

1.963 Report:  
A Sustainable Transportation Plan for MIT  
Campus  
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# Structure of Presentation

- Introduction/Current State: Tegin Teich
- Proposals/Scenarios: Francesca Napolitan
- Methodology and Results: David Block-Schachter
- Discussion/Questions

# Motivation: MIT Energy Initiative and the Role of Transportation

“Walk the Talk”: Meeting the global energy challenge by reducing energy use and greenhouse gas emissions.

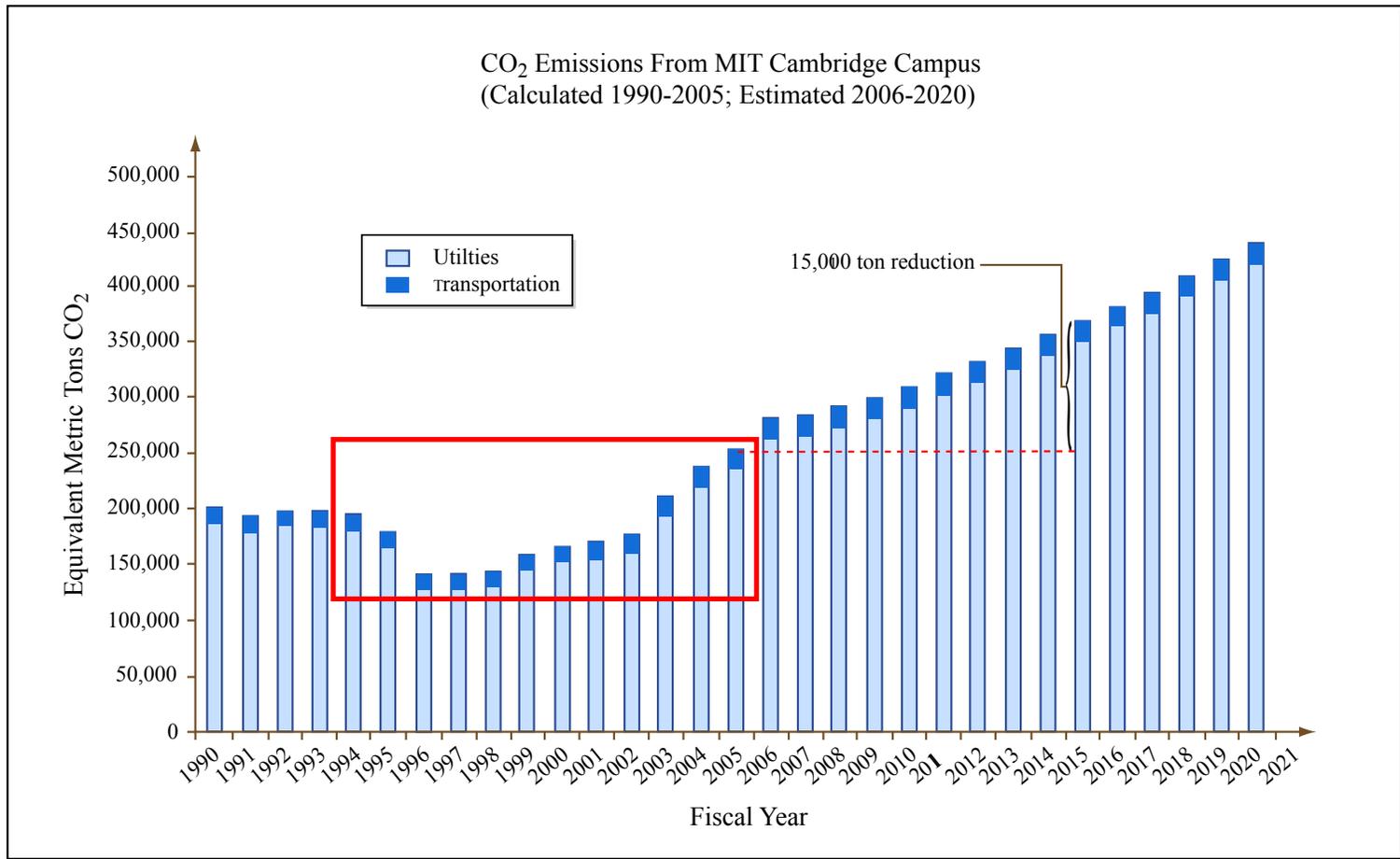


Figure by MIT OCW.

