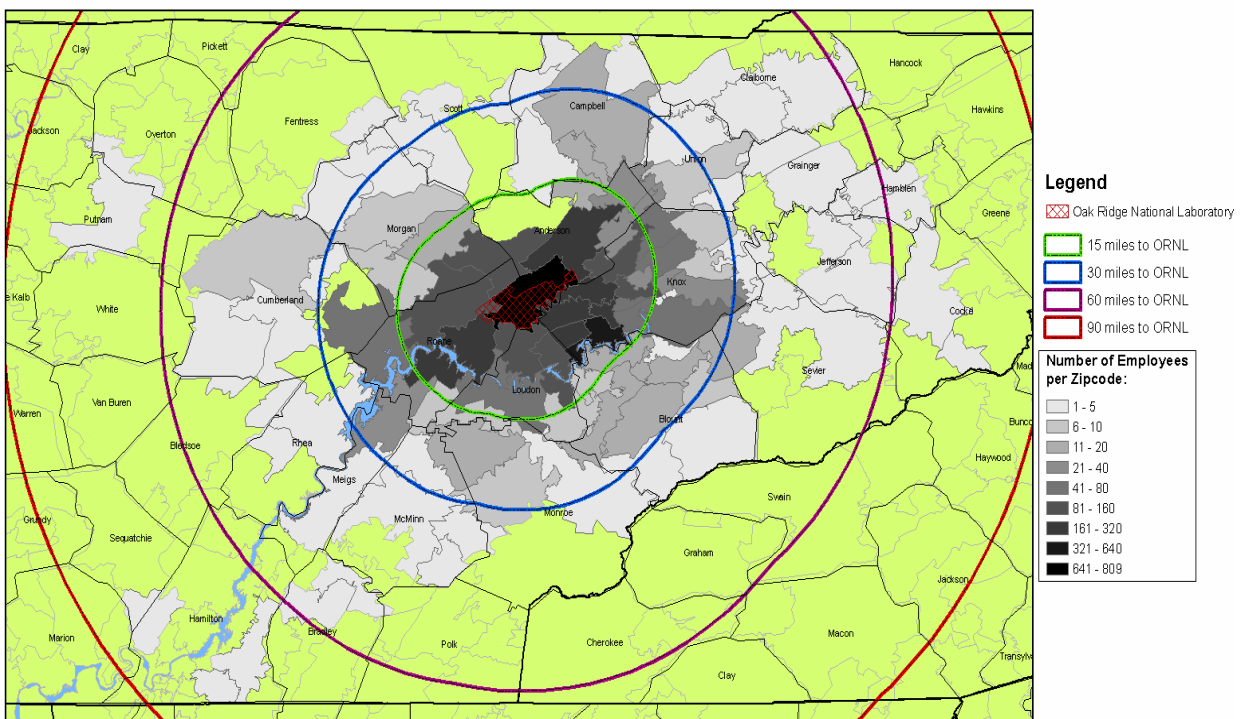


The average one-way commute is almost 18 miles or (36 miles round trip). For a 5 day drive-alone period, the weekly average round trip would be 180 miles. For an average year, with 221 working days, assuming that employees drove alone, the average annual commute miles would be 7,956 miles. The estimated cumulative commute miles, is over 20 million miles.

About 10 percent of the respondents were long-distance commuters (over 30 miles one way). These long-distance commuters are a good market for vanpools.

Data collected on employees by zip codes shows the employees by residential density. The majority of ORNL staff lives in the zip codes that are contiguous to ORNL, which logically puts them into a 15 minute “commute shed.”

**Figure 8. How Far Do Oak Ridge National Laboratory Employees Commute?**



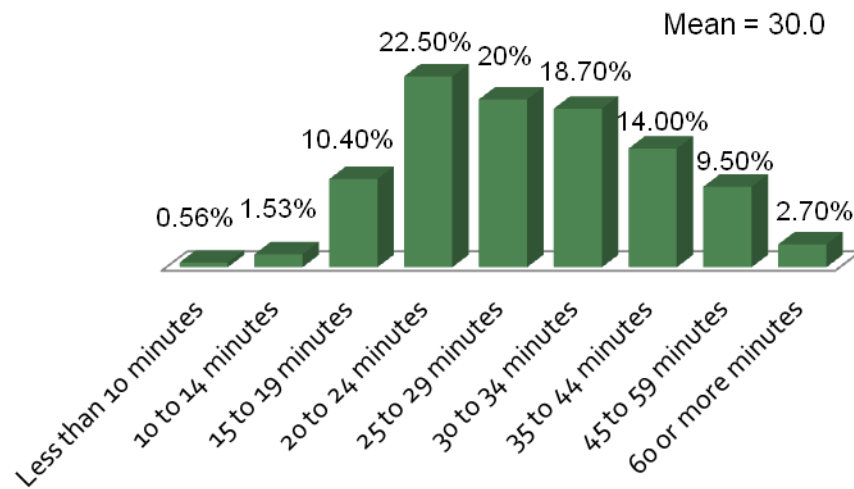
### Commute Time/Minutes

ORNL survey respondents have longer commute travel times compared with the regional commute travel times. The significance of the longer commute times is that more employees will fall into the market for carpooling, vanpooling, and transit. Longer commute times work against walking and bicycling.

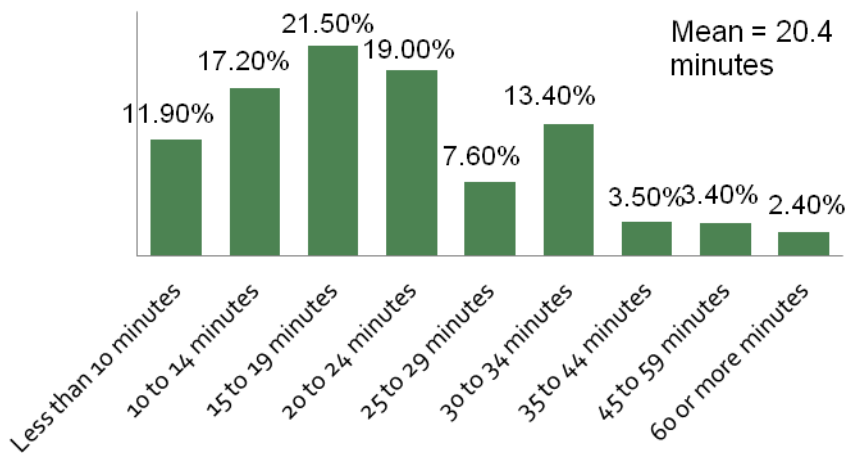
Commuters with commutes that are less than 10 miles or that require 20 minutes to get to work are less likely to carpool and more likely to drive their own cars. Commuters who live very close to work and have a commute under 10 minutes are candidates for bicycling and walking.

Vanpooling is ideal for employees who live at least 20 miles or more from the workplace.

**Figure 9. ORNL Travel Time to Work**



**Figure 10. Knoxville Area Travel Time to Work**



**TIME CHOICE AND WORK LOCATION**

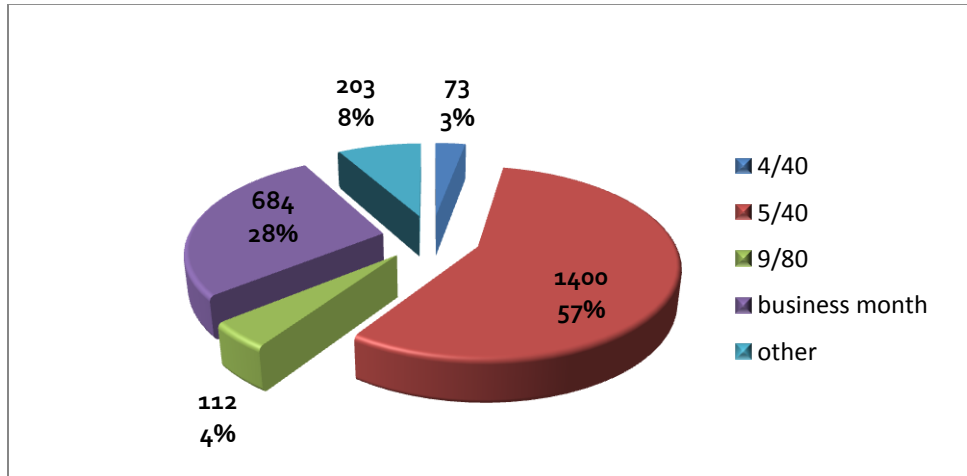
When employees “get to work” is a function of both mode and schedule. Employers who offer flex-time and alternative work schedules allow employees to plan their travel around peak commute times, thus reducing both travel time for the employee and peak period congestion for the community.

Sometimes, flexible work hour schedules help family members or neighbors share a ride; in other instances, flexible hours can discourage the use of alternatives because transit and vanpool schedules are largely set. In any event, employees tend to prefer flexible work hour arrangements because they allow for better management of personal time and responsibilities, such as family and outside activities.

Over half of the respondents (57 percent) work a traditional 5 day, 40 hour work week, which normally would be conducive to carpooling, vanpooling, or taking transit. However, the frequent occurrences of

working late or coming in early is disruptive to sharing rides among ORNL staff. The next most prevalent arrangement is the business month, which is worked by 28 percent of the respondents.

**Figure 11. Type of Work Arrangement**  
N-2472.



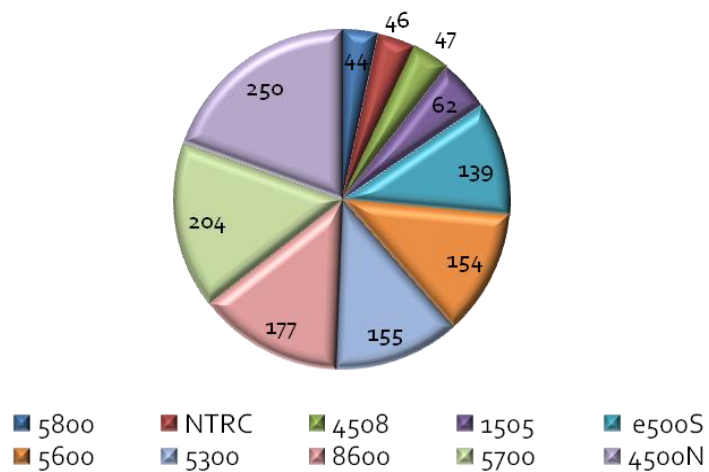
**WORK LOCATIONS**

Although respondents identified 248 campus building locations, over half of the respondents were clustered in 10 buildings. This concentration of employees is an advantage for formation of carpools and vanpools, as well as locating transit stops.

**Table 5. Building Locations**

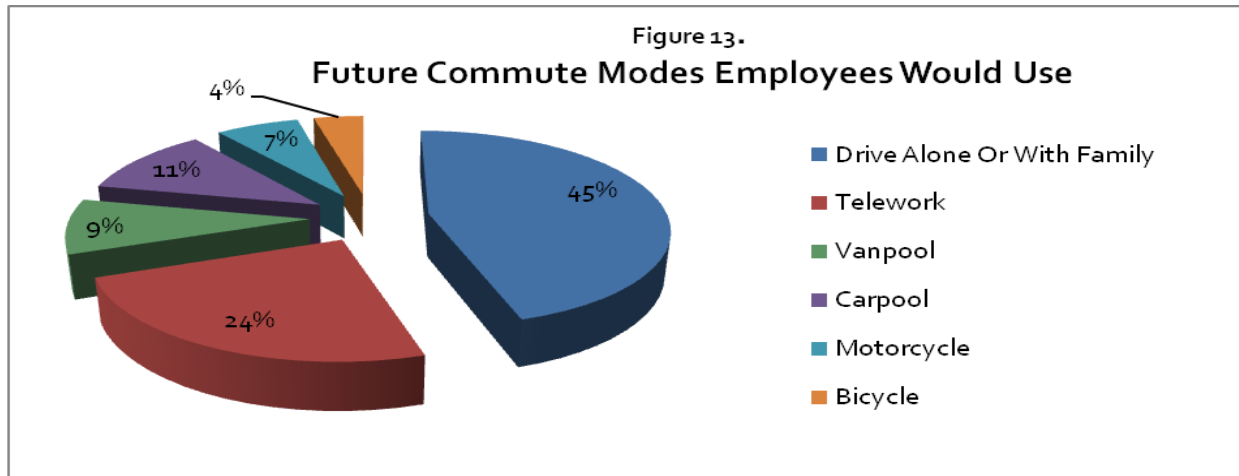
Building	N-2472	Percent
4500N	250	10.11%
5700	204	8.25%
8600	177	7.16%
5300	155	6.27%
5600	154	6.23%
4500S	139	5.62%
1505	62	2.51%
4508	47	1.90%
NTRC	46	1.86%
5800	44	1.78%

**Figure 12. Building Locations.**



## SECTION 2: FUTURE COMMUTE PREFERENCES

Respondents were asked whether they would shift from an SOV mode in the future. Over half (55 percent) of the total respondents indicated that would use another mode to commute other the single occupant vehicle. Over one-fourth of the respondents cited teleworking as their most popular future choice. The next most frequently cited future mode was carpooling (11 percent). Vanpooling is of interest to 9 percent (378) of the respondents. To put that number in perspective, if all 378 would join a 15-person vanpool, a total of 352 vehicles would be reduced/eliminated (this number assumes a full ridership per van). In addition to the 55 percent who would use an alternate mode, another 96 percent indicated that they might use one in the future. Incentives and disincentives are important in changing the mode use of these staff. The number of employees who indicated that they might use another mode is strong in the areas of vanpooling (29 percent) and carpooling (34 percent). An aggressive commute choice program with financial incentives and parking preferences would prove instrumental in moving these maybes into a higher occupancy vehicle.



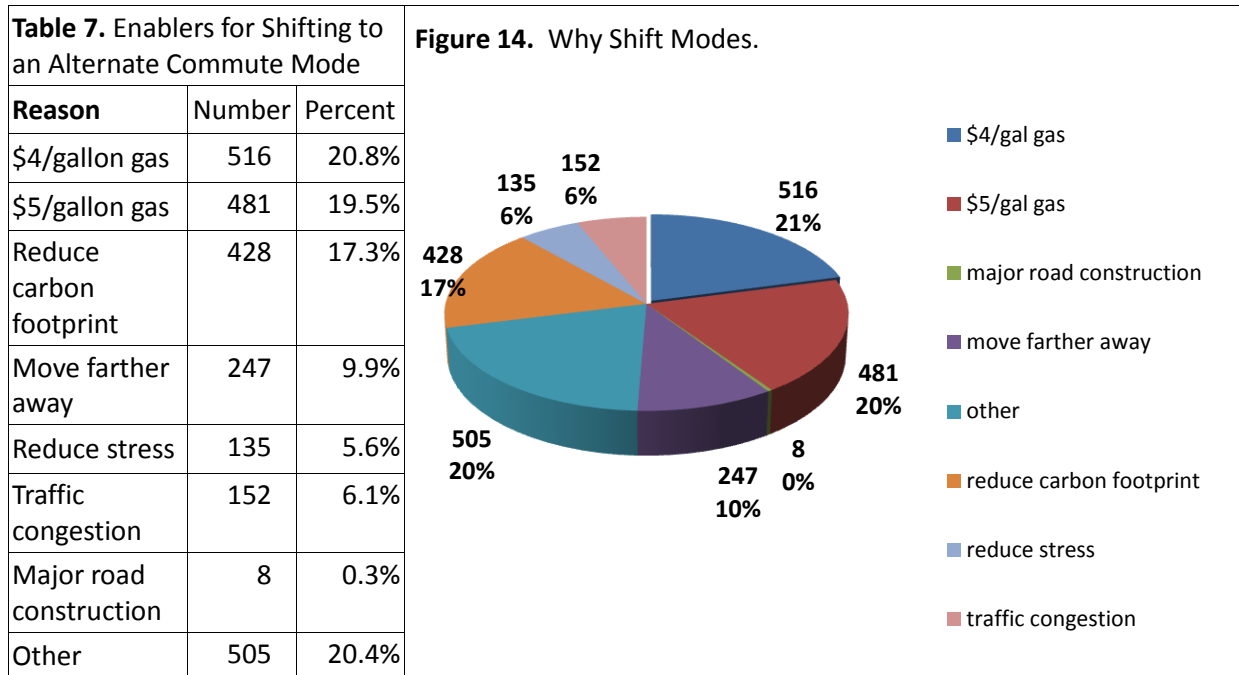
**Table 6.** Commute Modes That ORNL Workers Would Consider Using in The Future

Mode	Would Use		Might Use		Would Not Use		TOTAL
	N	%	N	%	N	%	
Drive Alone	1901	45%	81	4%	28	1%	2010
Telework	1019	24%	333	16%	412	11%	1764
Vanpool	378	9%	616	29%	378	10%	1372
Carpool	469	11%	720	34%	586	16%	1775
Motorcycle	278	7%	137	7%	1152	31%	1567
Bicycle	166	4%	212	10%	1159	31%	1537
Total	4211		2099		3715		

Only 11 percent indicated that they would not want to telework in the future; 10 percent would not vanpool; and 16 percent would not carpool. These numbers indicate that aggressive marketing and a

program of supportive incentives could result in a high market penetration rate for telework, vanpooling, and carpooling.

Table 7 presents reasons that respondents would consider a shift of modes in the future. Future fuel increases to \$4 and \$5 per gallon would motivate mode shift. Fuel costs of \$4 per gallon could motivate one-fifth of the respondent to begin to take transit or rideshare, whereas a jump to \$5 per gallon gas would bring another 19 percent into a high-occupant mode. About 17 percent will change their commute behavior in order to reduce global warming. Therefore, the rideshare match site and other internal ORNL communication mediums should contain calculators for estimating the carbon footprint reduction impact of travel behavior changes.

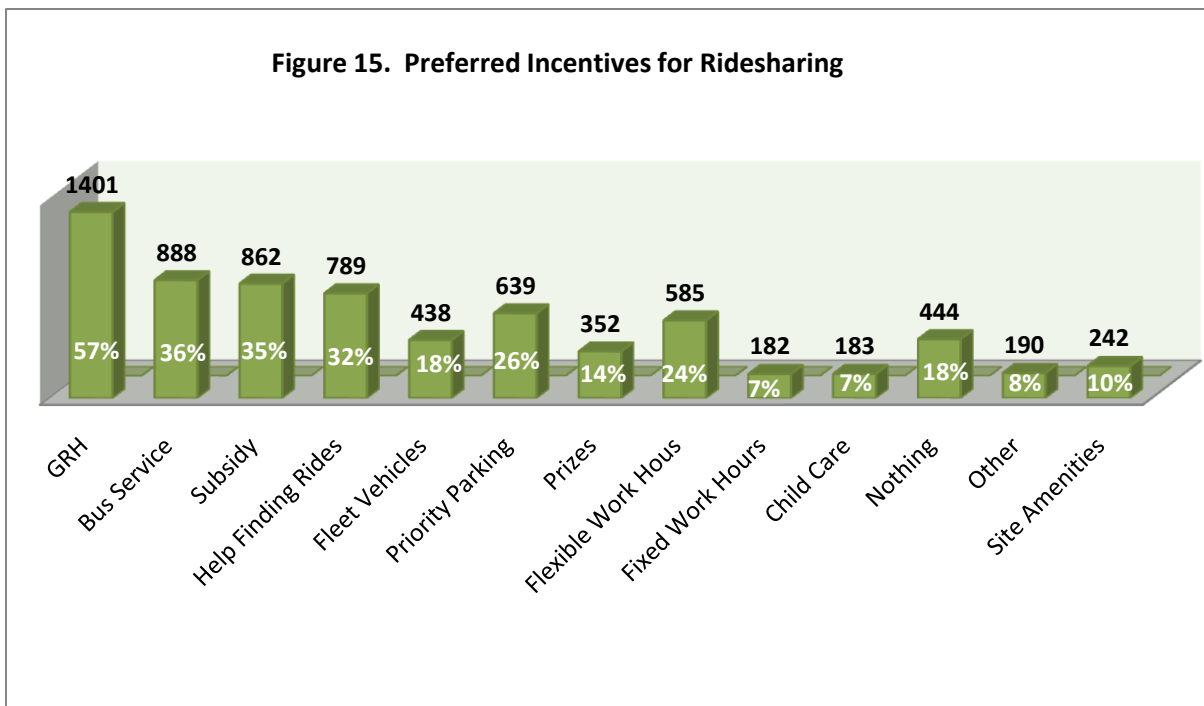


### INCENTIVES FOR HIGH-OCCUPANCY-VEHICLE USE

The convenience and comfort of a private automobile is undeniable; therefore, if it is important for environmental or business reasons to reduce auto use, positive incentives must be applied that will reduce the need to travel. In all, 82 percent of the respondents identified some measure or combination of measures that would enable them to switch to a high occupancy mode of travel. The incentive that the greatest number of respondents' state will enable them to begin to share rides is a guaranteed ride home (GRH). This was cited by 888 employees or 57 percent. A GRH program provides a free ride home, either in a taxi or a rental car, in the event of a family emergency, ensuring that employees who rideshare can respond to sick children, etc. Smart Trips provides a GRH service. Alternatively, ORNL could establish a service using its own vehicles. Another desirable incentive is access to convenient transit service (36 percent).