Source: The MIT Energy Research Council <http://web.mit.edu/erc/campus/index.html>

# Objectives

## **Multifaceted Objectives:**

- Reduce emissions
- Address rapidly increasing costs of providing parking

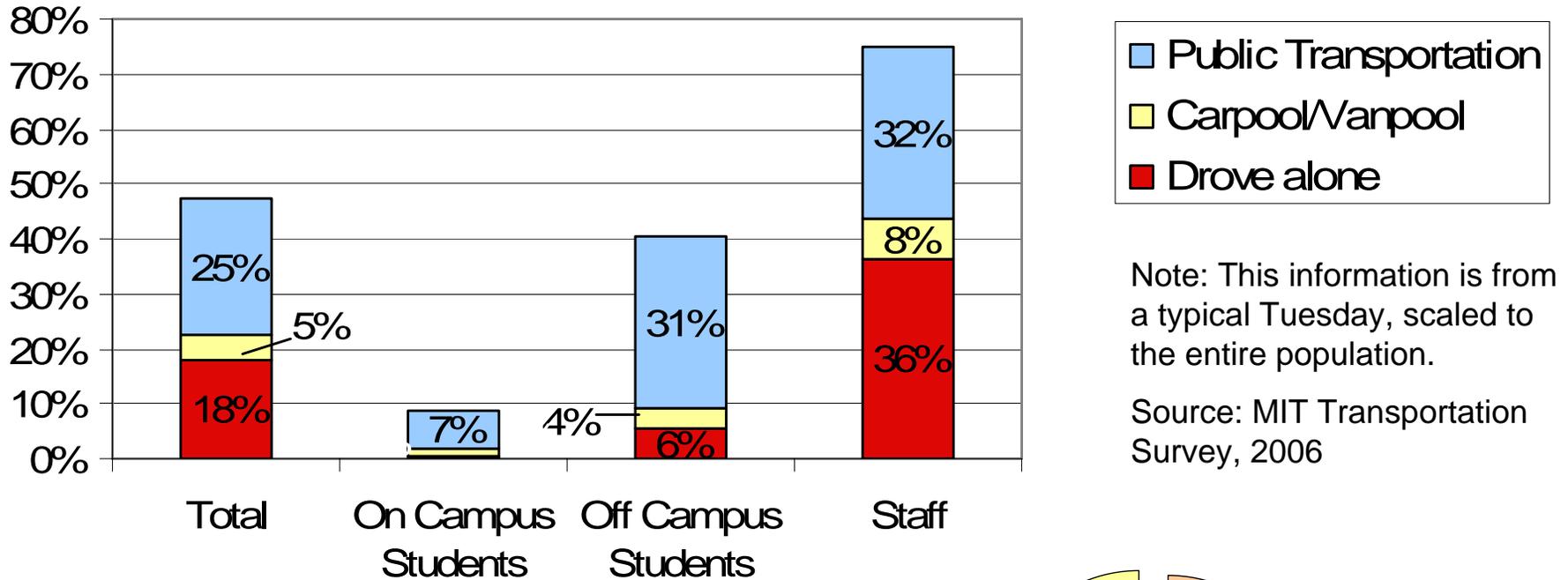
## **Method:**

- Establish a **Unified Transportation Program**
  - Parking
  - Transit
  - Shuttles

## **Outcome:**

- Induced shift from drive alone commutes to transit and carpool when feasible

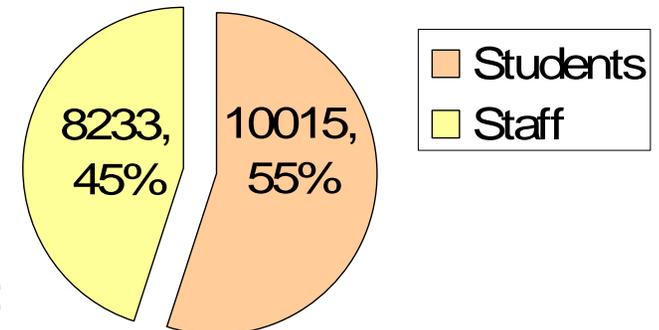
# Method of Commuting to MIT, 2006



Note: This information is from a typical Tuesday, scaled to the entire population.

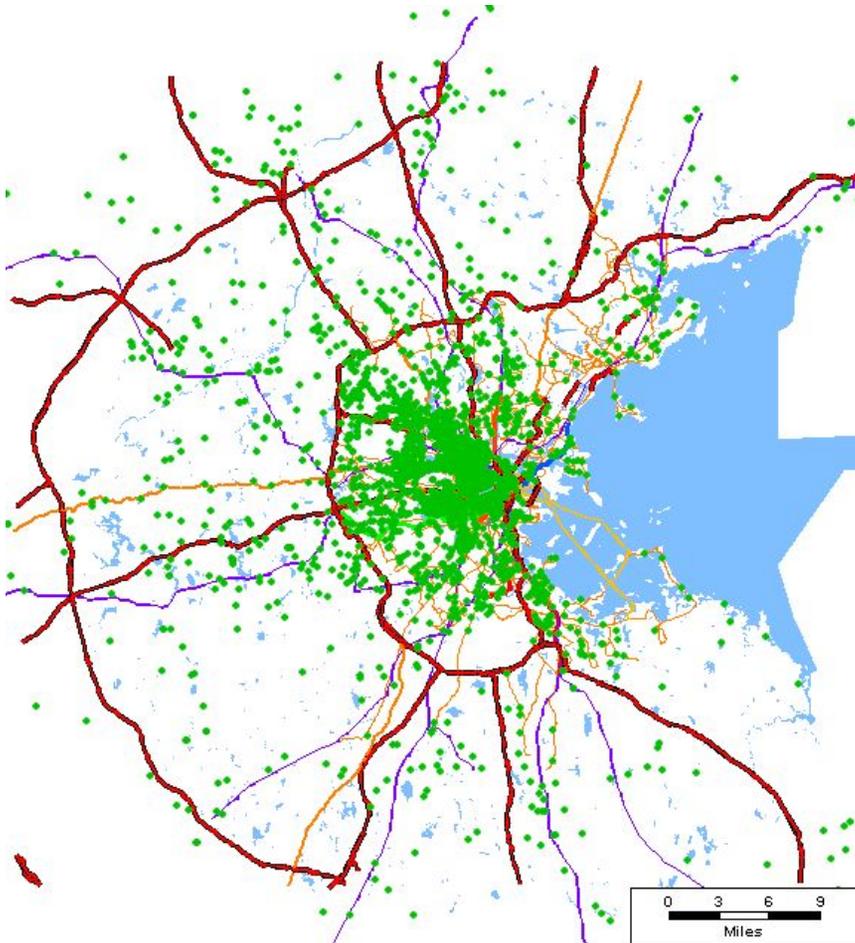
Source: MIT Transportation Survey, 2006

Percentage of Students and Staff at MIT:



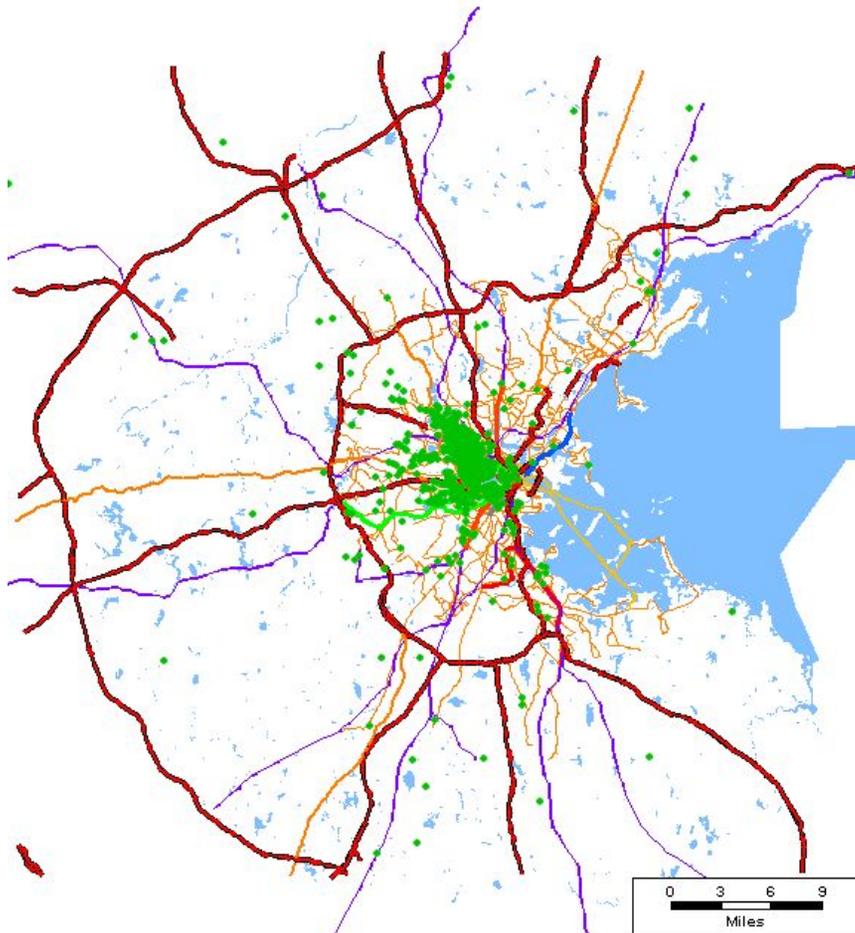
# Where People Live: 2006 MIT Transportation Survey