Additional employer-provided incentives that were identified by staff as enablers for ridesharing were financial subsidies for vanpoolers, assistance in locating people with whom to share a ride, access to

priority parking spaces for carpools and vanpools, and flexible work hours. Eighteen percent of the respondents could not identify any incentives that would motivate them to share rides.



Improving the website and holding on-site promotions are low-cost measures that could meet the desire for assistance in finding rideshare partners. Over one-fourth of the respondents would be encouraged to rideshare if they could have an assigned parking space.

Another effective enabler for ridesharing is having convenient staging places, known as Park and Ride lots, where commuters meet their carpools, vanpools, or express buses. In response to a question about the willingness to use a regional Park and Ride lot from which to stage an alternate commute, 38 percent of the respondents reported that they would use such a lot and another 34 percent said that they might use one while 28 percent were not interested.

**Table 8. Likelihood of Using a Park and Ride Lot in the Future**

Would Use		Might Use		Would Not Use		TOTAL
N	%	N	%	N	%	
713	38%	653	34%	529	28%	1895

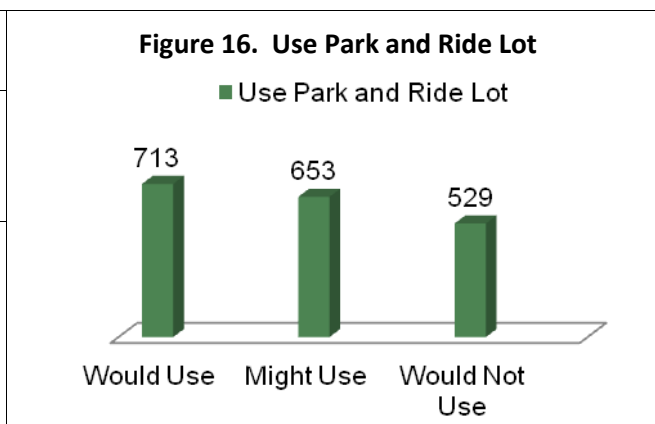
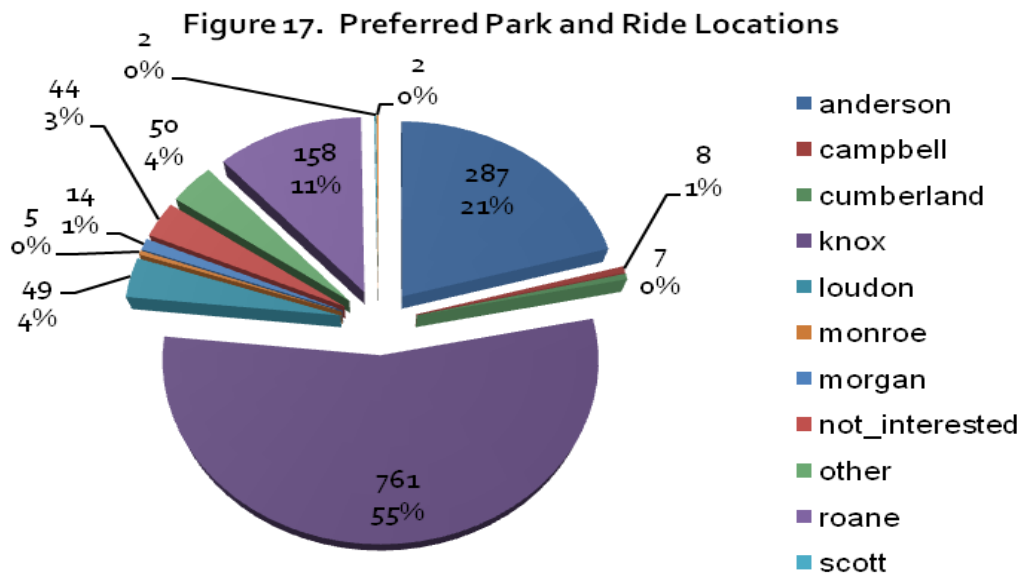


Table 9 shows the preferred county locations for the establishment of these regional Park and Ride lots. Within the primary locations—Knox County (761 commuters), Anderson County (287 commuters), and Roane County (158 commuters)—more specific site locations gathered from write-in comments are provided. Within Knox County, write-in comments suggested the creation of gathering places in Karns; Powell; Solway; Hardin Valley; Middlebrook Pike; Cedar Bluff; Farragut; and the Lovell Road area. Initial efforts to create a regional Park and Ride network should concentrate on these areas, using informal arrangements at shopping centers, churches, and other places with adequate daytime parking spaces and good lighting.

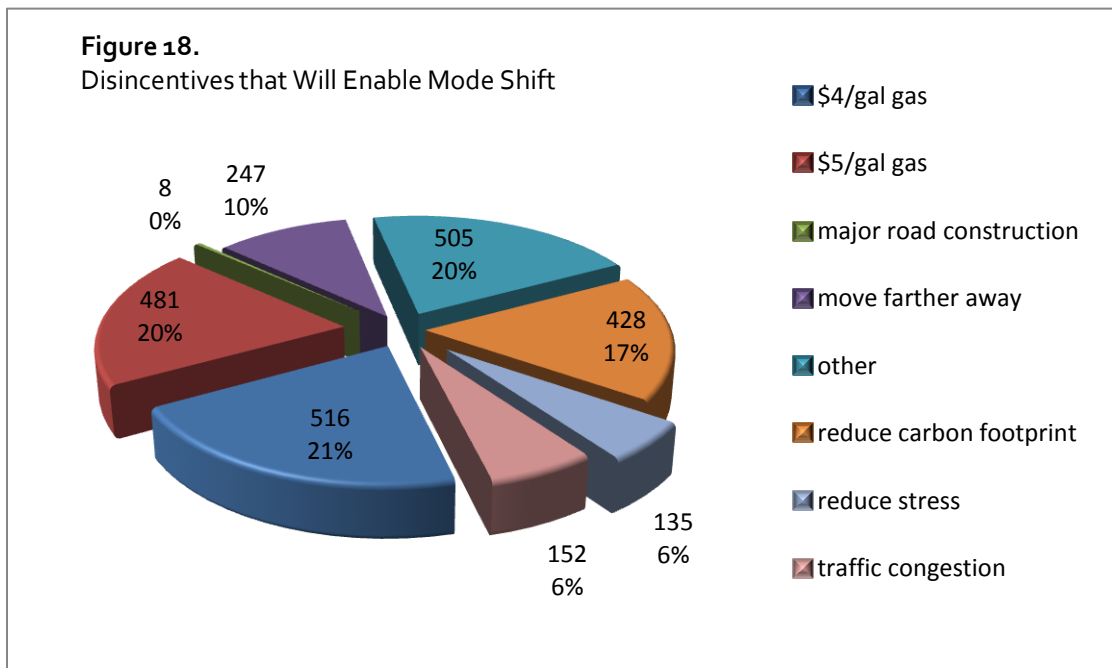
County	Number	Percent
Anderson	287	20.69%
Campbell	8	0.58%
Cumberland	7	0.50%
Knox	761	54.87%
Loudon	49	3.53%
Monroe	5	0.36%
Morgan	14	1.01%
Roane	158	11.39%
Scott	2	0.14%
Union	2	0.14%
Other	50	3.60%
Not interested	44	3.17%





## DISINCENTIVES THAT WOULD INCREASE HIGH-OCCUPANT-MODE USE

A combination of positive incentives, as well as disincentives, is needed to change travel behavior. Over 40 percent of the single-occupant drivers would be motivated to try ridesharing if fuel costs increased to \$4.00 or \$5.00 per gallon. About 20 percent would switch at \$4 per gallon, and another 20 percent would be motivated at the \$5.00. A significant number of employees (428) would also be motivated to change their travel behavior in order to reduce their carbon footprint. Although the question was not posed on the survey, it is highly likely that the loss of free parking or scarcity of parking would also compel a change in commute behavior.



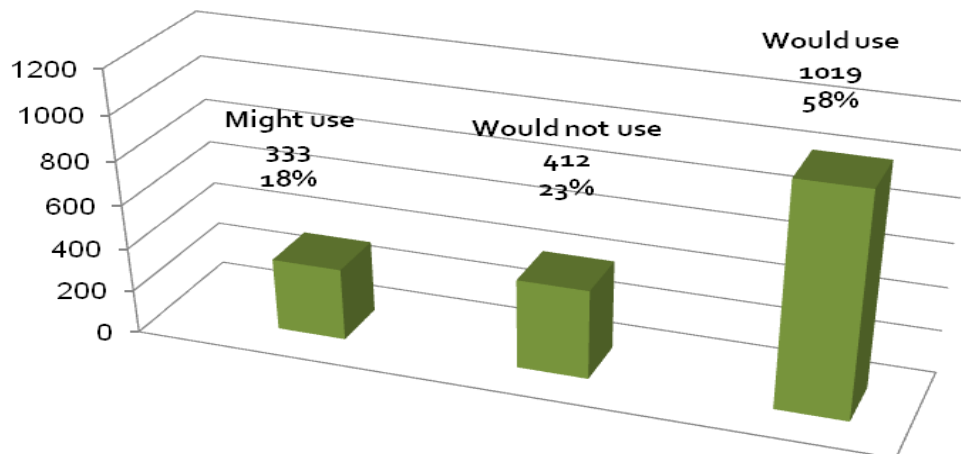
## STAFF INTEREST IN TELEWORK OPTIONS

Telework—meaning work that is performed at an employee’s home or at a work location other than a traditional office—has gained widespread attention over the past decade in both the public and private sectors, offering a variety of potential benefits to employers, employees, and society. The Office of Personal Management defines telework as “work arrangements in which an employee regularly performs officially assigned duties at home or other worksites geographically convenient to the residence of the employee.”

Essentially, telework is simply a way of getting work done from a different location, or moving the work to the worker, instead of the worker moving to work. Telework is considered to be a commute option, and it highly recommended since it removes or eliminates a trip and related vehicle miles of travel and related air pollutants.

Well over half (58 percent) of the ORNL survey respondents indicated a willingness to telework, while an additional 18 percent said that they might try teleworking. Twenty-three percent of the respondents do not want to try to telework.

**Figure 19. ORNL Staff Interest in Teleworking**



The write-in responses to under what conditions would you telecommute showed that an overwhelming number of workers want to work at home as frequently as allowed. Another subset indicated that due to the nature of their job, they would want to telework only 1 to 2 days a week.

The four largest barriers to telework, as identified from the write-in comments, were the following:

- perceived lack of supervisor permission and support;
- the need for proper equipment and high-speed connections at home;
- concern that the loss of “face time” with their peers and superiors would impact their careers; and
- the need for being in a lab environment close to their work would prohibit them from participating in a telework arrangement.

The adoption of policies and implementation of a formal telework program can address most of the above issues and barriers.

Last, many people indicated that they would be happy and would prefer to only telework 1 to 3 days per week. If everyone who said that they would telework (1019) did so for 1 day a week, at the average round trip vehicle miles traveled of 36 miles, that amounts to 36,720 fewer miles each week, or 1.9 million fewer miles a year.

## ORGANIZATIONAL BENEFITS OF TELEWORK PROGRAMS

The following figure presents many of the documented benefits of telework arrangements.

**Figure 20. Benefits of Telework Programs**

<b>Productivity</b>	<b>Flexibility</b>
More Work Accomplished <ul style="list-style-type: none"> <li>- Greater Focus</li> <li>- Fewer Distractions</li> <li>- Greater Efficiency</li> <li>- Commute Time Savings</li> <li>- Less Stress</li> <li>- Flexible Work Schedule</li> </ul>	Less Down Time <ul style="list-style-type: none"> <li>- Ability To Work on Snow Days</li> <li>- Ability To Work During Sick Leave</li> <li>- Ability To Work Remotely</li> <li>- Ability To Return To Work for Injured Employees</li> </ul>
<b>Cost Efficiency</b>	<b>Human Resources</b>
Reduces Hiring and Replacement Costs <ul style="list-style-type: none"> <li>- Relocation Costs — Hiring Expenses</li> <li>- Training Time and Expense</li> </ul> Reduced Unscheduled Absences <ul style="list-style-type: none"> <li>- Less Down Time</li> <li>- Reduced Costs Associated with Unscheduled Absences</li> </ul> Real Estate Savings <ul style="list-style-type: none"> <li>- Reduced Office Space</li> <li>- Increased Parking Efficiency</li> <li>- Shared Work Space</li> </ul>	Retention and Attraction <ul style="list-style-type: none"> <li>- Retention of Key Employees</li> <li>- Retention of Employees Relocating</li> <li>- Attraction of Employees Seeking Flexible Arrangement</li> </ul> Wider Labor Pool <ul style="list-style-type: none"> <li>- Access To Workers in Larger Geographic Area</li> <li>- Attract And Retain Qualified Persons with Physical Disabilities</li> </ul> Less Absenteeism <ul style="list-style-type: none"> <li>- Ability To Work without Infecting Others</li> <li>- Ability To Work Outside of Traditional Office Hours</li> </ul>
<b>Teleworking has been documented to help employees:</b>	
Reduce commute time, costs, and stress	Balance work and home life more easily
Increase job satisfaction	Maintain better health
Increase productivity	Value, and remain with, the organization
<b>Telework also has community-wide benefits:</b>	
Decrease traffic congestion	
Conserve resources through reduced gasoline consumption	Offer more employment opportunities for untapped labor force (e.g., disabled, part- time, retired)
Reduce air pollution	

### SECTION 3: CURRENT INTRA-CAMPUS TRAVEL

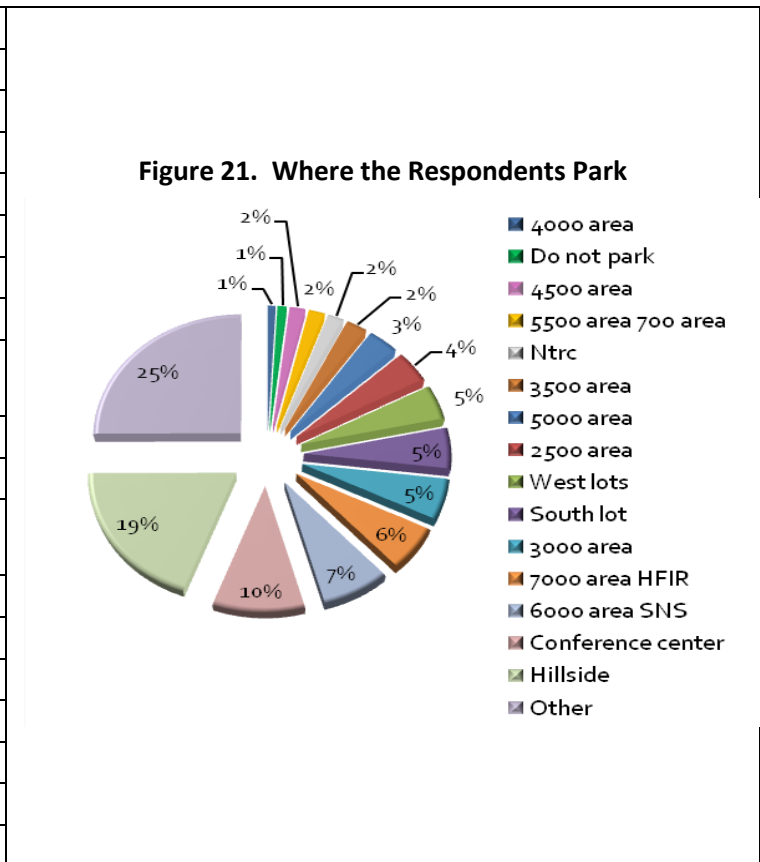
Section 3 section discusses the parking patterns, as well as the frequency with which, and by what mode, employees travel around the campus, after they arrive at work on a typical day.

#### PARKING CHARACTERISTICS

##### Locations

The hillside parking area was cited as their typical parking location by the greatest number of respondents (19 percent), followed by the Conference Center parking area (10 percent) and the SNS parking area.

Location	Number	Percent
2500 area	102	4.1%
3000 area	134	5.4%
3500 area	57	2.3%
4000 area	21	0.85%
4500 area	43	1.7%
5000 area	85	3.4%
5500 area 700 area	44	1.8%
6000 area SNS	183	7.4%
7000 area HFIR	147	6.0%
Conference Center	246	10.0%
Do not park	25	1.0%
Hillside	477	19.3%
NTRC	44	1.8%
Other	619	25.0%
South lot	133	5.48%
West lots	112	4.5%
<b>Total</b>	<b>2472</b>	



##### Ability to Find Parking

The majority of employees are able to find a parking space within 5 minutes of their arrival at the workplace, regardless of the arrival time. Almost everyone who arrives at work between 7:00 and 8:00 AM finds a parking space within a few minutes of their arrival. Obviously the lots fill up the later in the day but even then, 81 percent of people who arrive between 8:00 and 9:00 AM are able to locate a parking space within 5 minutes of their arrival. By 9:00 AM, 60 percent can find a parking spot within

minutes of beginning to look for one. However, the lots are at capacity by then, and 7 percent or 120 people require over 30 minutes to locate a parking space.

**Table 11. Minutes Required to Find a Parking Space after Arrival at Work**

Minutes To Find Parking From Arrival	Between 7:00am and 8:00am		Between 8:00am and 9:00am		After 9:00am	
	N	Percent	N	Percent	N	Percent
0–5 minutes	2163	96.91%	1483	81.93%	1025	60.51%
6–10 minutes	48	2.15%	220	12.15%	253	14.94%
11–15 minutes	19	0.85%	81	4.48%	162	9.56%
16–20 minutes	1	0.04%	9	0.50%	126	7.44%
21–25 minutes	0	0.00%	2	0.11%	8	0.47%
26–35 minutes	0	0.00%	14	0.77%	60	3.54%
36–45 minutes	0	0.00%	1	0.06%	0	0.00%
45–60 minutes	1	0.04%	0	0.00%	60	3.54%
Total	2232		1810		1694	

It is rare that anyone has to walk over 15 minutes from the time that they park to their office place. The vast majority of respondents have a short walk of 5 minutes or less, regardless of their arrival time. Arriving between 7:00 and 8:00am provided the greatest likelihood of a short walk, as cited by almost 83 percent of the survey respondents.