Total 5,945 mapped

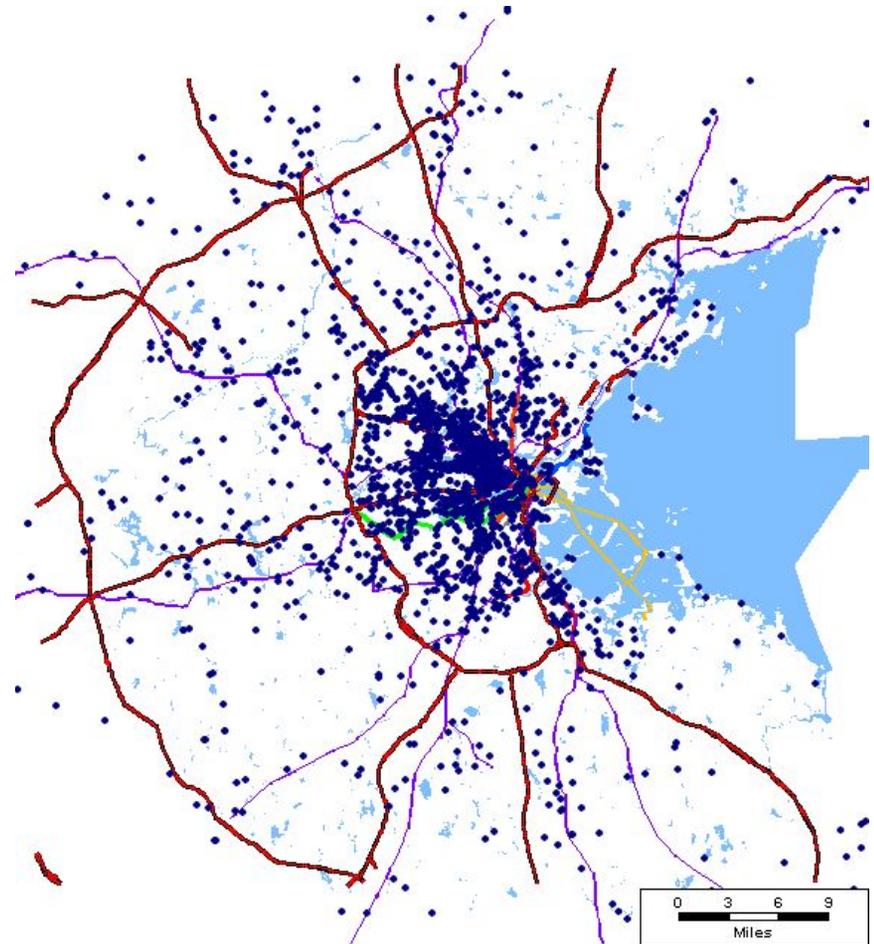


# Where People Live: Students and Staff

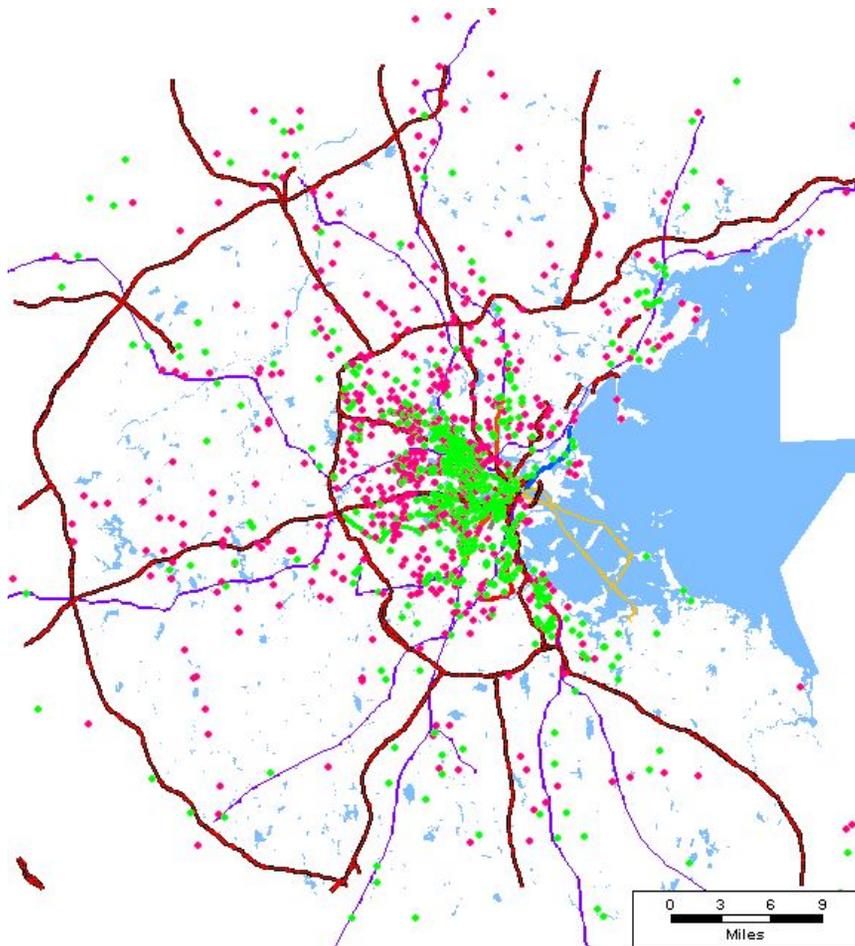
3,024 Students



2,917 Staff

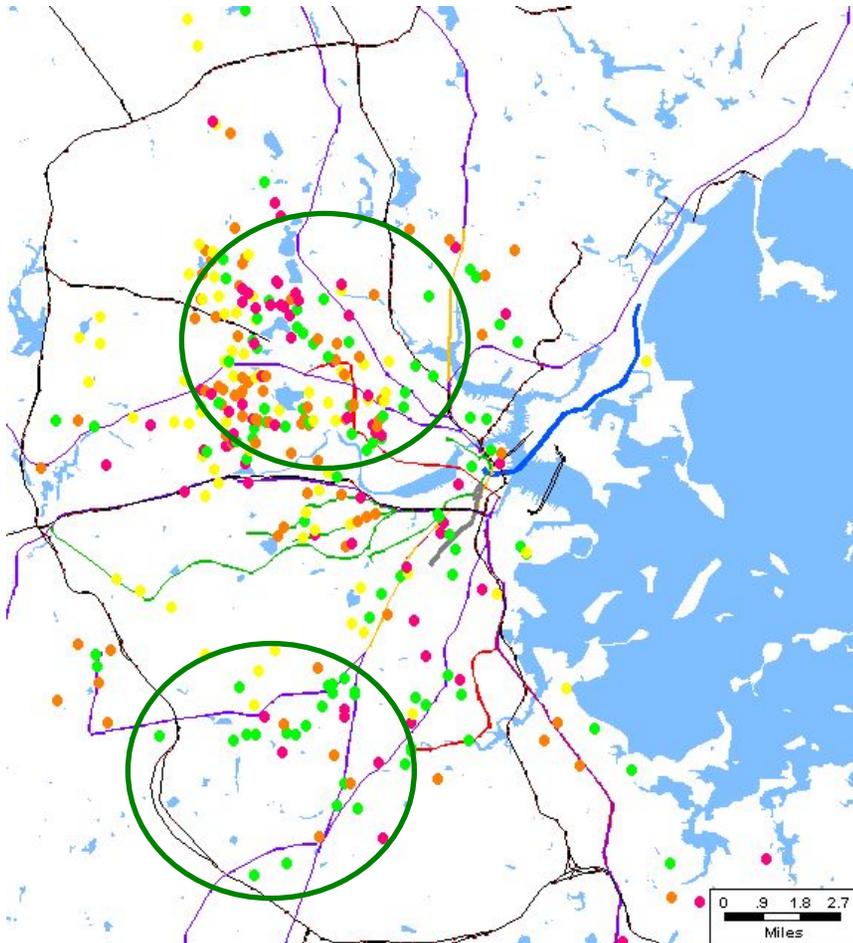


# Where People Live: Commuting Behavior



- Transit
- Drive Alone

# Transit versus Driving Times



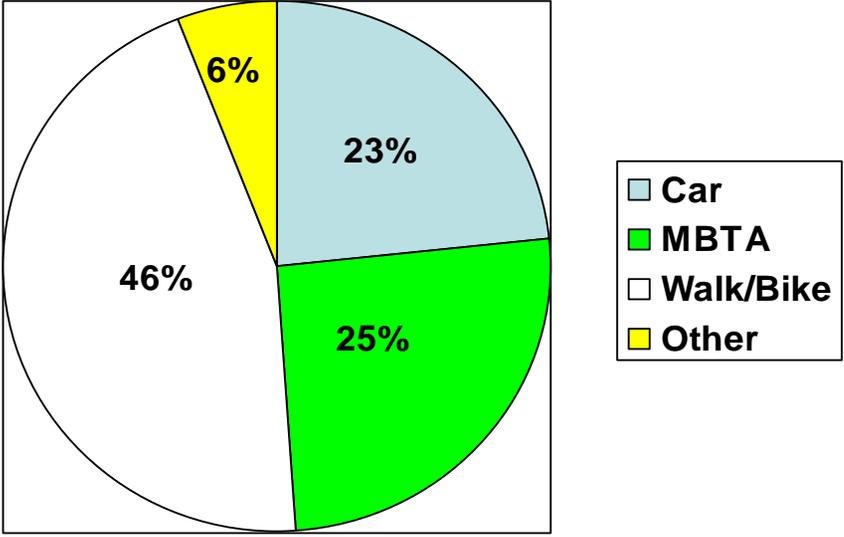