**Table 12. Time to Walk to Office after Parking**

Minutes	Between 7:00am and 8:00amM		Between 8:00am and 9:00am		After 9:00am	
	N	Percent	N	Percent	N	Percent
0–5 minutes	1856	82.97%	1093	60.82%	1096	65.90%
6–10 minutes	315	14.08%	541	30.11%	227	13.65%
11–15 minutes	25	1.12%	141	7.85%	244	14.67%
16–20 minutes	41	1.83%	21	1.17%	22	1.32%
21–25 minutes	0	0.00%	1	0.06%	55	3.31%
26–30 minutes	0	0.00%	0	0.00%	14	0.84%
Over 30 minutes	0	0.00%	0	0.00%	5	0.30%

As Table 13 shows, it requires only 10 minutes for the overwhelming majority of respondents to locate a parking space and then walk to their office or lab.

<b>Table 13. Minutes to Park and Walk to Office</b>				
Between 7:00am and 8:00am	Minutes to Find Parking from Arrival		Time to Walk to Office after Parking	
0–5 minutes	2163	96.91%	1856	82.97%
6–10 minutes	48	2.15%	315	14.08%
11–15 minutes	19	0.85%	25	1.12%
16–20 minutes	1	0.04%	41	1.83%
21–25 minutes	0	0.00%	0	0.00%
26–35 minutes	0	0.00%	0	0.00%
36–45 minutes	0	0.00%	0	0.00%
45–60 minutes	1	0.04%	0	0.00%
Total	2232		2237	

#### Sample of Parking Write-In Comments

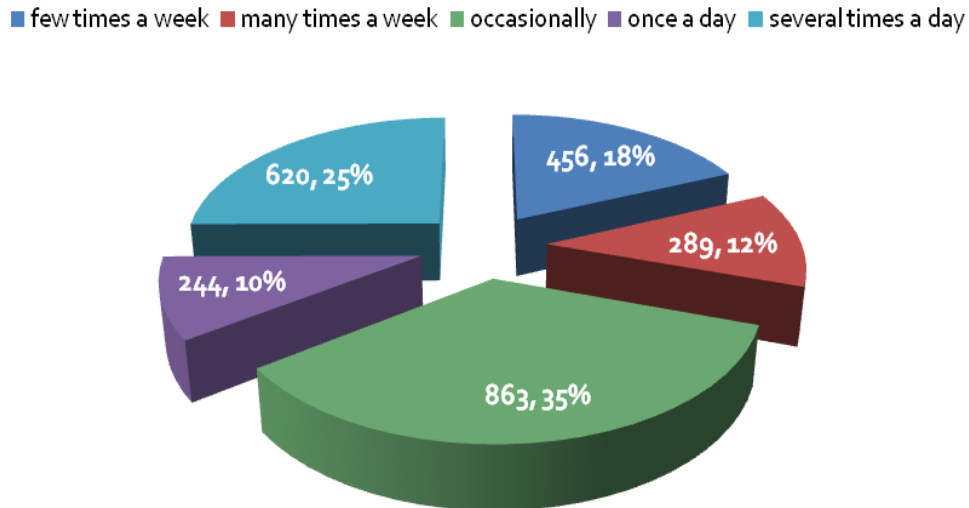
The issue of parking drew many write-in comments. A representative sample of these comments is provided below.

- We need more parking on the east end of the plant—new buildings are constantly being added and parking has been drastically decreased.
- Ideally, we need a parking garage for the east end.
- A large parking area near guard station with scheduled (early and late) shuttle to campus. A large parking lot around the security inspection area with a shuttle giving us rides to our buildings. A lot at east portal to accommodate slugging-type rideshare.
- We need more parking options. I work off campus and it would be great if I didn't have to drive around and around, and then walk so far just to drop off a document or something similar.
- When in a government vehicle going to medical there should be parking spaces at medical; the nearest place is across Bethel Valley road, and if you're actually sick, that's a long walk.
- We need more parking!
- Build a parking garage.
- The 5300 lot is sometimes full before 8:00am because people residing in other buildings are using it.
- We need something done to the 5300 MRF parking lot, possibly restricting it to building residents.
- Please remove all V-Badge parking until parking situation is fixed.
- Enforce "2-hour parking" spots, or get rid of them; 90 percent of them are used by lazy people who park their cars there all day long, or feel they are too important to have to park where others do in regular parking lots. It causes dissention and poor morale.
- Enforce current parking rules. We are in a van pool, and everyone else parks in those slots without permits.

### FREQUENCY OF CAMPUS TRIP-MAKING

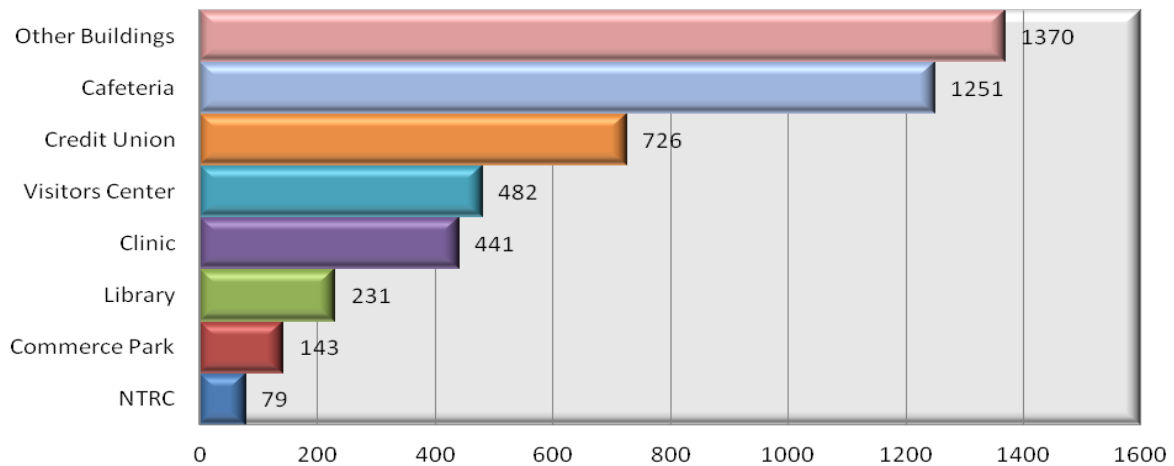
About 620 people or 25 percent of the respondents make more than one intra-campus trip per day, and 10 percent travel once a day. These people would comprise the primary market for any new fixed-route shuttle service. Another 35 percent travel around campus only on an occasional basis.

**Figure 22. Frequency of Moving Around Campus, after Arrival**



After arrival on campus, aside from going to the office or home lab area, the most frequent campus destinations are the cafeteria, the Credit Union, the Visitors Center, and the Clinic, as shown in Figure 23.

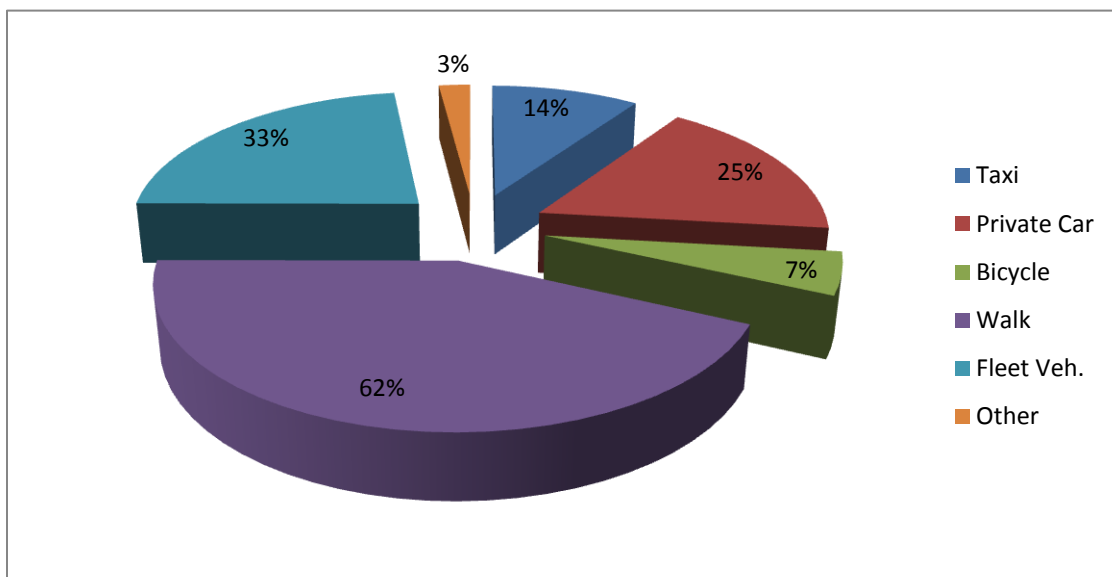
**Figure 23. Campus Destinations after Arrival**



## MODE OF INTRA-CAMPUS TRAVEL

So how are staff accessing the most frequently visited destinations on campus? The most frequently used mode of travel around the campus is walking (62 percent). This represents many car trips not made and is a great success story for the sustainable campus effort. Figure 24 shows that the results to a question asking what the two most frequently used modes are to move around the campus. By these results 93 percent do not use the bikes, 86 percent do not use taxis, 75 percent do not use their personal cars and 67 percent do not use the fleet vehicles. The two top modes that are used by the respondents for intra-campus movement are walking (62%) and the taxi. A goal of the sustainable campus effort should be to shift internal trips made by personal vehicles to clean fuel fleet vehicles or to substitute teleconferencing for trip making.

**Figure 24.** Mode of Travel on Campus

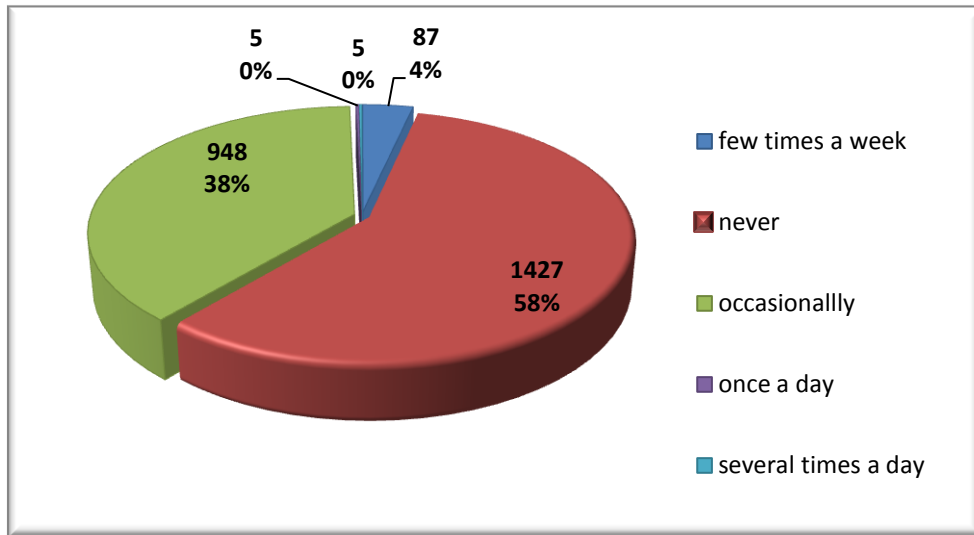


### Use of the ORNL Taxi Service

The taxi service operates between 7:00 am and 3:00 pm. Two taxis operate during the lunch period. The last taxi call is 4:15 pm. The service uses two 15 passenger vans, although, depending on demand, larger or smaller vehicles are used. The majority of the respondents (60 percent) never use the taxi service. Only 5 people were very frequent users (once a day to several times a day). However, 38 percent (948 people) were occasionally users. Fewer than 5 percent of the respondents use the taxi service on a regular basis.



Figure 25. Frequency of Using the ORNL Taxi Service

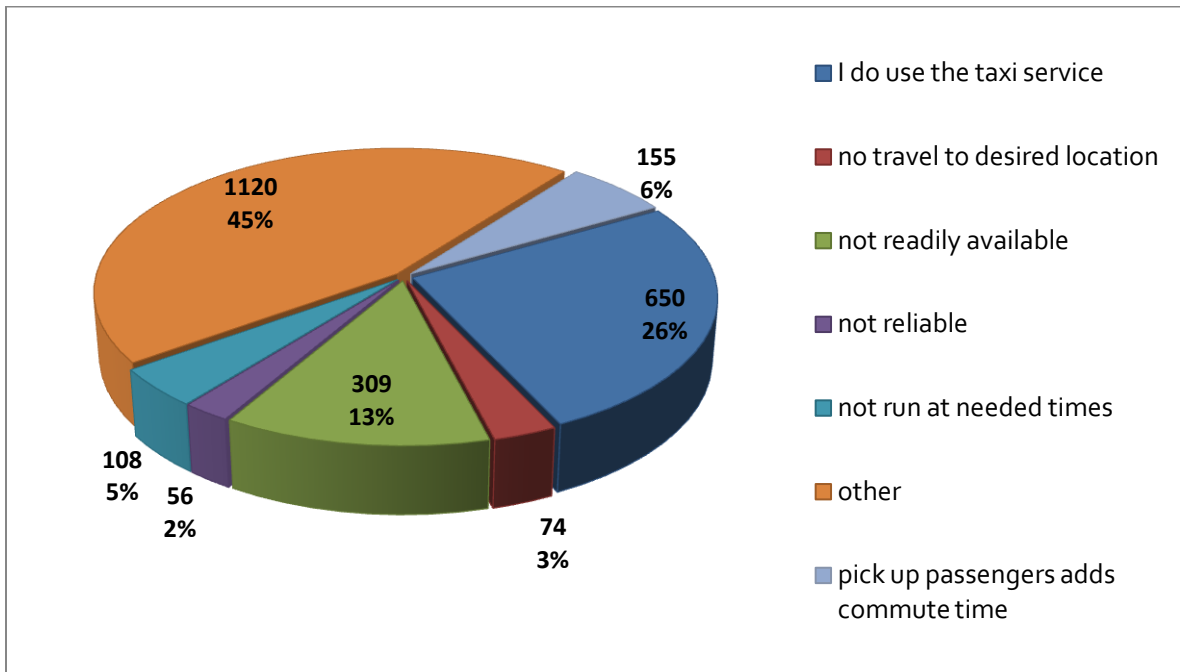


As opposed to the 58 percent who said that they never use the service, 75 percent indicating below that they do not use it in response to giving the reasons why it is not utilized. Primary reasons for not using the service include: it is not readily available when needed (13 percent), does not operate at times travel is required (5 percent), takes too long if other passengers are being picked up (6 percent), does not serve desired destinations (3 percent), and is not reliable (2 percent).

One of the most frequently cited “other reasons” for not using the taxi is that the respondents can usually walk to desired destinations and prefer walking because it is faster. Over 26 percent of the write-in comments (267/1007) indicated a preference for walking. At least 67 respondents wrote in that they had never heard of the taxi service and did not know how to use it.

Due to having the option to walk to their campus destination or to use a fleet vehicle, many people said that they have never needed it. Others only use the taxis if they have visitors, if they need to move equipment, and during inclement weather. A few avoid the taxis because they smell of cigarette smoke. Barriers to using the taxi service appear to be lack of reliability, availability of more attractive and faster options, lack of knowledge regarding how to use the taxi, and a perception that the taxi is not clean. One wonders if an ORNL transit service would be subject to some of the same reasons for lack of use: takes too long to wait for the bus arrival and walking is faster.

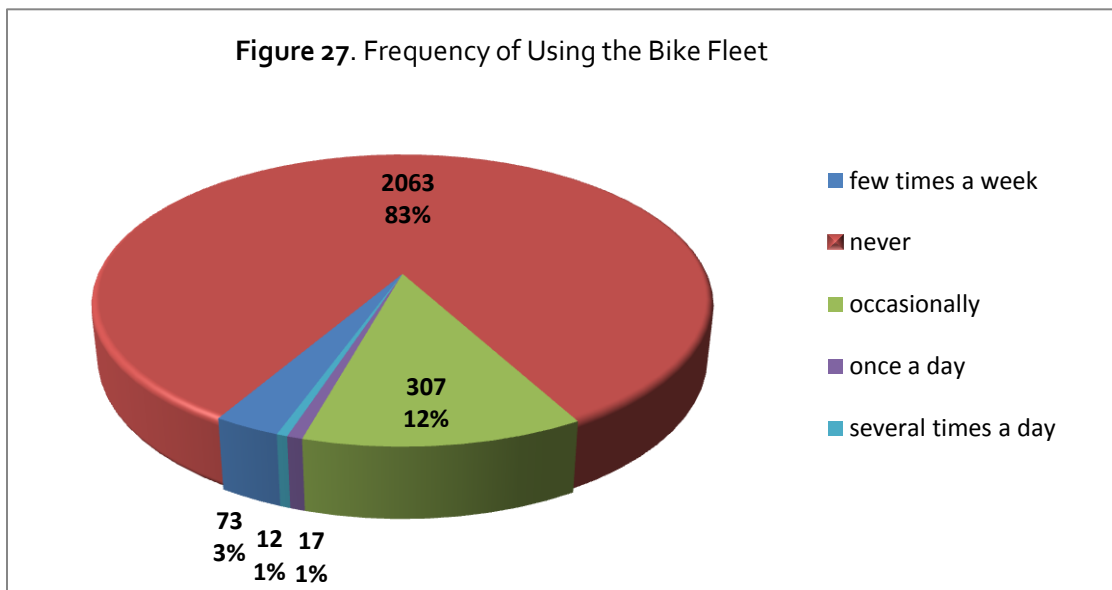
**Figure 26. Why Taxi Service Is Not Used**



Use of ORNL Bicycle Fleet

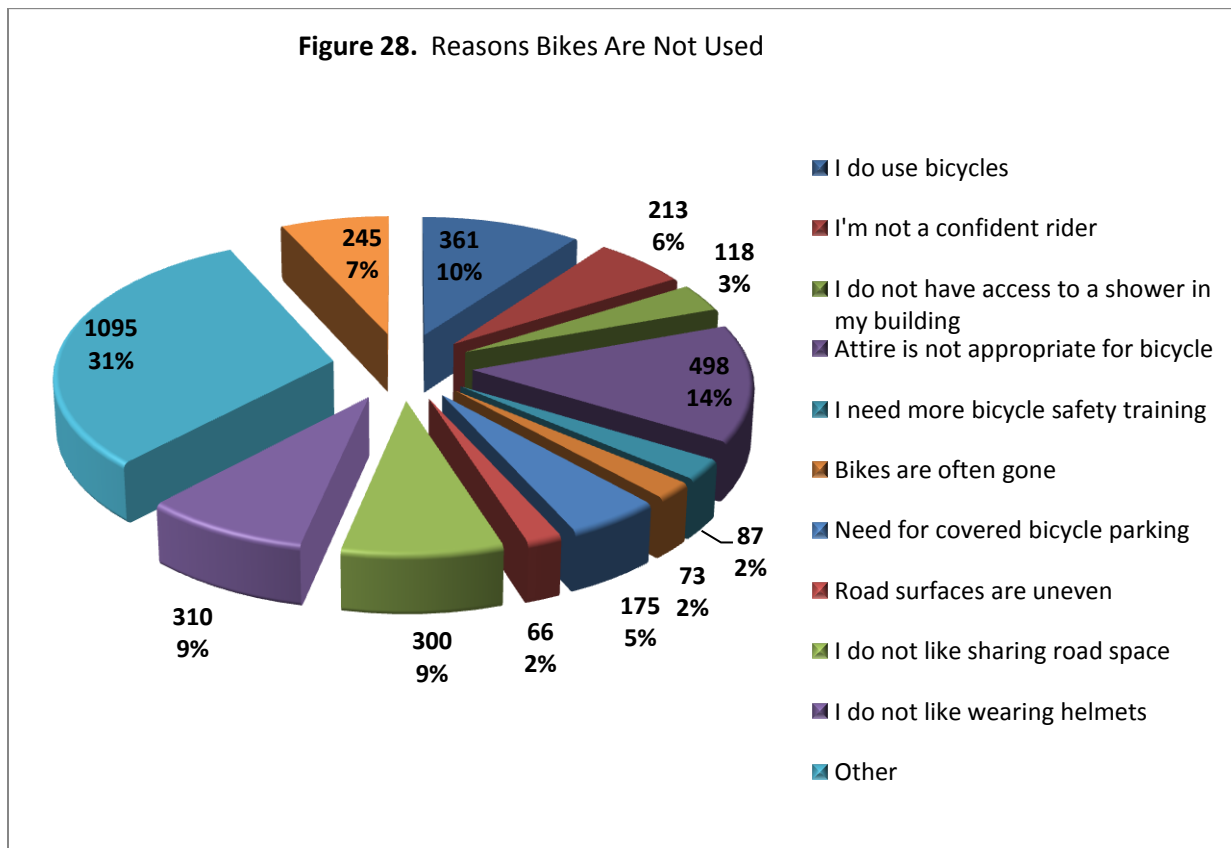
Beginning in 2007, ORNL made free bicycles and helmets available for staff use through a Bike-It-Green program. However, 83 percent of the survey respondents have never used one of the free bicycles. There is occasional use on the part of about 307 staff. The bikes are used by only 2 percent of the respondents or 29 people on a daily basis.

**Figure 27. Frequency of Using the Bike Fleet**



However, according to Joan Lawson, 1,458 ORNL employees have taken the bicycle training to use the free bikes. Survey response therefore shows that at least 27 percent of the people who have taken the training have used the bikes. It is important to understand how to increase this utilization rate by analyzing the reasons given for why people are not bicycling. The chief reason given for not cycling are that their daily attire is not appropriate (20 percent) and that they do not like to wear helmets (12 percent). Another 12 percent expressed unease with sharing the road with automobiles. Areas that were not of concern were the availability of bikes, needing additional training, or not having access to shower facilities.

There were 497 write-in comments regarding bike facilities. Some people do not like the type of bikes provided in the free program ("Share Bikes" are poorly balanced (too high), and the "automatic transmission shifts UP when I try to start moving after a stop"). Others commented that the topography on campus makes biking difficult ("5300 is up a large hill and it is easier to walk" and "7600 area is far and the road is steep"). Still others do not like the fit of the bikes themselves ("Bikes are too small" and "Bikes are too tall and seat is not adjusted"). With all of the construction, specifically White Oak Avenue and East of 5800, people find it is sometimes difficult to get around on a bicycle. Concern was also expressed over the traffic on Bethel Valley Road, and several respondents cited knowledge of previous bicycle accidents and fatalities.



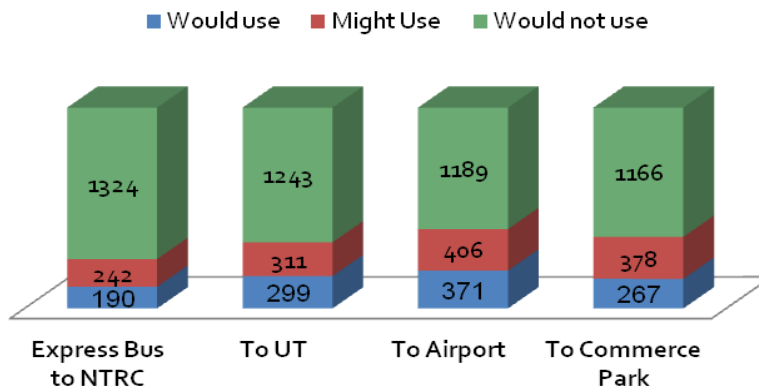
### Interest in Express Shuttle Service

Only 19 percent of the respondents would use a shuttle in the future to go to the airport, 16 percent to go to the University of Tennessee campus, 15 percent to go to Commerce Park, and 11 percent to travel back and forth to the National Transportation Research Center at Hardin Valley.

Although the percentages of employees who are interested in an express bus from campus to NTRC, the Airport, and UT are low, in absolute numbers they might be enough to support a small 24-seat coach shuttle. More market research is necessary to determine if any of these shuttle destinations would be feasible.

Of the four possible destinations, survey respondents expressed the greatest interest in an airport service. However, given the probably low ridership at any 1 hour of service, none of these routes appear to be cost-effective unless ORNL elects to heavily subsidize the service.

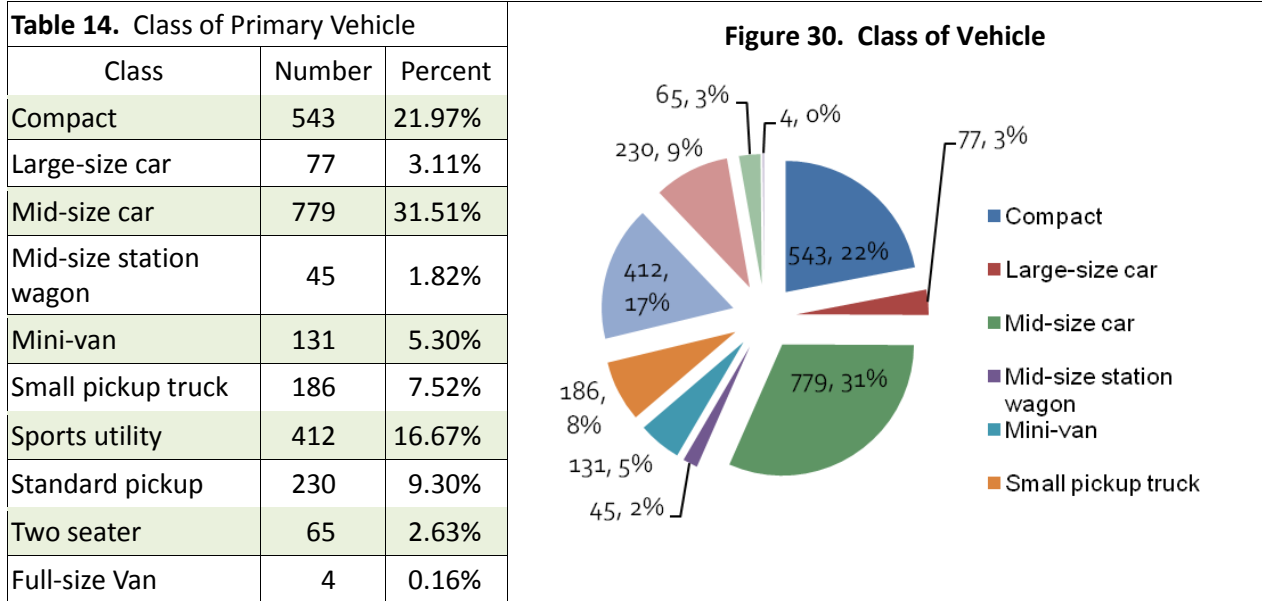
**Figure 29. Future Use of Shuttle by Destinations**



## SECTION 4: CHARECTERISTICS OF THE PRIMARY COMMUTE VEHICLE

### CLASS OF PRIMARY VEHICLE

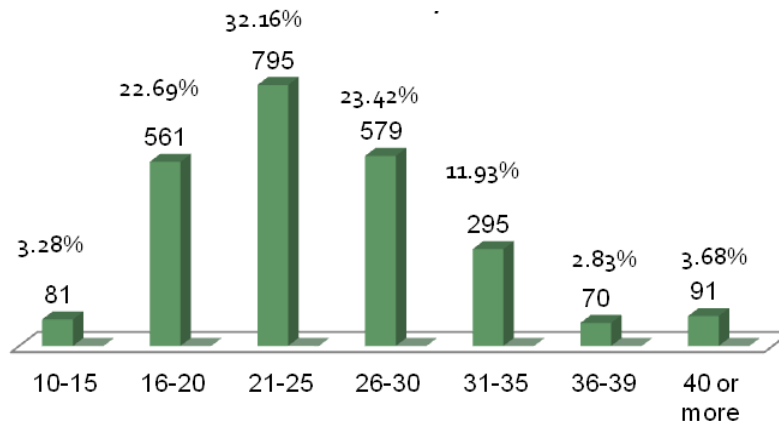
Mid-sized automobiles (32 percent), compact cars (22 percent), and sport utility vehicles (17 percent) comprise the majority of the “private fleet” owned by ORNL survey respondents.



### ESTIMATED FUEL ECONOMY OF PRIMARY VEHICLE, MPG

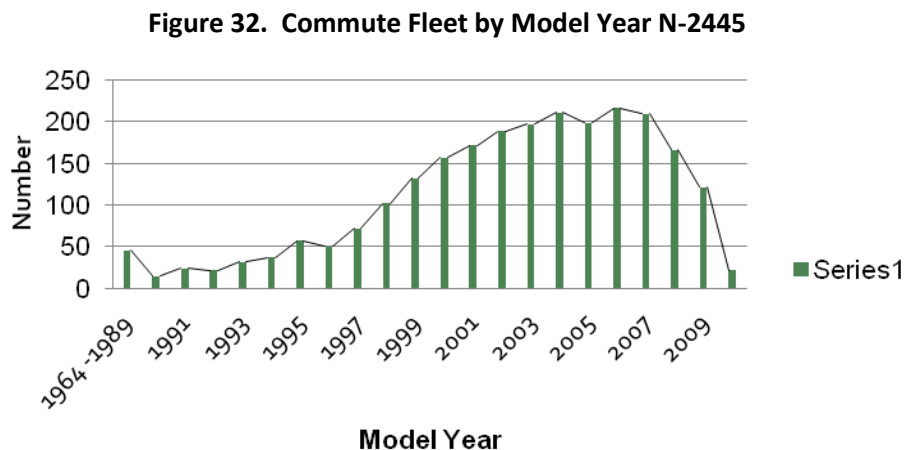
The primary fuel types of the vehicles are gasoline (94 percent), hybrid (2.75 percent), flex-fuel (1.50 percent), and diesel (1.42 percent). ORNL employees were asked to provide an estimate of the fuel economy of their commute vehicle. Over 6 percent achieve over 36 miles per gallon (MPG), while the majority (58 percent) gets less than 25 MPG. The average MPG for the primary vehicles owned by respondents is 21 MPG.

**Figure 31. Estimated Fuel Economy of Primary Commute Vehicle, MPG**



## MODEL YEAR OF PRIMARY COMMUTE VEHICLE

Almost 50 percent of the vehicles used by the respondents are models produced between 2001 and 2006. One-fifth of the respondents operate vehicles which were purchased post-2006.



## SECTION 5: FUTURE STAFF VEHICLE PURCHASES

About 60 percent of the respondents anticipate making a new vehicle purchase within the next 5 years. The opportunity for a turnover from gasoline-fueled vehicles to more energy efficient hybrid or all electric vehicles is substantial.

Regarding the next vehicle purchase, there is a stronger interest in plug-in hybrid electric vehicles (PHEV) or all electric vehicles than current hybrid electric vehicles among ORNL workers. One third of the respondents stated that it is very likely that they will purchase a PHEV or all electric vehicle when they become commercially available, and an addition 45 percent (1101) said that such a purchase is somewhat likely in the future.

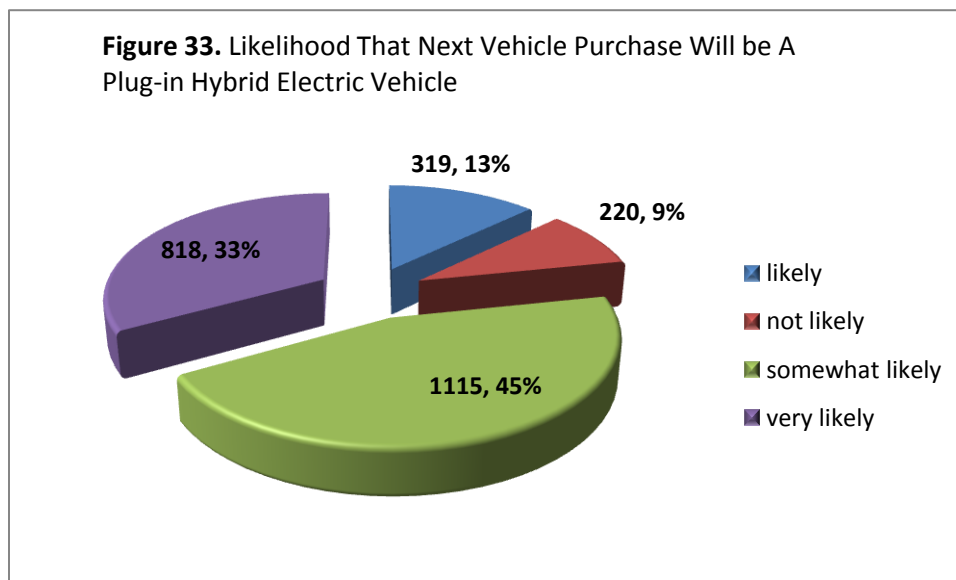
**Table 15. Readiness to Purchase a New Vehicle**

	Number	Percent
1–3 years	518	20.95%
3–5 years	964	39.00%
More than 5 years	482	19.50%
Not sure	294	11.89%
Incentives or price is right	214	8.66%



On the other hand, only 10 percent (249) would be very likely to purchase a hybrid fueled vehicle as their next vehicle. In total, over 65 percent of the respondents are open to their next vehicle purchase being a hybrid, with 10 percent of the total stating that it is highly likely that they will purchase a hybrid in the future. The market penetration for all-electric vehicles will be very strong among ORNL employees, with 91 percent of the total respondents

stating that a future purchase is likely and one-third of the respondents stating a future purchase is highly likely.



ORNL employees are much more interested in purchasing a PHEV or all-electric vehicle, as compared with the future purchase of a hybrid fuel vehicle, as shown in Table 16.

**Table 16. Next-Car-Purchase Comparison between Hybrid and Plug-In Electric Hybrid Vehicles**

	Very Likely		Somewhat likely		Likely		Not Likely	
	Count	Percentage	Count	Percentage	Count	Percentage	Count	Percentage
Next Purchase will be a Hybrid Fuel Vehicle	249	10.07%	1101	44.54%	275	11.12%	847	34.26%
PHEV or all electric vehicle	818	33.09%	1115	45.11%	319	12.90%	220	8.90%

### PREFERRED INCENTIVES FOR PURCHASE OF ALTERNATIVE FUEL VEHICLES

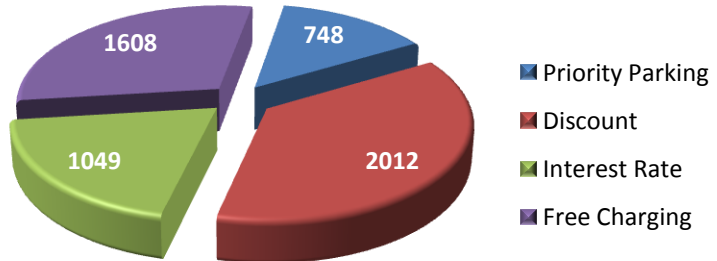
The respondents appear to be highly sensitive to the use of positive incentives, with 81 percent indicating that a discount off the vehicle sticker price would be of interest. Other incentives that will be desirable to maximize the purchase of alternative fuel vehicles on the part of ORNL employees include the availability of free vehicle charging, low loan interest rates, and preferential parking on campus

The preferred incentives that were identified by the respondents were a discount on the purchase of the vehicle (81%), free battery charging (65%), low interest rates on vehicle loan (42%), and preferred parking spaces on campus.

**Table 17** Preferred Incentives for Purchase of Alternative Fuel Vehicles (Can select all that apply)  
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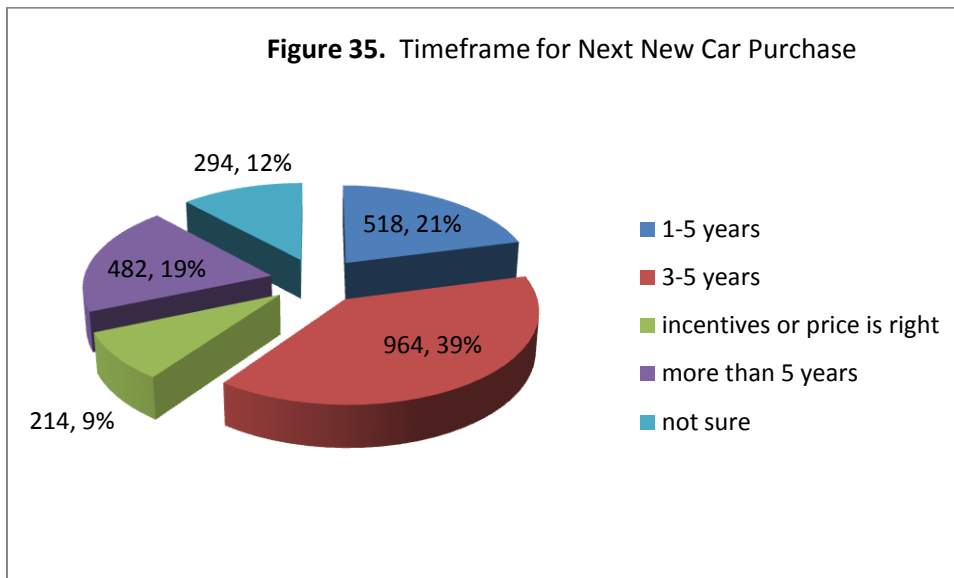
Incentive	Number	Percent
Discount on price of vehicle	2012	81.39%
Free charging	1608	65.05%
Attractive interest rate	1049	42.44%
Preferred parking	748	30.26%
Other	339	13.71%

**Figure 34.** Preferred Incentives for Purchase of PHEV and Hybrid Vehicles



Vehicle turnover expectations on the part of employees indicate when the penetration of new, low carbon vehicles will become substantial enough to dominate the Sustainable Transportation strategy. One-fifth of respondents anticipate purchasing a new vehicle with 1-5 years and 39 percent may purchase a new vehicle in the 3-5 year timeframe.

**Figure 35.** Timeframe for Next New Car Purchase





## **COMMUTE-GENERATED GREENHOUSE GAS EMISSIONS**

Using survey-derived averages of total round-trip commute miles (20,239,340 miles) divided by average fuel economy (21 MPG), then multiplied by the DOE-provided default parameter for estimating CO<sub>2</sub> emissions (19.564) and then converting the amount to metric tons, it is estimated that ORNL annual commute-related CO<sub>2</sub> is 8,551 metric tons. The recommended strategy is to shift travel from single-occupant gasoline vehicles to high-occupancy modes, telework, and electric vehicles.

The remainder of this report draws from the survey findings to make recommendations for the design and implementation of a program to reduce commute related greenhouse gases.