Survey respondents for whom taking transit would be faster or take between 0 and 15 minutes longer:

- 364 Possibilities (Around 900 scaled up to the population)

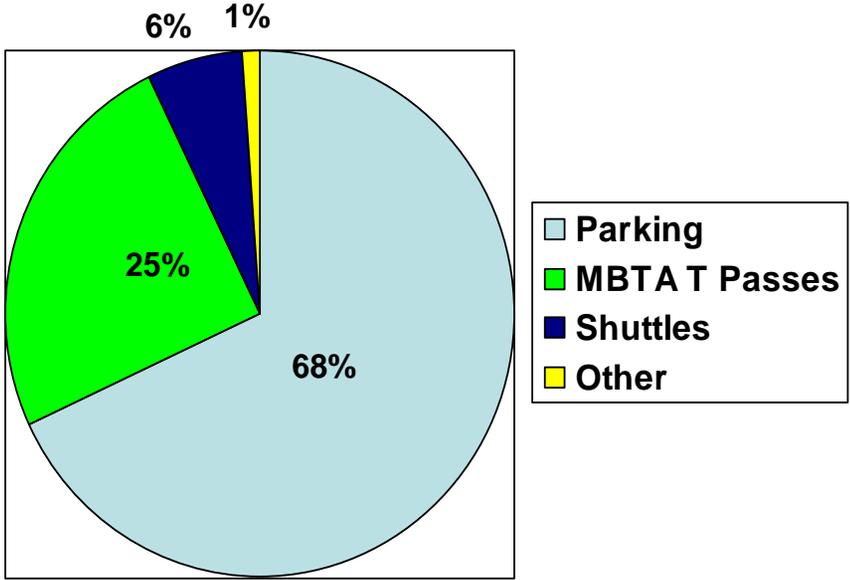
- Transit Quicker
- < 5 Minutes Longer
- 5-10 Minutes Longer
- 10-15 Minutes Longer

# Comparison of Transportation Use & Expenses

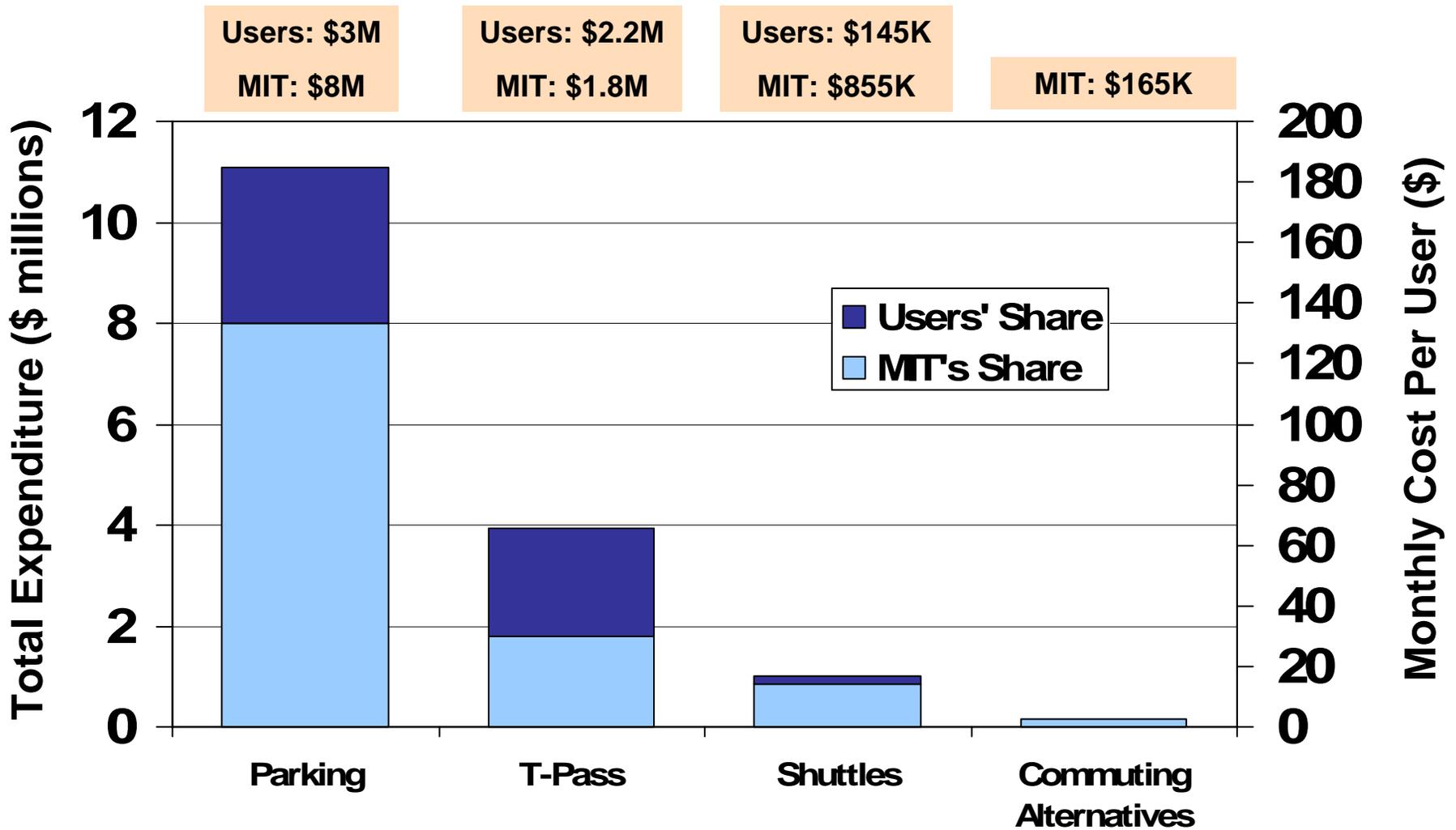
## How People Arrive to MIT



## MIT Transportation Expenses



# MIT Parking & Transportation FY07 Budget



# FY07 Transportation Subsidy Breakdown

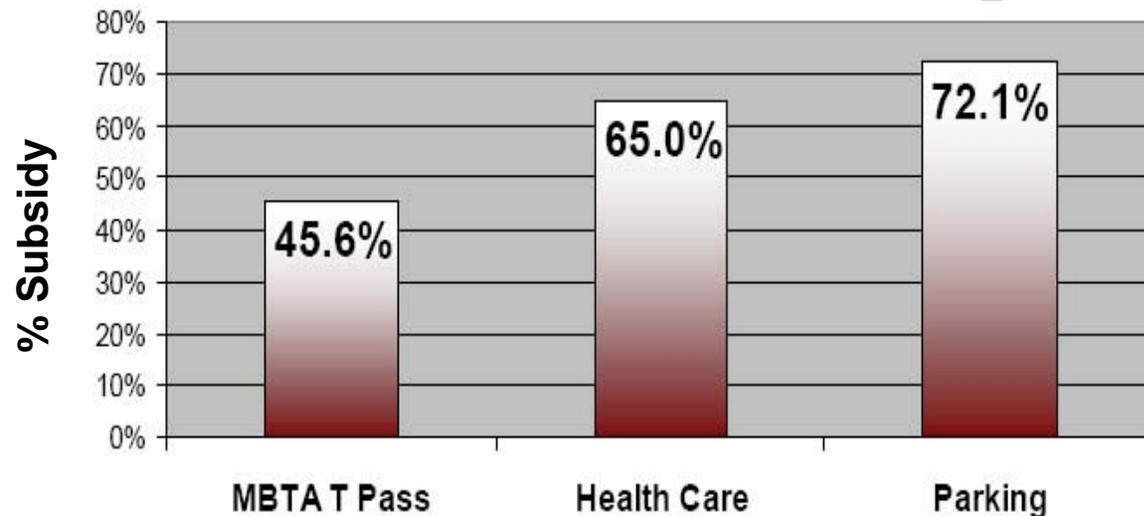
<b>Category</b>	<b>Expenses</b>	<b>Revenues</b>	<b>Subsidy</b>	<b>Annual Subsidy Per User</b>	<b>% Subsidy (share of total expense)</b>
<b>Parking</b>	\$11,060,000	\$3,090,000	\$7,970,000	\$1656	72.1%
<b>T Pass</b>	\$3,975,000	\$2,150,000	\$1,825,000	\$347	45.6%
<b>Shuttles</b>	\$1,000,000	\$145,000	\$855,000	~\$285	85.5%
<b>Commuting Alternatives</b>	\$165,000	\$0	\$165,000	n/a	100.0%
<b>TOTAL</b>	\$16,225,000	\$5,385,000	\$10,815,000	~\$1000	66.7%

# Campus Trends

- Surface lots being replaced by buildings
- Parking spaces replaced 1-for-1 underground
  - Cost of Underground space: \$100,000
    - Monthly Cost: \$700-\$800
- MIT leasing off-campus spaces in interim
  - Average cost of leased space: \$235/month



- End result:



# What is Sustainable Transportation Policy?

## *Environment:*

- Minimizes the environmental impact of driving to commute to MIT.