# SUSTAINABLE TRANSPORTATION PROGRAM: GREEN COMMUTE AND GREEN FLEETS

ORNL has the opportunity to aggressively pursue two technologically feasible scenarios to reduce GHGs on campus and on the part of its employees. Survey results were used to estimate an annual commute-related CO<sub>2</sub> of 8,551 metric tons. The recommended strategy is to shift travel from single-occupant gasoline vehicles to high-occupancy modes, telework, and electric vehicles. ORNL will exercise leadership on campus and in the community by modeling ways to minimize global warming emissions and by integrating sustainability throughout the campus. The ORNL Sustainable Campus Initiative encompasses employees, buildings, and the fleet for a total sustainability concept. The process of establishing and maintaining a sustainable campus will include the establishment of commute options for the employees and the conversion of employer vehicle fleets to clean fuels, as well as the establishment of a regional consumer market for electric vehicles. The overall benefits of the Sustainable Campus program to society, the East Tennessee region, and employees will include the following:

- Reduction in Ground-Level Ozone
- Reduction in Traffic Congestion
- Reduced Risk of Traffic Accidents
- Reduction in Energy Dependence

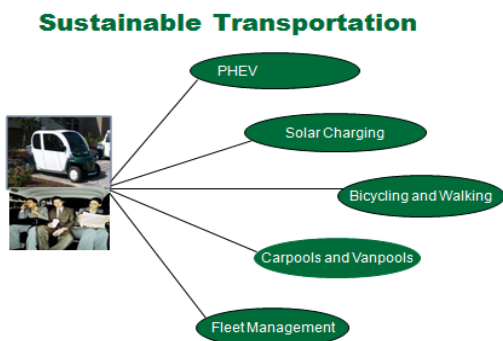


The Knoxville region has been designated by the Environmental Protection Agency (EPA) as being in non-attainment for mobile source ozone (counties of Anderson, Blount, Jefferson, Knox, Loudon, Sevier, and the portion of Cocke within Great Smoky Mountains National Park). These counties violate the revised 2008 8-Hour Ozone Standard of 0.075 parts per million (ppm), based on 2004–2006 air quality data. Non-attainment not only jeopardizes economic expansion but harms the health of ORNL employees and their families. The region is also out of compliance for particulate matter (PM 2.5) pollution (Anderson, Blount, Knox, Loudon, and part of Roane County). Almost half of the NO<sub>x</sub> emissions result from automobile and truck traffic. These non-attainment counties are the ones that also comprise the commute shed for ORNL employees. As a good corporate citizen and responsible employee, ORNL's Sustainability Initiative will be guided by the vision of developing a program for sustainable transport management, which includes the reduction of the community and environmental impacts of traffic generated by ORNL. It will provide employees with options for travel to and from work, including healthy modes of transport, as part of an overall response to recruitment and retention of employees.

As an employer, ORNL will benefit from reduced accidents, increased employee health, additional parking as people rideshare, and extension of ORNL's corporate image as an energy/environmental leader. The ORNL Sustainable Campus efforts will reduce congestion, improve fuel economy, and improve air quality through the promotion of commute options to the single-occupant vehicle such as carpools, vanpools, transit, biking and walking, variable work hours, and telework options.

Several recent studies are supportive of the impact that travel efficiencies have on GHG reductions. The Urban Land Institute (ULI) estimates that an integrated package of transit and smart growth planning can reduce overall vehicle miles travelled (VMT) by 10–14 percent by 2050 (Urban Land Institute, 2008). Commuter Benefits, such as subsidies for transit passes and carpools, can reduce local VMT by 10 to 11 percent (EPA study for TRB, 2006). Pay-As-You-Drive Insurance could provide people the incentive to drive 8 percent fewer miles nationwide (Bordoff, J., *Brookings Institute*, 2008). Deployment experience, as well as extensive modeling, has shown that integrated packages of services and programs are necessary to achieve any measurable reductions. For instance, in *Moving Cooler*, an aggressive application of technologies was reported to result in a 16 percent reduction from total light-duty GHG emissions by 2030 with the following package:

- 5.0 percent from speed limit reductions and urban parking restrictions
- 3.1 percent from intelligent transportation and eco-driving
- 3.0 percent from land use and Smart Growth
- 2.9 percent from pricing (e.g., parking taxes, congestion pricing)
- 2.3 percent from high-occupancy-vehicle/vanpool/carpool/commute strategies
- percent from public transportation strategies



11 Managed by UTRGV for the U.S. Department of Energy

ORNL Green Transportation Action Plan

The development and adoption of an ORNL Green Transportation Action Plan (GTAP) will document the strategies that will be developed to foster more efficient employee commuting patterns. Such a plan includes specific strategies to encourage changes in travel routes in an effort to reduce traffic congestion and greenhouse gas (GHG) emission and improve regional air quality. The following basic principles are recommended to guide the vision and implementation of the Green Transportation Action Plan.

- The Green Transportation Action Plan will guide strategic transportation investments and strategies for the next 10 year period. Its strategies will complement other laboratory-wide sustainability efforts.
- Moving people, not vehicles, is the primary mobility focus of the Plan.
- An organizational framework will be developed to support the implementation of the Plan.
- Strategies are more successful when they are monitored and periodically adjusted so ORNL will continue to track the commuting habits and growth of its population to report results and improve performance.
- The plan will form the basis for collaborative discussions to help inform future strategic transportation plans of local city, county, and regional governments and ORNL. Therefore, collaboration with regional and state public transportation organizations will be a strong feature of the plan.

## CHALLENGES AND OPPORTUNITIES

Opportunities for establishing and continuing an effective tiered approach to sustainable transportation program include the following:

- A strong bicycle program (free bikes, helmets, training and lockers) is leading the way.
- Long-distance commuting is the norm, so as gas goes up, more people will consider shifting modes to save money.
- The current scarcity of parking at ORNL is a motivation to try other modes and to change commute behavior.
- Technical assistance available from area organizations can help start up a strong program and will provide continuous support (Smart Trips, Regional Planning Organization).
- The opportunity to integrate mobility options into the Sustainable Campus Initiative offers a new beginning and fresh approach to campus transportation.

The Green Commute and Green Vehicles programs can/will take advantage of the extensive expertise and experience ORNL's Energy and Transportation Science Division in travel demand management, alternate fuels, and flex vehicles. A successful low-carbon transportation agenda can be realized through an integrated program of reducing travel demand; improving travel planning; reducing the need to travel and other measures; reducing the carbon intensity of fuels; and improving vehicle selection, vehicle efficiency, and driving efficiency.

Challenges to be overcome for the establishment of a significant Sustainable Transportation Program include the following:

- Restrained corporate culture — there is no existing mobility office or employee commute options coordinator.
- ORNL's very low-density campus and the regional low-density residential land use will make transit more difficult to economically operate.
- There is a weak carpool-matching web site.
- No financial incentives exist to support ridesharing.
- There is a lack of transit connections to the surrounding region.

## ORGANIZATION AND PROGRAMMATIC RECOMMENDATIONS

The ORNL Rideshare program is currently underutilized and ineffective as an enabler of greenhouse gas reductions. To remedy this, efforts must be made to institutionalize the program. There is a clear pattern to the characteristics of successful travel plans at other major corporate sites, such as Microsoft or Boeing. It is recommended that ORNL follow this successful formula and incorporate the following key features



into its program design. Below are several recommendations to assist in the development of a Smart Traveler Program.

- Form a Green Transportation Council (GTC). Key representatives from Human Resources, Facilities, Finance, Transportation, etc., should be assigned to the council as a means of providing continuous input and assistance to the Commuter Choice program. Representatives from these divisions have the ability to leverage the needed resources to facilitate an effective program. The GTC will be responsible for holding management support and showing upper management the benefits of a Commuter Choice program. The council should also be composed of employees who have a strong interest in telework, transit, bicycling, and other alternative modes.
  
- Designate an ORNL Commute Options Coordinator to serve as a liaison to commuters. The role of this coordinator will be to promote programs such as carpooling, vanpooling, telecommuting, biking or walking, and transit (if applicable). Just like any employer-sponsored program, a lead person needs to be responsible for overall coordination of activities. This person will need to be responsible for the daily activities and overall operations of the program. For instance, this person will establish regular communication with the Knoxville Smart Trips Program, monitor the Ridematch site, help plan regular promotions, and make reports to management on progress. The coordinator will distribute commuter information, monitor and document program benefits, and develop an annual marketing campaign. Actions of a typical Commute Options Coordinator could include the following.
  - Investigate the existing transportation situation, develop a database, and determine the potential for change.
  - Select reasonable goals and objectives, plan appropriate strategies and tasks for carrying them out, develop a timetable, and establish a budget.
  - Actively solicit support from agency management, other departments, and key individuals within ORNL.
  - Advertise and market the program to employees and visitors in order to create awareness and interest in participating in alternative travel modes.
  - Create conditions and incentives that will encourage employees and visitors to change their travel behavior.
  - Facilitate the formation and utilization of commute options.
  - Track and report changes in site-related travel behavior.
  
- Make Use of External Resources. The ETC and coordinator should rely on assistance from local transportation organizations, such as Smart Trips and Tennessee Vans. ORNL may wish to form a partnership with Tennessee Vans for vehicles and administration of vanpools. ORNL already has partnered with the Smart Trips program for promotions and materials, as well as bicycle safety education.
  
- Incorporate Commuting and Green Vehicle promotion information into all new employee orientation materials.

## MARKETING RECOMMENDATIONS

### Reasons to Develop a Strong Green Transportation Program

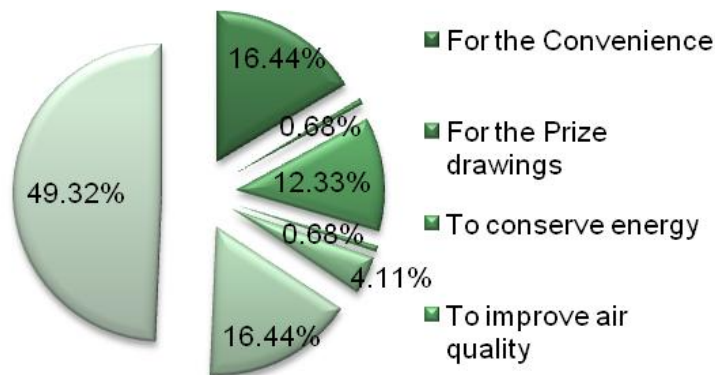
There are several business reasons to develop and maintain a strong green transport program.

- Public Image/Corporate Responsibility
- Supplier and Customer Concerns
- Employee Driven (based on cultural interest in becoming greener)
- Current and Potential Legislation

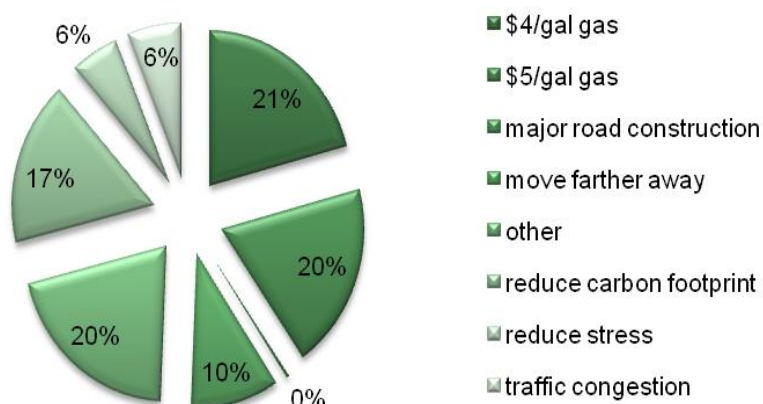
### Service Development Focused on the Customers

Development of services and attendant marketing of those services should draw upon the information on commute trends and preferences gained from the survey. For instance, the primary reasons cited in the survey for using an alternate mode were to save money (49 percent); reduce wear and tear on the personal vehicle (16 percent); for convenience (16 percent); and to save energy (12 percent). Therefore, marketing should emphasize the green benefits of smarter travel choices as well as their cost-effectiveness.

**Figure 36.** Reasons to Rideshare.



**Figure 37.** Future Reasons to Rideshare



By partnering with the regional rideshare agency, SmartTrips, ORNL can obtain technical guidance, effective promotional materials, hosting of transportation fairs, and assistance in designating/signing regional Park and Ride lots. Smart Trips has a home page for ORNL (<http://mobile.basetech.com/knoxsmarttrips/ornl.site>)

### Create a GREENRIDE Web Site for Employees

A GreenRide web portal should be created as a marketing measure and should contain a Cost of Commuting calculator as well as a GHG Commute calculator. Current commute information is out of date and fragmented. A first priority of the new program should be to develop a comprehensive “one-stop” GREENRIDE website on the Sustainable Campus SharePoint site which contains the following elements:



- An updated ridematch software application
- Information on the ORNL bicycle program and cycling safety tips
- Link to daily Ozone forecasts from the Regional Air Quality Coalition (<http://www.etnrcac.org/>)
- Links to Air Quality information ( <http://tn.gov/environment/apc/ozone/ozoneforecast.shtml>)
- Information on the national 511 system which provides information on East Tennessee traffic congestion
- Map of regional Park and Ride lot locations (as they are developed)
- Map of East Tennessee Clean Cities alternative refueling station locations
- Link to TDOT traffic cameras and Knoxville area traffic conditions (<http://ww2.tdot.state.tn.us/tsw/smartmap.htm?city=Knoxville>)
- As ORNL adds traffic cams to the portals, link those to the site also
- Link to current weather information
- Map of internal parking locations  
<http://portal.ornl.gov/sites/fo/fd/pjm/p/Maps/Open%20Parking%20Lots.pdf>
- Link to airport arrival and departure schedules <http://www.fly.faa.gov/flyfaa/usmap.jsp>)
- Link to Smart Trips, Tennessee Vans, KATS, and ETHRA (<http://ctr.utk.edu/programs/tnvans.html>;  
<http://www.ci.knoxville.tn.us/kat/>)
- Cost of Commuting calculator (<http://www.knoxsmarttrips.org/calculat.htm>)
- Carbon Footprint Calculator

### Ridematch Software

The updated rideshare system should be easy to use and have several customized options. It needs to include the six-county region. Ridematch tools should work at the region and localized scales (long-distance one-time trips and employer/site-specific routine trips). At a minimum, the matching algorithm should match on home and work location, work times, and mode preference. The matching algorithm should also accommodate matching applicants to the nearest Park and Ride lot. Desirable features would include evaluation and reporting features that provide individuals as well as the ETC with annual estimated financial savings and greenhouse gas emissions averted. It is recommended that ORNL consider consolidation of their ridematch



site with the Smart Trips ridematch system. Promoting both sites to staff is somewhat confusing and dilutes/reduces the pool of potential matches.

#### Hold Carpool and Vanpool Meetings

Getting groups of employees together for a brown bag lunch or coffee event can break down the impersonal barriers of sharing a ride with a stranger.

#### Construction Projects

Coordinate with construction mitigation projects, when surrounding major roads are being upgraded by TDOT. People are much more likely to change their travel behavior during these times. Having people share rides creates fewer cars and makes the work site safer for the construction workers too.

#### One-Less-Trip Campaign

Develop a One-Less-Trip Campaign to encourage staff and their families to bundle or group their errands together in order to reduce vehicle miles of travel and resultant air pollution and fuel use. A great seed project would be to develop a software program that pushes information on short alternate routes and location of services that are in proximity to one another to PDAs and mobile devices.

#### Develop a Campaign to Pledge to a Green Commute

The environmental psychologist Doug McKenzie-Mohr has written how the act of eliciting a commitment to change can be a catalyst for adapting sustainable behaviors. Therefore many transportation management organizations are encouraging participants to commit to shifting a trip through a pledge form. Smart Trips in Portland, Oregon, reported that individuals who pledged to shift at least one drive-alone trip reported a 24 percent relative reduction in drive-alone trips compared to an 18 percent reduction for all participants. The use of a pledge to create an implicit “social contract” is a measure used in social marketing programs whose goal is lasting and sustainable change.

#### Maintain Continuous Attention on Alternative Modes and Green Transport

Keep a continuous but fun focus on the Green Commute by design a marketing campaign around monthly recognition days, such as the following.

##### **February**

- February 25–March 3: Telecommuter Appreciation Week [www.yourata.com/ata-taw.html](http://www.yourata.com/ata-taw.html)

##### **April**

- April 6: National Walk to Work Day
- April 15–22: National Environmental Education Week [www.eeweek.org](http://www.eeweek.org)
- April 22: Earth Day [www.earthday.net](http://www.earthday.net)
- April 27: National Arbor Day [www.arborday.org](http://www.arborday.org)





## **May**

- May—National Clean Air Month [www.lungusa.org](http://www.lungusa.org)
- May—National Bike Month
  - May 14–18: National Bike to Work Week
  - May 18: National Bike to Work Day
- May 13–19: National Transportation Week [www.ntweek.org](http://www.ntweek.org)
- May 16: National Employee Health & Fitness Day [www.physicalfitness.org](http://www.physicalfitness.org)

## **June**

- June 5: World Environment Day [www.unep.org/wed/2007/english/About\\_WED\\_2007/index.asp](http://www.unep.org/wed/2007/english/About_WED_2007/index.asp)

## **Green Commute Options**

The following presents recommendations for the primary commuter transportation strategies that ORNL should undertake. Together they will provide a full range of commuting choices for the ORNL community that will enhance campus sustainability efforts and have a positive effect on livability and reducing the carbon footprint. These strategies are not necessarily listed in order of priority.

## **TELEWORK RECOMMENDATIONS**

The Telework Team of the General Services Administration (GSA) Office of Governmentwide Policy is responsible for guidance, technical support, and coordination of telework across the U.S. Federal government. Assisted by the International Telework Association and Council (ITAC), GSA developed an invitation list of 79 experts in the telework field. Using a standard Likert-type scale with scale points representing a value continuum, these experts were asked to rate 33 practices. Seven of the 33 practices that the experts rated received an overall consensus rating of "essential" to the success of a telework program.

- Developing clear, measurable telework program goals.
- Utilizing an executive champion.
- Utilizing a telework program manager/coordinator.
- Requiring telework training for managers of teleworkers.
- Ensuring that teleworker performance appraisals follow the same procedures and guidelines as those applied to other employees.
- Conducting an assessment to determine teleworker and/or organizational technology needs.
- Establishing formal arrangements for technical support of teleworkers.

## **Establish a Pilot Telework Program**

Therefore, it is recommended that ORNL follow proven steps to telework success by hiring a telework consultant to guide the successful initial implementation of a pilot program. This pilot will allow ORNL to test a telework program with a specific group of employees, focusing on issues such as program management, efficiencies, and technical details. The success and lessons learned from the pilot will help overcome any

executive or managerial reluctance and fine-tune the adoption of a specific telework policy. There are multiple resources to assist ORNL in establishing a telework program. Most resources are divided into guides for upper management (Benefits of Telework), managers (How to be an Effective Telemanager), and the employer (convincing your supervisor; how to set up your home office). Appendix B contains sample telework policies and model agreements. In addition, here is a link to a state of Virginia video on How to Set Up a Telework Program: <http://teleworkva.redmon.com/module/setup/index.html> .