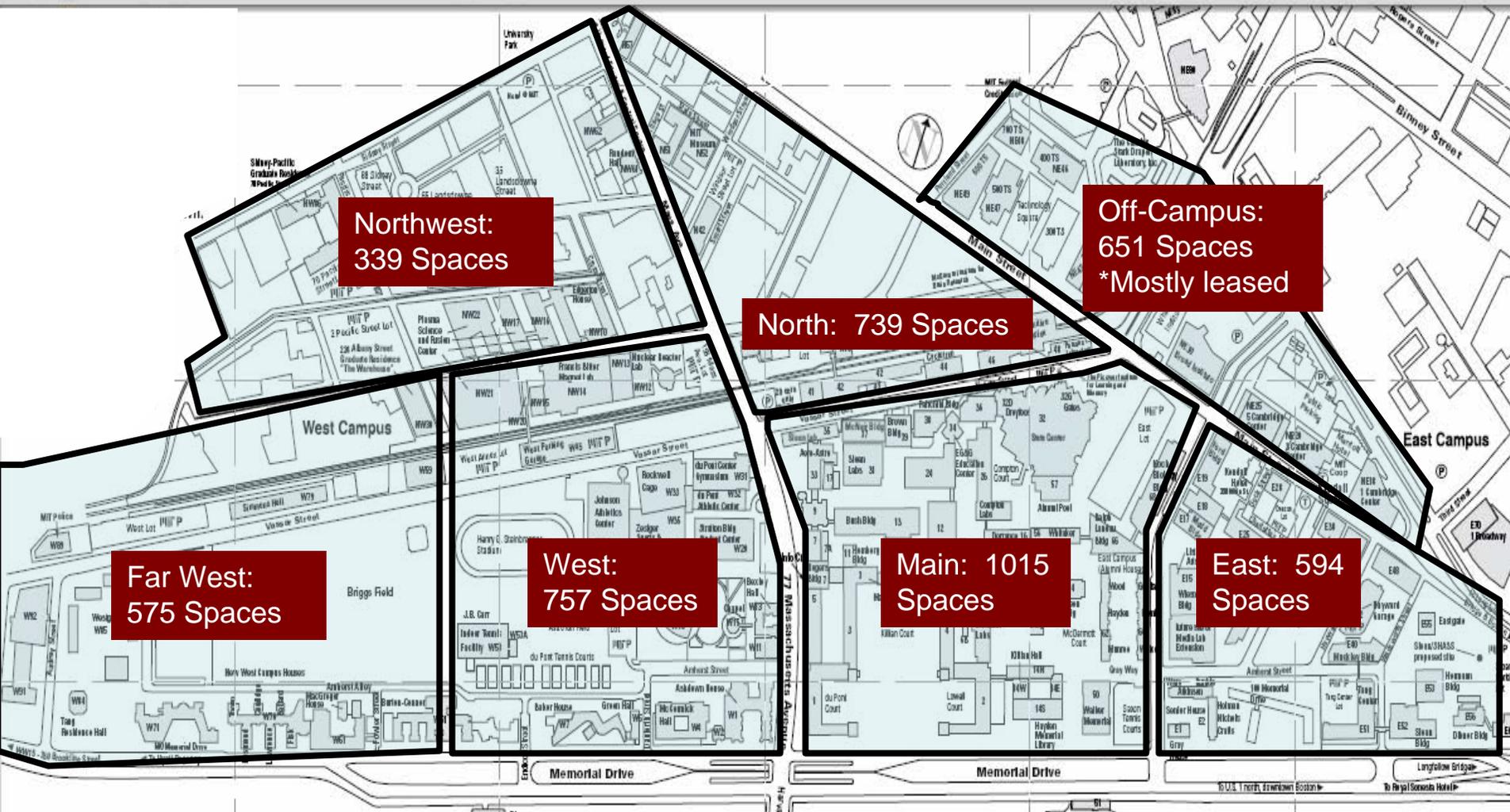
## *Finance:*

- Provides significant revenue while lessening the financial burden to MIT of subsidizing parking.

## *Equity:*

- Provides incentives for those who can reasonably commute by other means.
- Provides strategic, affordable parking options for those who may not have a choice to drive alone.
- Equalizes the subsidies for parking and transit.

# Parking Space Locations



On-street: 472 metered spaces; most are two-hour limit for \$1.00  
132 non-metered on Memorial Drive; free, street cleaning once per month



# Non-MIT Public Transportation

	Origin-Destination	Daily Round-trips	Headway	Cost	Estimated Daily MIT Boardings
<b>M2 Shuttle</b>	LMA-Harvard via Mass. Ave.	54	Peak: 5 Min., Off-Peak: 1 Hour	\$2.30	<100
<b>EZRide</b>	North Station-Cambridgeport via Kendall Sq. and University Park	47	Peak: 10 Min., Off-Peak: 20 Min.	Free to MIT*	300

\*\$100K MIT Annual Contribution

	Origin-Destination	Daily Round-trips	Headway	Cost	Estimated Daily MIT Boardings
<b>Red Line</b>	Alewife-Braintree & Ashmont via Kendall and Central Squares	203	4-7 Minutes	\$1.70	4,500
<b>#1</b>	Harvard Sq.-Dudley Sq.	112	Peak: 7 Min. Off-Peak: 20 Min.	\$1.25	1,000
<b>#CT1</b>	Boston Med. Center-Central Sq.	34	Peak: 20 Min. Off-Peak: 30 Min.	\$1.25	180

Other MBTA Bus Routes Serving MIT Vicinity: CT2, 64, 68, 70, 85

# Proposals

# Transportation Pricing Proposals

## Objectives

1. Equalize subsidy between transit and parking
2. Provide tiers of pricing in order to ensure there are options for captive drivers
3. Retain or increase revenue
4. Encourage transit use by increasing transit subsidies

# Pricing Option 1 – Annual Permit System

- Maintain existing annual parking permit system