### Telework at Federal Agencies

In February 2009, 78 Executive Branch agencies submitted data on their telework programs to the Office of Personnel Management. The data represented telework participation and related activities between January 1 and December 31, 2008. For 2008, agencies reported that 78 agencies reported a total of 102,900 out of 1,962,975 employees were teleworking, with 5.24 percent of the total population reported as teleworkers and 8.67 percent of the eligible population reported as teleworkers. About 60 percent (48 agencies) reported an increase in their overall telework numbers. In terms of practice, 78 percent of the agencies provide formal notice of eligibility to their employees; 23 percent of agencies use electronic tracking to count teleworkers; 83 percent use telework agreements; and 53 percent use time and attendance (NOTE: agencies may select more than one category due to difference in tracking mechanisms at the sub-agency level, so the total exceeds 100 percent). Over half (56.4 percent) of the federal 44 agencies have fully integrated telework into Continuity of Operations Planning (COOP). Twenty-seven agencies reported cost savings/benefits as a result of telework; of these, the greatest benefit was to morale (24 agencies), then productivity/performance and transportation (22 each), and then human capital (21). Note: agencies could select all that apply.

In terms of major barriers to telework, office coverage was highest (48 agencies), followed by management resistance (38), organizational culture (36), and IT security and IT funding (both at 25). Note: agencies could select all that apply. To overcome these barriers, 42 agencies are offering training for managers, 35 are offering training for employees, 29 have increased marketing, and 21 have established or increased budget for IT expenditures. Note: agencies could select all that apply.

Due to the many productivity and business continuity benefits of telework programs, many corporations are accelerating their implementation of telework also. The 2007 Society for Human Resource Management benefits survey showed that 56 percent of the 590 U.S. companies surveyed were offering some form of telework in 2007, up from the 51 percent that did so in 2006.

### **RIDESHARING PROGRAM**

Carpooling is the easiest option for most employees to use. It simply requires two or three people agreeing to share a ride. Other options require more rigorous schedules or commitments. The following recommendations are made to strengthen the rideshare program at ORNL.

- Expand and enhance the existing ORNL carpool program by broadening access to support services such as Emergency Ride Home and improving the ridematch service.
- Employee Guided Services—Many excellent suggestions were made by ORNL employees as part of the Commute Travel Survey. Focus groups should be held to follow up on the suggestions, as new services

are developed and implemented. Talk to employees about what they think of various options and what it will take to change their commuting habits.

- Establish a Guaranteed Ride Home program.
- Increase the number of rideshare parking permits and open the permits to 2+ carpools.
- Offer pre-tax commuter benefits accounts.
- Include Commute Options as Part of New Employee Orientation—most people form their commuting habits within the first week of starting a new job. Assisting these new employees with personalized options can increase the chance that they will try something other than driving alone.
- Show Top Management Support—Clear support from top management that Commuter Choice is important to the organization will send a strong message to all employees—this is especially true when senior-level managers use an alternative mode themselves.
- Build into Company Culture—Employees who use alternative modes do not want to be perceived as different in any negative sense. Having to leave a meeting to catch a bus or vanpool should not be frowned upon. A clear policy on core hours for meetings is one example. Company policies and the general culture should embrace travel options.
- Provide Strong Incentives—A 2001 study by the Washington State Department of Transportation summarized the research on which measures are effective in reducing drive-alone commuting. Their analysis suggested that telecommuting, compressed work weeks, financial incentives, financial disincentives, programs and incentives for biking and walking, and guaranteed ride home programs are most likely to be related to change in driving-alone commuting. (Paula Reeves, Edward Hillsman, and T. J. Johnson, “Understanding the Evolution of Employer-Based Travel Demand Management Programs in Washington State,” paper presented at ACT International Conference, Portland, Oregon, August 2001)
- Market and Promote— Promotion of the program is an ongoing effort.
- Track Success—Monitoring program activities and participation. Prepare status reports with information such as the number of participants, number of vehicle miles reduced by the participants, greenhouse gas reductions, and cost of the program. Change or refine the program if it is not as effective as you need it to be to achieve anticipated reductions.

### Community Vanpooling

Tennessee Vans is a regional commute organization with commuter minivans and 15-passenger vans that are leased to individual commuters and community organizations. The program is designed to broaden economic opportunities throughout the region by alleviating transportation barriers to employment and by improving mobility options for area workers. Tennessee Vans has placed 116 vans with 75 different organizations throughout the region and moves over 1,300 individuals annually. The Tennessee Vans Program provides vehicles, insurance, maintenance, and fleet management assistance. A group of commuters share the monthly cost of operating the vanpool, and one member of the pool is a volunteer driver, who receives a free ride in

exchange for driving. The estimated Tennessee Vans monthly cost for a 70 mile round trip is \$1010, of which \$560 is comprised of fixed costs and \$450 goes towards fuel. Shared by 14 riders (the volunteer driver rides free in most cases), the individual monthly cost would be \$72.

Research indicates that vanpools can either complement transit services or even replace underutilized transit routes. The average trip distances characteristic to vanpools are frequently beyond local transit agencies catchment areas. Lower operating costs, due primarily to having volunteer drivers and sharing of all expenses between riders, allow vanpools to operate in areas not viable for conventional transit, and serve areas with non-supportive transit densities or ridership patterns. Vanpooling has been in East Tennessee since the energy



crisis of 1973. The program was started by the Tennessee Valley Authority (TVA) to transport workers constructing the local Hartsville Nuclear Plant during the 1980's and was nationally known. During the 10 year construction period where as many as 6,000 employees were working at the site, the ridesharing program initiated there included 132 vans and 17 buses, which transported 56 percent of all the day shift workers.

ORNL should work with Tennessee Vans and the Regional Planning Organization (RPO), various municipalities, and other major employers to establish a vanpool service. Tennessee Vans officials have been contacted and have flex fuel vehicles to offer for ORNL employees to lease. However, at present, they have discontinued their start-up fund where they contributed to the costs of the first 3 to 6 months of van operation.

ORNL should consider offering free fueling on campus for vanpools as a way to reduce the cost of the vanpool and provide a significant incentive for van formation.

### Transit Service

Conduct a feasibility analysis of the ridership and cost of procuring and operating hybrid shuttle buses for peak hour service linking to regional Park and Ride lots. Compare the costs of operating the service directly, through a private vendor, or as a subscription bus through the Knoxville Area Transit (KAT) service. Evaluate whether the same vehicles could be used for a lunchtime shuttle circulator. Work with transit providers to strengthen existing transit connections and make improvements, recognizing their financial challenges and the need for efficiency.



A particular focus should be on being a catalyst for the start-up of new transit services for employees who live in the West Knoxville and Oak Ridge area. ORNL should engage the larger transportation community to

leverage resources. One upcoming opportunity will be to participate in the development of a Regional Transit Development Plan to incorporate ORNL commute/transit needs into the future strategy for the region. See Appendix C for a description of the current Regional Transit Development Plan.

### Park and Ride Facilities

In order for ORNL employees who have long-distance commutes to rideshare, there is need



for a regional Park and Ride system. The development of such a system will require a close partnership

with the Knoxville RPO and TDOT. ORNL can make a great contribution by helping to identify strategic locations while it should be the responsibility of the public organizations to establish, sign, and promote the locations. Initial ridership will be primarily carpool and vanpools, but the long-term goal will be the staging of high-quality, express transit service to the ORNL campus from these locations.

The greatest interest in Park and Ride facilities came from ORNL workers in Knox County (761 commuters), Anderson County (287 commuters), and Roane County (158 commuters). These numbers indicate these large clusters of commuters can support new vanpool and carpool services. ORNL should work with the Knoxville RPO, as well as the East Tennessee Development District, to establish at least two Park and Ride opportunities in each county.

## **Existing Area Public Transit Opportunities**

### Knoxville Area Transit (KAT)

Knoxville Area Transit is the largest provider of public transit in the Knoxville Region. KAT focuses a majority of its services within the city of Knoxville but does provide some service in Knox County outside the city limits. KAT provides fixed route bus service, downtown trolley circulators, the University of Tennessee campus service, and door-to-door paratransit service for those persons who are disabled. The KAT fixed route bus system provides service from 5:30 a.m. until 12:30 a.m. Monday through Saturday and from 10:00 a.m. until 7:00 p.m. Sundays. KAT also provides bus service to the University of Tennessee on a comprehensive system called "The T," which consists of on- and off-campus fixed routes, curb-to-curb minibus service, and ADA paratransit service. Trolley service complements KAT's bus system and serves the downtown and University of Tennessee areas on five routes served by eight antique style trolleys and four hybrid propane trolleys. Service is provided 6:00 a.m. until 6:30 p.m. Monday through Thursday and 8:00 a.m. until 3:00 a.m. Friday and Saturday.

Additionally, KAT also operates a demand response service for persons with disabilities called the LIFT consisting of 14 24- ft vans that operate during the same days and hours as fixed route services.

### Oak Ridge Transit System

The Oak Ridge Transit System provides service throughout the city of Oak Ridge and is available to all citizens. Oak Ridge Transit operates three ADA accessible and 14 passenger mini-buses.

Service is provided 6 days a week, Monday through Saturday, 8:00 a.m. to 5:30 p.m. Mini-buses will pick up passengers and transport them anywhere within the Oak Ridge city limits for \$1.50 per one-way trip.

## AUTO-FREE CAMPUS ZONES AT THE CAMPUS CORE

As part of an ongoing transition to walking and bicycling, ORNL should have a goal of an auto-free campus in core mobility zones. Through an aggressive program, ORNL would eliminate private cars on campus and achieve a car-free or car-minimized campus core, with exceptions for maintenance and emergency vehicles.

## BICYCLE INFRASTRUCTURE

ORNL has purchased 100 pedal bikes that are made freely available to employees who have taken a safety training class and received a helmet. These bikes are left outside the entrances of major building in a shared system. They are not well used for a variety of reasons



documented in Section 1 of the report. Several actions can be taken to increase the utilization of this free Shared Bike Service.

First, a commitment must be made to



upgrade and then maintain the bicycling environment at ORNL, both for the safety reasons as well as frequency of use. ORNL should adopt a policy statement that bicycling (and walking) facilities will be

incorporated into all new ORNL transportation projects unless exceptional circumstances exist.

A Task Force of cyclists should be formed to assist in the evaluation of the design and layout of the campus, to identify potential improvements to the walkability of the campus as well as the safety and accessibility of bicycling routes. Then a follow-up implementation plan should be developed to remedy any safety shortcomings, such as the need for better lighting, cleaning of shoulders to prevent bike accidents, continuing bike safety education, and provision of additional showers available.

ORNL should immediately procure and place “Share the Road” signs along the main transportation routes so that motorists will have greater regard for cyclists, etc. Other incremental improvements that would be welcomed by current riders and could increase bike usage include the following:

- Add covered area or awnings to keep bikes dry during inclement weather.
- Add a bike trail from Oak Ridge (Country Club Estates).
- Add a bike path or lane Bethel Valley Rd. Install Share the Road signs on Bethel Valley Road to remind motorists to look out for cyclists.
- Evaluate the use of the parallel service road as a bike facility.

## Types of Bike Facilities

**Bikeway** is the generic term that covers all types of facilities for bicycles. There are three basic classifications of bikeways, known as Class I, II, and III bike facilities.

**Trail or Path** (Class I Bikeway) is a facility totally separate from the roadway with dedicated space for bikes, where cars are prohibited. They are often multi-use facilities for bicyclists and pedestrians.

**Bike Lane** (Class II Bikeway) is an on-street facility with dedicated space for bicyclists, usually near the right-side of the street. Bike Lanes are designated by roadway striping and signage.

**Bike Route** (Class III Bikeway) is an on-street facility that shares space with cars. It's usually the right shoulder of the far-right travel lane, with occasional signs.





- When roads are closed due to construction, consider the impact that it will have on walkers and bicyclists. Use proper signage to direct pedestrian traffic to safe areas.
- Work with the City of Oak Ridge to develop a continuous bike lane along Scarboro Road into ORNL.
- Add bicycle racks to the existing ORNL shuttle buses and specify bike racks on any future fleets.
- Start a Bike Buddy Club as a support for new cyclists.



### Master Bicycle Circulation Plan

Finally, a comprehensive master plan for the development of a bicycle system should be prepared. The current situation encourages cyclists to ride on shoulders or to share sidewalks with pedestrians. Utilizing a sidewalk as a shared-use path is unsatisfactory for a variety of reasons. Sidewalks are typically designed for pedestrian speeds and maneuverability and are not safe for higher speed bicycle use. It is well documented that having

dual-use sidewalks can result in serious car-bike conflicts at intersections and driveways, as well as conflicts between bicyclists and pedestrians, and only the most experienced and confident riders will ride on the major roads. Until there is a bike path system created and designated for cyclists, many people will never feel safe on a bicycle. Novice, youth riders, and infrequent riders prefer Class I facilities. Bike lanes are often criticized as creating a false sense of security for the cyclist and lead to conflicts with autos at intersections. Class III routes are generally preferred by the experienced cycling community.



### **WALKING**

The high rate of walking on campus is a hallmark of sustainable transportation and should be cultivated. There are several measures that could enhance the current pedestrian environment.

- First, a map should be prepared that identifies the preferred walking circulation system.
- There should be good lighting and regular maintenance along these pathways. A sufficient annual maintenance program should be dedicated to maintaining the pedestrian system of existing sidewalks, including correction of uneven surfaces and drainage problems. The sidewalks between 4500N and 4508 apparently have drainage problems so that there is standing water during times of heavier rainfall.
- A master plan for pedestrian access should be developed. There is really no sidewalk system as such. The master plan should provide for a continuous network of a minimum of 6 ft sidewalks. Walkers and cyclists should not have to share the same space, so if the facility is expected to serve a dual use, it needs to be a minimum of 10 ft wide. Where pedestrians are adjacent to roadways, there needs to be sidewalks on both sides of the road.
- Pedestrian crosswalks need to be added in all areas where there will also be motorists.
- Attractive landscaping can make the walking experience more enjoyable and can help as a way-finding measure to direct people to the most direct or preferred pathway.

## COMPLEMENTARY SUPPORT MEASUREMENTS

There are many services and programs that an employer can offer that will enable their employees to shift commuter modes. Without the support of programs such as the ones described below and absent very significant disincentives such as high gas prices or priced parking, it is unlikely that any significant mode shift will occur.

### On-site Facilities/Services That Enable People To Rideshare and Leave Personal Vehicles at Home

The goal is to reduce the need for travel, so adding on-site services and facilities that will allow employees to make “one less trip” is a key strategy. Excellent existing on-site services include the Credit Union, Clinic, and cafeteria, as well as shower facilities and Main Street coffee service. New on-site services that could minimize on-campus travel would include the placement of ATM machines on both ends of the campus; instituting a dry cleaning pick-up service; provisions for child care at facilities on or near campus; and contracting for a small-goods concessionaire.

### Guaranteed Ride Home

The survey revealed that some employees are reluctant to rideshare out of fear that they will not be able to get home in case of an emergency or if they have to work overtime. A GRH program guarantees these commuters a ride home in an emergency situation (e.g., sick child at school). While this is generally not the primary motivating factor for traveling to work via a mode other than driving alone, the program does remove this one potential barrier to using alternative forms of commute travel. A GRH program is based on offering the riders a convenient and reliable mode of transportation.

### Financial Incentives—Qualified Transportation Fringe Benefits

The Internal Revenue Service permits employers to provide workers with up to \$230 per month in tax-free transit and vanpool benefits. The monthly limitation under Section 132(f)(2)(A) Qualified Transportation Fringe Benefits regarding the aggregate fringe benefit exclusion amount for vanpools (commuter highway vehicles) and transit passes is \$230. The monthly limitation under Section 132(f)(2)(B) regarding the fringe benefit exclusion amount for qualified parking is \$230. Commuters can receive both the transit and parking benefits (i.e., up to \$460 per month). Employers can allow employees to use pretax dollars to pay for transit passes, vanpool fares, and parking. Qualified transportation fringe benefits include the following.



Commuter Tax Benefits Summary Table				
	Transit	Vanpool	Qualified Parking	Qualified bicycle reimbursement
<b>Incentive Levels</b>	Up to \$230/month* for transit expenses	Up to \$230/month* for vanpool expenses	Up to \$230/month** for parking at or near an employer's worksite, or at a facility from which employee commutes via transit, vanpool, or carpool	Up to \$20 per qualified bicycle commuting month. This exclusion for qualified bicycle commuting reimbursement includes any employer reimbursement during the 15-month period beginning with the first day of the calendar year for reasonable expenses incurred by the employee during the calendar year.
<b>Employer Tax Benefit</b>	Employers give their employees up to \$230/month* to commute via transit; gets a tax deduction and saves over providing same value in gross income or Employers allow employees to use pre-tax income to pay for transit and employers save on payroll tax (at least 7.65% savings) or A combination of both up to statutory limits	Employers give their employees up to \$230/month* to commute via vanpool; gets a tax deduction and saves over providing same value in gross income or Employers allow employees to use pre-tax income to pay for vanpooling and employers save on payroll tax (at least 7.65% savings) or A combination of both up to statutory limits	Employers give their employees up to \$230/month** for qualified parking; gets a tax deduction and saves over providing same value in gross income or Employers allow employees to use pre-tax income to pay for qualified parking and employers save on payroll tax (at least 7.65% savings) or A combination of both up to statutory limits	Employers reimburse their employees up to \$20/month for qualified bicycle commuting; gets a tax deduction and saves over providing same value in gross income  According to the IRS, "Generally, you can exclude qualified transportation fringe benefits from an employee's wages even if you provide them in place of pay. However, qualified bicycle commuting reimbursements do not qualify for this exclusion."
<b>Employee Tax Benefit</b>	Employee receives up to \$230/month* tax free (not on their W-2 form) or Employee pays for commute benefit with the pre-tax income and saves on income tax or A combination of both	Employee receives up to \$230/month* tax free (not on their W-2 form) or Employee pays for commute benefit with the pre-tax income and saves on income tax or A combination of both	Employee receives up to \$230/month** tax free (not on their W-2 form) for qualified parking or Employee pays for commute benefit with the pre-tax income and saves on income tax or A combination of both	

Source: [Federal Register / Vol. 66, No. 8 / Thursday, January 11, 2001 / Rules and Regulations](#)

\*Tax-free transit and vanpool benefit limit increased from \$120 to \$230 per month beginning March 1, 2009 (part of the stimulus bill action).

\*\*Tax-free parking benefit limit increased to \$230 per month beginning January 1, 2009.

**Qualified bicycle commuting month.** For any employee, a qualified bicycle commuting month is any month the employee: Regularly uses the bicycle for a substantial portion of the travel between the employee's residence and place of employment and does not receive: Transportation in a commuter highway vehicle, any transit pass, or qualified parking benefits. Reasonable expenses include: The purchase of a bicycle and bicycle improvements, repair, and storage. These are considered reasonable expenses as long as the bicycle is regularly used for travel between the employee's residence and place of employment.

### Provision of Preferential Parking for Poolers

Preferential parking is an excellent way and immediate way to encourage modal shifts from single-occupancy vehicles to high-occupancy vehicles. Preferential parking provides access to closer, reserved spaces for registered carpoolers. It recognizes and rewards commuter options program participants and creates a visible, permanent reminder of the program itself. Preferential parking spaces are typically the most convenient spaces sought after by employees. ORNL should restore the 2+ priority parking spaces to encourage more people to carpool. The minimum number of occupants required to qualify for carpool parking is a fundamental issue in the success of the program. North American employers typically use a minimum occupancy of two persons, providing an incentive for all rideshare participants. Two-person carpools, while not as beneficial as three-person carpools, still require commitment and offer significant benefits (e.g., a 50 percent reduction in parking requirements and environmental impacts). A two-person eligibility rule also maximizes both the number of employees rewarded and the number of preferential parking spaces, thus increasing their visibility.

ORNL should consider a minimum requirement for using preferential carpool parking spots as being a two-person carpool which operates at least 3 days per week. The carpool parking stalls should be located near the main entrance of buildings or in the more desirable locations in parking lots. A rule of thumb is to provide a minimum of one carpool-reserved parking space for every 100 workstations or 1 percent of the total number of regular parking spaces, whichever is greater. The spaces should be clearly marked carpool parking spaces as reserved for carpoolers and the spaces need to be enforced. Enforcement includes having eligible employees register the names of carpool members and the license plate numbers of the carpool vehicle(s) in order to receive a parking decal or hangtag. At least once a year, the list of registered carpools and vanpools should be updated in order to purge names of people who have left the company, or who no longer meet the eligibility criteria for other reasons.

### **OTHER MEASURES**

#### Employee Business Travel

- Implement a program and a policy to encourage greater use of teleconferencing in lieu of travel, both for internal and external trip making. First, inventory and evaluate the facilities at ORNL that support substitution of communication technology for travel. Every division should have easy access to the use of teleconferencing equipment.
- Establish a policy of offsetting greenhouse gas emissions generated by air travel paid for by ORNL.

#### Eco-driving

The way in which a car is driven has a significant impact on its fuel economy and, therefore, carbon emissions. Studies show that “eco-driving” can reduce CO<sub>2</sub> emissions by up to 10 percent at fleet level and up to 25 percent at the individual level. It is suggested that ORNL develop eco-driving classes for employees.

## Fleet Management

Proactive fleet management which involves regular vehicle maintenance helps reduce CO2 emissions by ensuring optimal vehicle efficiency and, thus, reducing fuel consumption. Fleet planning techniques using advance logistics can also help to optimize transport efficiency.

## Safety Leadership

In tandem with environmental leadership, ORNL should also lead the way for transportation safety. Some of the policies that could be enacted that would create a safety campus for motorists and non-motorists alike include:

- Ban cell phone use while driving on campus;
- Stricter enforcement of speed limits to enhance safety for pedestrians and bicyclists as well as motorists themselves;
- Put clauses into contractors' contracts that penalize speeding on campus (large construction trucks in particular).
- Regular bike safety classes should be scheduled. Employees should be encouraged to take periodic refresher course. All motorists on campus should be made aware of proper rules when sharing the road with cyclists.

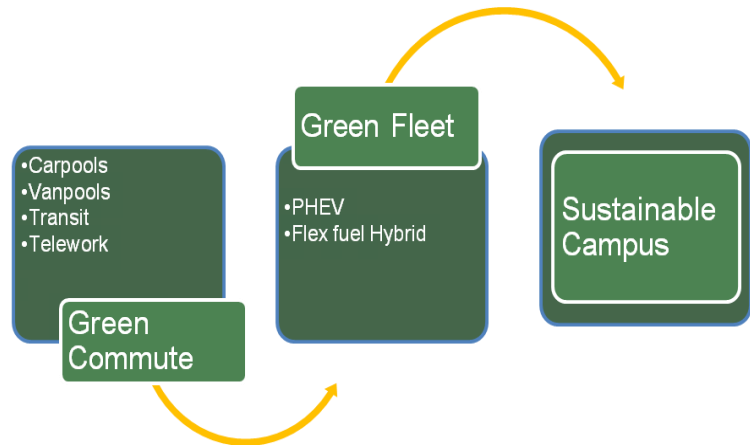
## **GREENING THE FLEET**

Green Fleet activities will include the following.

- Promote clean-fuels activities, in concert with the East Tennessee Clean Cities Program.
- Procure alternative fuel vehicles (AFVs) as part of fleet inventory.
- Evaluate an incentive program to promote employee discounts for the forthcoming Nissan battery electric vehicles in 2010 and VW clean diesels.
- Develop a procurement strategy for highway-worthy hybrid electric vehicles or electric vehicles for trips between the main campus of ORNL, NTRC, and Commerce Park.
- Disseminate information on flex-fuel cars available for intercity travel to encourage employee purchases.
- Provide electric charging stations on campus.
- Provide information on the locations of solar charging stations and E85 refuel sites on the revamped Smart Travel Choices web site.
- Develop Shared Electric Vehicle Fleet Program to establish a fossil-free vehicle fleet that is accessible for check out, rent to replace, or supplement the need for departmental vehicles.

## EXPECTED 5 YEAR OUTCOME AS A RESULT OF A COMPREHENSIVE STRATEGY

The first 3 year phase of the program should concentrate on the “low hanging fruit” and strive to convert the people who expressed strong interest in shared modes. This includes 378 employees who are interested in vanpools; 469 people who will carpool; and the 1019 who want to telework. A hypothetical plan for reducing vehicles and the resultant vehicle miles traveled is provided below. The numbers are assumed to be cumulative so that van and carpool ridership established in Year 1 would be



sustained throughout the program. Between 2010 and 2014, a very aggressive plan could reduce up to 1,400 vehicles. Under this scenario, by the year 2015, there would be 39 vanpools, one express bus, 430 carpoolers, 115 hybrid/PHEV, 30 new bicyclists and 650 teleworkers.

YEAR	MEASURE	VEHICLES REMOVED
2011	Pilot Telework Project with 50 participants	50
	Ten 8-passenger mini-vans	60
	Five full-size vans	65
	180 carpools formed (two person)	90
	Hybrid vehicles	20
	<b>Subtotal</b>	<b>285</b>
2012–	Teleworkers with 250 participants	250
2013	Eight 8-passenger mini-vans	56
	Three full-size vans	42
	125 two-person carpools	62
	15 three-person carpools	30
	Hybrid vehicles	45
	Five bicyclists	5
<b>Subtotal</b>	<b>490</b>	
2013–	Telework Program	350
2015	Ten 8-passenger mini-vans	60
	Three full-size vans	42
	125 two-person carpools	62
	15 three-person carpools	30
	Hybrid vehicles	50
	Express bus from Farragut	40
	25 bicyclists	25
<b>Subtotal</b>	<b>639</b>	

The scenarios presented above give ORNL sustainability planners an indication of the level of effort that will be required to achieve a 28 percent reduction in drive-alone trips by 2015. A very aggressive program of carpools, vanpools, and telework will be required. By 2020, the drive-alone rate is to be reduced by 50 percent. Correspondingly, 50 percent of the business fleet will be converted to zero carbon emissions in 10 years.

The following figure shows a distribution of the Green Fleet and Green Commute strategies.

By FY 2015 Goal: Vehicle Reduction of 1400 Vehicles (28% reduction)		By FY 2020 Goal: Vehicle Reduction of 2500 Vehicles (50% reduction)	
STRATEGY	VEHICLES REMOVED	STRATEGY	VEHICLES REMOVED
<b>GREEN FLEET</b>		<b>GREEN FLEET</b>	
Hybrid Vehicles	80	Hybrid Vehicles	200
PHEV or all Electric	35	PHEV or all Electric	525
<b>GREEN COMMUTE</b>		<b>GREEN COMMUTE</b>	
Telework	650	Telework	1000
Carpool (430 + 90)	275	Carpool	300
Vanpools (11 full; 28 mini)	290	Vanpools (11 full; 28 mini)	290
Transit (Farragut Express)	40	Transit (Farragut & Oak Ridge)	185
Bicycle	30	Bicycle	50
Supported by financial incentives, guaranteed ride home, priority parking, and strong marketing programs. Other greenhouse gas reductions through on-campus walking, biking, teleconferencing, and eco-driving.		Supported by financial incentives, guaranteed ride home, priority parking, and strong marketing programs. Other greenhouse gas reductions through on-campus walking, biking, teleconferencing, and eco-driving.	

## TRACKING AND MEASURING PROGRESS

### Establish Targets

Establish targets for five primary objectives.

- Embed the value and concept of Sustainable Transport Management within the culture of ORNL. Pursue a staged program that includes commitment to implementation and continuous improvement.
- Reduce single-occupant car driving through the management of parking, provision of rideshare match assistance, and shared ride vehicles. The Smart Traveler program will reduce ORNL-related personal vehicle trips and encourage staff to drive less. *Experience from existing travel plans in both the United States and Europe indicate that, for a well-designed and supported plan, a 15 percent reduction in car driver trips to site over about 3 years is a typical result.*
- Establish a goal to reduce the rate of employee single-occupant vehicle usage by 25 percent within 5 years and by 50 percent in 10 years. Establish a goal to convert 50 percent of the fleet to zero carbon emissions in 10 years.
- Increase public transport usage by improving the quality and availability of infrastructure and services for people accessing the site.
- Increase cycling and walking on campus by improving the quality and availability of infrastructure, including bicycles, helmets, and lockers and signage, as well as education.
- Increase the ratio of hybrid fuel vehicles and electric vehicles in the ORNL fleet.

### Program Metrics

Conduct ongoing evaluations in order to measuring the extent to which the program has achieved its stated objectives. Surveys and focus groups will be among the methods used to determine the following.

- What was the change in Mode Split or Average Passenger Occupancy over the year?
- How many people were placed into a carpool per year or per 100 employees?
- How many new vanpools were formed?
- How many people were placed as riders into new and existing vanpools per year?
- How many total customers were served?
- How many requests for assistance were filled?
- What is the estimated change in vehicle miles traveled?
- What is the estimated change in vehicle trips?
- How has demand for parking been affected?
- What reduction in pollutants is estimated?
- How much money did our employees save as a result of the program?

Below is an example of the types of goals and performance measures that the Green Transportation Management Plan might adopt. The Council will guide the development of the services and policies for the program and the Coordinator will work with appropriate ORNL staff to implement the program and track progress.

## **Goal 1: Establish an Effective ORNL Commute Options Program**

### ***Potential Actions***

- 1.1 Provide information to commuters about commute alternatives
- 1.2 Develop a matching system
- 1.3 Contract for and/or provide vans for commuting purposes
- 1.4 Develop a marketing program to promote
  - (a) carpooling
  - (b) vanpooling
  - (c) transit use
  - (d) walk/bike
- 1.5 Develop an employer outreach program

### ***Performance Measures***

- 1.1 Number of ORNL commuters requesting assistance
- 1.2 Number of ORNL commuters switching modes
- 1.3 Number of vans in service
- 1.4 Number of vehicle trips eliminated
- 1.5 Number of vehicle miles eliminated

## **Goal 2: Reduce Costs of Auto Ownership**

### ***Potential Actions***

- 2.1 Develop an ORNL marketing campaign based on reduced costs
- 2.2 Implement marketing campaign

### ***Performance Measures***

- 2.1 Gasoline costs savings

This performance measure estimates cost savings accrued from not having to purchase gasoline. It is calculated by taking the vehicle-miles-traveled reduction figure and multiplying it by gallons used per mile by the average automobile and the cost per gallon of gasoline (VMT x gallons/mile x cost/gallon).

- 2.2 Auto maintenance savings

For this performance measure, the savings are calculated by taking the VMT reduction figure and multiplying by the maintenance costs of an automobile/mile. (VMT x maintenance cost/mile). Maintenance costs are included in the AAA cost per mile figure and generally are about 10-15 cents per mile.

- 2.3 Commuter costs saved

This performance measure is calculated by multiplying vehicle miles reduced (or eliminated) by the average cost per mile to operate an automobile.

## **Goal 3: Reduce Single-Occupancy-Vehicle Parking and Increase High-Occupancy-Vehicle Parking**

### ***Potential Actions***

- 3.1 Reduce the parking use on campus
- 3.2 Increase the carpool and vanpool parking

### ***Performance Measures***

- 3.1 Number of parking spaces saved. It is calculated by taking the vehicle trips reduced figure from the database survey. Could also conduct parking lot counts.
- 3.2 Number of carpool parking spaces allocated and used

#### **Goal 4: Provide Incentives to Shift Commuters into Plug-in Hybrid Electric Vehicles and Hybrid Vehicles**

##### ***Potential Actions***

- 4.1 Increase the number of private plug-in hybrid electric vehicles and hybrid vehicles through the implementation of incentives and disincentives, such as free parking, free charging, or low-interest loans.
- 4.2 Increase demand through education as to the environmental benefits of alternative vehicles.

##### ***Performance Measures***

- 4.1 Number of incentives developed
- 4.2 Number of marketing campaigns



## APPENDIX A. SUSTAINABLE CAMPUS TRANSPORTATION SURVEY

As part of the Sustainable Campus Initiative, ORNL is working to develop workplace initiatives that will lead the way to environmentally friendly transportation choices for ORNL employees. The Sustainable Campus Initiative supports ORNL's commitment to sustainable transportation and, in doing so, strives to reduce the Lab's greenhouse gas emissions.

We have embarked on a project that will help set forth a plan to provide better commuting and intra-campus travel options for ORNL staff. The first step in developing such a plan is to conduct this survey. Survey results will help us to design a program that best meets employee needs and preferences through environmentally friendly alternatives.

Your participation is important! This web-based survey will take approximately 10–15 minutes to fill out. Please be assured that your responses will be grouped with other responses for analysis so that individual answers remain strictly confidential. All responses are separated from the e-mail link during the electronic transmission.

### PART 1. MY COMMUTE TO WORK

#### Current Commute Patterns

Please answer the following questions about your typical commute to work.

**1. Commute Mode.** In a typical week how do you get to work? (please check all that apply.)

Commute Mode	Monday	Tuesday	Wed.	Thursday	Friday
Drive alone or with family in a car, van, truck, or SUV (Go to question 2.).					
Ride a motorcycle					
Ride a bicycle (Go to question 4.)					
Work from off-site locations (alternative work location)					
Do not work, scheduled day off					
Drive or ride with others (Go to question 3 and then question 4.)					

**2. Drive Alone Reasons.** What are your two main reasons for driving alone to work?

- Need my car at work for company business
- Need my car at work for personal business
- Parking is free or inexpensive
- Need to run errands before or after work

- Prefer to drive my own car
  - Need to transport my children
  - No reasonable transit option
  - Need a specially equipped vehicle
  - Safety concerns
  - Cannot get home in an emergency
  - Live close to work
  - Don't have anyone to ride with
  - Don't like to depend on others
  - Irregular work schedule
  - Anything else takes too much time
  - Poor bicycle and pedestrian access
  - Other, please specify
- 

**3. Vehicle pool.** If you usually ride to work with others, please specify:

Total number of people, including yourself \_\_\_\_\_  
 Type of vehicle pool Car \_\_\_\_\_ Van \_\_\_\_\_  
 Arrangement formal \_\_\_\_\_ informal \_\_\_\_\_

**4. Alternative Modes.** If you normally use an alternative mode other than driving alone, what motivated you to do so? (Check all that apply.)

- To save money
- To reduce stress
- Safety of riding with others
- To save time
- Convenience
- Prize drawings
- To improve air quality
- To reduce wear and tear on my personal vehicle
- To conserve energy
- Preferential parking spaces
- Flextime program
- Showers and clothing lockers
- Other cash incentives
- Other \_\_\_\_\_

**5. Commute Miles.** How far do you live from your work location? \_\_\_\_\_ Miles

**6. Commute Time.** How long does it take you to travel directly to work (not when making additional stops)?  
 \_\_\_\_\_ Minutes.

**7. Work Schedule**

- A. What is your work schedule?
- 5 days, 40 hours per week
  - 4 days, 40 hours per week

9 days, 80 hours every two weeks  
 Business Month (flexible work schedule)  
 other, please specify \_\_\_\_\_  
 \_\_\_\_\_

- B. At what time do you normally arrive at work? \_\_\_\_\_ AM PM  
 Consistently \_\_\_\_\_ Inconsistently \_\_\_\_\_
- C. At what time do normally leave work? \_\_\_\_\_ AM PM  
 Consistently \_\_\_\_\_ Inconsistently \_\_\_\_\_
- D. Would you consider an alternate work schedule if you could car/van pool? Yes \_\_\_ No \_\_\_

**Future Commute Preferences**

8. **Future Mode.** If these options were made available and worked well, which system(s) would you consider using?

Option	Would use	Would not use	Might use	Please specify conditions under which you might use the option
Drive alone or with family				
Motorcycle				
Bicycle				
Ride with others				
Telecommute				
Park and Ride Lot in your area				
Bus				

9. What would cause you to consider share a ride to work in a carpool/vanpool or transit? (check all that apply.)

- I have to walk further from my parking lot to my office
- Fee based parking rates go into effect for those driving alone
- Reserved parking close to the building for carpools/vanpool
- Company subsidy for vanpoolers/carpoolers
- Help finding people with whom to carpool
- Prizes, drawings, contests, etc. for poolers
- More flexible work hours
- More fixed work hours
- Use of company vehicle during work day
- Child care facilities at or near the work site
- More on-site amenities and services such as dry cleaning pick-up
- If bus service were available
- Change of work shift
- Guaranteed ride home in the event of an emergency or schedule change

- Other, please specify \_\_\_\_\_
- Nothing

**10. Reasons for Ridesharing.** What is the major reason you would start sharing a ride to work? (Check one.)

- Traffic congestion
- To reduce stress
- Major road construction
- If I move farther away from work
- To reduce my carbon footprint
- Gas prices go to \$4.00 a gallon
- Gas prices go to \$5.00 a gallon
- Other, please specify \_\_\_\_\_

**11. Future Park and Ride Lots.** If you are interested in Park and Ride, please specify the required location by city and general location.

- Anderson County \_\_\_\_\_
- Knox County \_\_\_\_\_
- Loudon County \_\_\_\_\_
- Roane County \_\_\_\_\_
- Cumberland County \_\_\_\_\_
- Scott County \_\_\_\_\_
- Morgan County \_\_\_\_\_
- Campbell County \_\_\_\_\_
- Union County \_\_\_\_\_
- Monroe County \_\_\_\_\_
- Other (County/City/Town) \_\_\_\_\_

**Click here if you would like more information on carpool and vanpool options.**

**Fuel Consumption and Vehicle Type**

**12. Current Commute Vehicle.**

A. What is the model year of your primary commute vehicle? \_\_\_\_\_

B. What class is your primary commute vehicle?

- Compact
- Mid-size car
- Large-size car
- Mid-size station wagon
- Mini-van (6-8 passengers)
- Small pick-up truck
- Standard pick-up
- Sports utility
- Two-seater
- Van (9–15 passengers)

C. What is the fuel economy, in miles per gallon, of your primary commute vehicle? Please give us your best estimate of your actual fuel economy.

- 10–15 mpg
- 16–20 mpg
- 21–25 mpg
- 26–30 mpg
- 31–35 mpg
- 36–39 mpg
- 40 mpg or over

[Click here if not sure \(fuelconomy.gov\).](http://fuelconomy.gov)

D. What type of engine does your primary commute vehicle have?

- Gasoline (not hybrid)
- Diesel
- hybrid
- Flex Fuel (Ethanol Blend E85 or greater)
- Other \_\_\_\_\_

13. **Future Vehicle Purchase** What is the likelihood that you would purchase a hybrid fuel vehicle as the next vehicle you buy?

- Not likely
- Somewhat likely
- Likely
- Very likely

14. When commercial plug-in hybrid electric vehicles (PHEV) and all electric vehicles become available, how likely is it that you will purchase one to be your main means of transportation?

- Not likely
- Somewhat likely
- Likely
- Very likely

15. When will you be in the market for a new vehicle?

- 1–2 years
- 3–5 years
- More than 5 years
- When incentives and/or price is right
- Not sure

16. What incentives to purchase an alternative fuel vehicle (hybrid, biofuel, PHEV, electric) would be of interest to you?

- Preferred parking
- Attractive interest rate

- Discount on price of vehicle
- Free charging (for electric and PHEV vehicles)
- Other \_\_\_\_\_

Click here if you would like more information on ORNL vehicle incentives as information becomes available.

**PART 2. How I move around campus. We are interested in how people move around on campus and how we can make improvements to intra-campus mobility.**

**Current Parking**

17. Where do you typically park? (see Parking Lot Map for locations.)

- Hillside (Large lot behind 5000 area)
- Conference Center (Across Bethel Valley Road at the roundabout)
- North (By Bethel Valley Road near 3100 area)
- North Hill (Near 5300)
- South/Fifth Creek (behind 3500 area)
- Central (Off central avenue near 3500 area)
- JIBS (Next to 1520)
- West (Near 1005)
- Physics (6000 area)
- 7000 area
- SNS
- HFIR
- NTRC (Hardin Valley)
- Commerce Park
- I park near \_\_\_\_\_
- I do not park (carpool; drop off, bike, etc.)

18. How long does it typically take you to find a parking space from when you first start looking?

- If you arrive between 7:00 – 8:00 \_\_\_\_\_
- If you arrive between 8:00-9:00 \_\_\_\_\_
- If you arrive after 9:00 \_\_\_\_\_

19. After parking at work, how many minutes does it typically take for you to then walk to your primary work location?

- If you arrive between 7:00 – 8:00 \_\_\_\_\_
- If you arrive between 8:00-9:00 \_\_\_\_\_
- If you arrive after 9:00 \_\_\_\_\_

**Intra-campus Travel**

20. In which building is your primary work location? \_\_\_\_\_

21. In addition to your daily walk to and from the parking areas to your primary work location, how frequently do you move around the campus to other destinations?

- Several times a day
- Once a day
- Many times a week
- A few times a week
- Occasionally

22. What are your primary frequent destinations other than your primary work location?

- ORNL Cafeteria
- Credit Union in Building 5700
- Clinic in Building 4500N
- Library in Building 4500N
- Visitors Center in Building 5200
- HFIR
- SNS
- Commerce Park
- NTRC
- Building (specify number) \_\_\_\_\_

23. What are your *primary* modes of transportation as you move around campus?

- My private vehicle
- ORNL Taxi
- Bicycle
- Walk
- ORNL fleet vehicle
- Other \_\_\_\_\_

24. How often do you use the ORNL Taxi Service for on-site transportation?

- Several times a day
- Once a day
- A few times a week
- Occasionally
- Never

25. If you do not use the ORNL Taxi Service, why not?

- Taxi is not readily available
- Taxi is not reliable
- Picking up additional passengers adds to commute time
- Taxi doesn't travel to desired location
- Taxi doesn't run during times needed
- Other, please specify \_\_\_\_\_

26. How often do you use the ORNL bicycle fleet for on-site transportation?

- Several times a day
- Once a day
- A few times a week
- Occasionally
- Never

27. If you do not use the ORNL bicycle fleet, why not?

- I am not a confident rider
- I do not have access to a shower in my building
- Attire is not appropriate for riding a bicycle
- I need more bicycle safety training
- Bikes are often gone when I leave my destination building
- Need for covered bicycle parking at work (Bikes are sometimes wet when I need one.)
- I need training on bicycle maintenance
- I need a buddy to ride with
- The road surfaces are uneven
- I do not like sharing road space with vehicles
- I do not like wearing helmets
- Other: \_\_\_\_\_

28. Do you have any specific recommendations for improvements to the road and trail network and/or bicycle parking facilities that you think should be explored and implemented?

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### Future Intra-Campus Travel

29. Which of the following on-campus modes of transportation might you use on a regular basis if they were offered in the future?

Future Mode	Would Use	Would Not use	Might Use	Conditions under which you might use this future mode of on-campus transportation
Bus circulator system on fixed 30 minute schedule				
Bus circulator system on fixed 15 minute schedule				
Taxi Service				
Bicycle Fleet				
Walking				
Other				



30. Under what conditions and how frequently would you use the following express bus services?

<b>ORNL to Destination</b>	<b>Would not use</b>	<b>Would Use</b>	<b>Might Use</b>	<b>Frequency of Use</b>	<b>Conditions for use</b>
McGhee Tyson Airport					
University of Tennessee					
NTRC					
Commerce Park					

**GENERAL**

Do you have any comments or specific recommendations for transportation-related improvements that should be explored as part of the Sustainable Campus effort?

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**Thank you for your participation.**

Links for related information:

Car/Van Pool Program <https://home.ornl.gov/~fli/>

ORNL Bicycle Fleet and Training <https://portal.ornl.gov/sites/fo/ls/tm/big/default.aspx>

ORNL Taxi Service [https://www.fo.ornl.gov/lsd/fleet\\_services/taxi.htm](https://www.fo.ornl.gov/lsd/fleet_services/taxi.htm)

Fuel Efficiency <http://www.fueleconomy.gov/>

Knoxville's Smart Trips, alternatives to driving alone <http://www.knoxsmarttrips.org/>

Alternative Work Schedule <http://sbms.ornl.gov/sbms/sbmsearch/subjarea/flex/sa.cfm>

## APPENDIX B. SAMPLE TELECOMMUTE MATERIALS FROM THE UNIVERSITY OF CALIFORNIA, BERKELEY

### Staff Employee Telecommuting Procedures

#### TELECOMMUTING GUIDELINES

1. A telecommuting agreement should be voluntary. No employee should be required to telecommute.
2. The arrangement must be in the best interests of the university. It should benefit—or at least not cause significant problems—for the department as well as the employee. In evaluating benefits to the department, these are some factors to consider:
  - Does the nature of the work lend itself to telecommuting?
    - Jobs that entail working alone or working with equipment which can be kept at the alternate work site are often suitable for telecommuting. Examples: writer, editor, analyst, word processor, programmer.
    - Jobs that require physical presence to perform effectively are normally not suitable for telecommuting. Examples: receptionist, student advisor, food service worker, child care worker, custodian, maintenance worker.
  - What potential costs and savings are expected?
    - Space is often saved. However, juggling shared space among several part-timers may be difficult, especially if there is much turnover.
    - Equipment costs may be saved at the office (as when existing equipment is freed up for use by others). However, costs may be incurred at the alternate work site, depending on the nature of the agreement. For example, the department may need to buy, or support the costs of maintaining, a computer, modem, fax, or phone lines.
    - Staffing costs may be saved if the arrangement helps the department to recruit or retain a valued employee, or if the employee becomes more productive as a result of the new work arrangement. (Employees often produce more if they are freed from constant interruptions.) On the other hand, some work requires constant interaction with coworkers. In addition, telecommuting by one employee may affect the workload or the productivity of others.
  - Is the employee a good candidate for telecommuting?
    - Telecommuting during the probationary period is not usually a good idea, because of the need to clarify job responsibilities, establish relationships with co-workers and clients, and assess suitability for continued employment.
    - Employees who have performance problems, or who require close supervision, are not good candidates for telecommuting.
    - Some employees are not comfortable with physical isolation from other employees, or do not work well independently, or cannot create a home work space that is safe (for them and for university equipment and files) and is free from distractions.

- Sometimes employees who telecommute feel that they are "out of the loop" and are overlooked when it comes to various kinds of workplace opportunities. (For this reason, and others, telecommuting should not normally be done more than two or three days a week.)
3. The focus in telecommuting arrangements must be on results. The supervisor should communicate in advance what assignments or tasks are appropriate to be performed at the telecommuting site, and what assessment techniques will be used to measure success in meeting performance standards.
  4. The agreement should be as specific as possible. It should include:
    - Days and hours the employee is expected to be working in the department
    - Hours the employee is expected to be working and reachable at the telecommuting site
    - Methods of contact (such as dedicated phone line, voice mail, modem, fax, beeper, etc.)
    - Times and frequency of contact (in both directions)
    - Who owns and maintains required equipment and supplies
    - Who pays for on-going expenses, such as phone lines
    - A statement that the employee agrees to maintain a safe work environment, and that the employee agrees to hold the university harmless for injury to others at the telecommuting location
    - A statement that the employee agrees to provide a secure location for university-owned equipment and materials, and will not use, or allow others to use, such equipment for purposes other than university business; and that the university is entitled to reasonable access to its equipment and materials
    - A statement that management retains the right to modify the agreement on a temporary basis as a result of business necessity (for example, the employee may be required to come to campus on a particular day), or as a result of an employee request supported by the supervisor
    - A statement that the arrangement is voluntary, and may be terminated at any time by either party, with specified notice
  5. The agreement should be in writing and should be signed and dated by the employee, the supervisor, and the department head or designee. A copy should be given to the employee; the original should be kept in the employee's file.
  6. Questions should be directed to your Employee Relations Consultant in Human Resources, the Office of Risk Management, or University Health Services, as appropriate.

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## MODEL TELECOMMUTING AGREEMENT

This agreement specifies the conditions applicable to an arrangement for performing work at an alternate work site on a regular basis. The agreement begins on DATE and continues until DATE or INDEFINITELY. It can be withdrawn with X DAYS written notice by either party.

1. Days and hours when the employee is normally expected to be in the department are SPECIFY DAYS AND HOURS.
2. The alternate work site is SPECIFY LOCATION. Days and hours when the employee will normally work at this alternate work site are SPECIFY DAYS AND HOURS.
3. Additional hours involving overtime at any work site must be approved in advance by the supervisor.

4. Duties and assignments authorized to be performed at this alternate work site are SPECIFY DUTIES. The supervisor reserves the right to assign work as necessary at any work site.
5. Recognizing that effective communication is essential for this arrangement to be successful, the following methods and times of communicating are agreed upon:

[SPECIFY: who (include backup and emergency contacts), when, how often, during what time frames, how (phone, fax, beeper, face-to-face, etc.)]

6. The employee agrees to remain accessible during designated work hours, and understands that management retains the right to modify this agreement on a temporary basis as a result of business necessity.
7. Regarding space and equipment purchase, set-up, and maintenance, the following is agreed upon:

[SPECIFY: purchase, set-up, maintenance, provision of supplies, insurance arrangements (consulting Office of Risk Management as necessary), etc., for each piece of equipment, furniture, phones, etc.]

8. The employee agrees to maintain a safe and secure work environment. The employee agrees to allow the university access to assess safety and security, upon reasonable notice.
9. The employee agrees to report work-related injuries to the supervisor at the earliest reasonable opportunity. The employee agrees to hold the university harmless for injury to others at the alternate work site.
10. The employee agrees to use university-owned equipment, records, and materials for purposes of university business only, and to protect them against unauthorized or accidental access, use, modification, destruction, or disclosure. The employee agrees to report to the supervisor instances of loss, damage, or unauthorized access at the earliest reasonable opportunity.
11. The employee understands that all equipment, records, and materials provided by the university shall remain the property of the university.
12. The employee understands that his/her personal vehicle will not be used for university business unless specifically authorized by the supervisor.
13. The employee agrees to return university equipment, records, and materials within X DAYS of termination of this agreement. All university equipment will be returned to the university by the employee for inspection, repair, replacement, or repossession with X DAYS written notice.
14. The employee understands that she/he is responsible for tax consequences, if any, of this arrangement, and for conformance to any local zoning regulations.
15. The employee understands that all obligations, responsibilities, terms and conditions of employment with the university remain unchanged, except those obligations and responsibilities specifically addressed in this agreement.

I hereby affirm by my signature that I have read this Telecommuting Agreement, and understand and agree to all of its provisions.

\_\_\_\_\_  
Employee and Date

\_\_\_\_\_  
Supervisor and Date

\_\_\_\_\_  
Department Head/Designee and Date

## **SAFETY CHECKLIST FOR TELECOMMUTERS**

The following checklist is recommended for use by each telecommuter in organizing an alternate work site. The telecommuter should review this checklist with his/her supervisor prior to the start of telecommuting, and they are encouraged to work together to ensure the safety of the alternate work site.

### **Work Site**

- \_\_\_ Telecommuter has a clearly defined work space that is kept clean and orderly.
- \_\_\_ The work area is adequately illuminated with lighting directed toward the side or behind the line of vision, not in front or above it.
- \_\_\_ Exits are free of obstructions.
- \_\_\_ Supplies and equipment (both departmental and employee-owned) are in good condition.
- \_\_\_ The area is well ventilated and heated.
- \_\_\_ Storage is organized to minimize risks of fire and spontaneous combustion.
- \_\_\_ All extension cords have grounding conductors.
- \_\_\_ Exposed or frayed wiring and cords are repaired or replaced immediately upon detection.
- \_\_\_ Electrical enclosures (switches, outlets, receptacles, junction boxes) have tight-fitting covers or plates.
- \_\_\_ Surge protectors are used for computers, fax machines, and printers.
- \_\_\_ Heavy items are securely placed on sturdy stands close to walls.
- \_\_\_ Computer components are kept out of direct sunlight and away from heaters.

### **Emergency Preparedness**

- \_\_\_ Emergency phone numbers (hospital, fire department, police department) are posted at the alternate work site.
- \_\_\_ A first aid kit is easily accessible and replenished as needed.
- \_\_\_ Portable fire extinguishers are easily accessible and serviced as needed.
- \_\_\_ An earthquake preparedness kit is easily accessible and maintained in readiness.

### **Ergonomics**

- \_\_\_ Desk, chair, computer, and other equipment are of appropriate design and arranged to eliminate strain on all parts of the body, in conformance with Campus Occupational Health Program guidelines.
- \_\_\_ *A User-Friendly Workstation, Personal Workstation Checklist, and Computer & Desk Stretches*, published by the Campus Occupational Health Program, are available for easy reference at the alternate work site.

## APPENDIX C. FUTURE TRANSIT OPPORTUNITIES

### Express Bus Service

Oak Ridge to Knoxville was identified in the 1996 *Regional Transportation Alternatives Plan for East Tennessee—Final Report* as primary corridors with current activity that warrants immediate consideration of mass transit opportunities. The report states that “The magnitude of the Oak Ridge commute due to the concentration of jobs in a specific area suggests that this market is mature enough to support an express bus service that operates just in the peaks.” The report specifically cites the concentration of jobs at Y-12 but does not include X-10 in the narrative. Sevier County along State Route 66 and US 411 was also identified as a primary corridor. Secondary corridors require additional growth or other changes before mass transit is viable. Of six potential secondary corridors, the Airport to West Knoxville/Oak Ridge Route was 4th in order of probably viability.

#### Primary Express Bus Corridors

- ☑☑ Sevier County Corridor along SR 66 and US 441
- ☑☑ Oak Ridge - Knoxville via Pellissippi Parkway

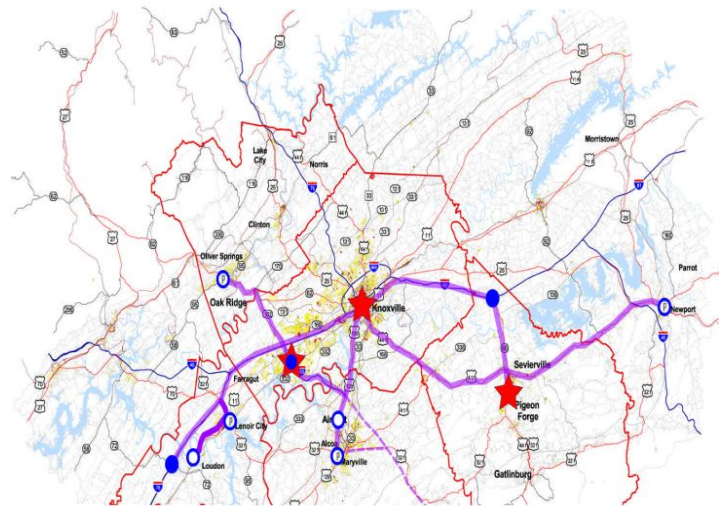
#### Secondary Corridors (in order of probable viability)

- ☑☑ Airport—Knoxville
- ☑☑ Knoxville—Sevier County
- ☑☑ Newport—Sevier County
- ☑☑ Airport—West Knox/Oak Ridge
- ☑☑ Maryville—Knoxville
- ☑☑ Loudon—West Knox/Downtown Knoxville

### Bus Rapid Transit and the Pellissippi Parkway

Reconstructing the Pellissippi Parkway to provide a bus-only lane for 14 miles from I-40 to Oak Ridge is estimated to cost \$102 million. This is based on the Dulles Airport experience that cost \$7.3 million per mile. Activity in this corridor is limited primarily to peak hour commutes. Therefore, the report concluded that regional investment in a BRT system would be underutilized for most of the day. For this reason, investment in the corridor was not proposed for the regional concept.

Discussions are underway between the Knoxville-Knox County Regional Transportation Organization staff, the City of Knoxville Transportation and Mobility Committee, and the Tennessee Department of Transportation for funding to program an update of the *Regional Transportation Alternatives Plan for East Tennessee*.



		Estimated Cost (\$millions)	
★	Transfer Center	Knoxville	\$21
		Sevier County	\$ 4
●	Small Station/ Park and Ride (no improvement needed at airport)	7 @ \$1m each	\$ 7
★	Transfer Center / Major Park and Ride	West Knox	\$ 7
	Maintenance Facility		\$ 6
	<b>TOTAL ESTIMATED FACILITY CAPITAL COST</b>		<b>\$45</b>

## **APPENDIX D. SUMMARY OF 2004 TRAFFIC, PARKING, AND MASS TRANSIT STUDY**

Cannon and Cannon. Traffic, Parking and Mass Transit Strategy Development Study for Oak Ridge National Laboratory, Oak Ridge, Tennessee, September 2004

Cannon and Cannon Engineering conducted an analysis of the traffic, parking and mass transit needs in September of 2004. One major conclusion was that there was a significant shortage of conveniently located parking spaces. The recommended solutions were to (1) construct/provide new parking spaces near major work centers, and (2) operate a transit service to shuttle workers between the parking areas and office buildings. The transit option was considered to be the most cost effective, less disruptive, and most feasible to implement. Therefore, a Transit Service Plan was developed for internal and off-campus travel needs. The off-campus plan was very broad, with few specifics. The Transit Service Plan for Internal Circulation had a peak and a non-peak hour strategy as follows:

1. The so called "commuter hour" strategy provides for two separate transit routes, referred to as east and west loops, for use only during AM and PM peak commuting hours. These routes would serve travel from peripheral parking areas to work areas.
2. The mid-day travel strategy provides for one central linear route for use only during mid-day travel, serving internal campus travel between buildings.

At the time of the study, in October 2003, there were 3891 workers at the main campus. Over 91 percent of the workers drove alone in a single occupant vehicle. About half of these workers had offices in the central campus (Buildings 4500 (N & S), 5700 and 5600 (in descending order)). The most commonly used parking lots were the North Lot (Off Bethel Valley Road) and Flag Pole Hill.

Most employees arrived at work between 7 to 9 AM and departed between 4:30 to 5:50 PM. Nearly 25 percent of employees had access to designated parking spaces, and nearly 50 percent of them use the Red permit. The walking time from parking lots for 62 percent of the respondents was less than 6 minutes. Assuming a walking speed of 4 ft per second, six minutes is equivalent to approximately 1,440 feet. However, the average acceptable walk time for all employees responding to the survey was 4.3 minutes. Assuming a walking speed of 3.5 feet per second, this is equivalent to approximately 900 feet. Additionally, 85 percent of survey respondents were found to be only willing to walk at least 2.0 minutes or 400 feet (at 3.5 fps).

Intra-campus travel destinations were primarily Building 4500 (N & S), 5600 and 5700. In terms of frequency, employee was likely to go to another building twice a week.

Cannon and Cannon. Traffic, Parking and Mass Transit Strategy Development Study for Oak Ridge National Laboratory, Oak Ridge, Tennessee, September 2004