- Raise annual permit prices by the institute standard of 11% per year
- All parkers would be required to buy a MBTA Pass for \$15 a month
- The commuter rail subsidy would be increased to 50% or 100%

# Options 2, 3, and 4: Differential Pricing

- No annual permits
- Pricing varies by lot
- Mobility Pass

# What is a Mobility Pass?

- MBTA monthly pass plus an occasional parking permit
- Would replace annual parking permit
- Monthly cost is \$15 after a 3-month free trial for those who currently do not have an MBTA pass or parking permit
- Annual opt-out period for the MIT Community
- May or may not include a commuter rail pass

# The Mobility Pass and the MBTA

- MIT purchases transit passes in bulk for all employees and students
- Price paid to MBTA is based on actual or predicted usage, rather than on the face value of a monthly pass
  - For 20,000 people, the cost of the passes based on actual usage is \$600,000 per month rather than \$1.2m (20,000\*\$60 per month).
- MBTA benefits from increased ridership, for which it is fully compensated.

# Base Structure for Differential Pricing by Lot Options

- Instead of purchasing annual passes, drivers will pay a daily rate on the days that they drive.
- The entire MIT community would be eligible for a monthly mobility pass
- The commuter rail subsidy would be increased to 50% or 100%
- Two or three tiers of pricing by lot, classification based on demand, convenience, surface lot or garage
- Student parkers and daily parkers would be generally housed in different lots
- Weekend parking is free

# Annual Passes Under Differential Pricing Options

<b>Group</b>	<b>Current cost</b>	<b>Proposed cost</b>
Student & Staff Residents	\$657, \$638	\$910
Carpools	\$320 (per car)	\$180 (per person)
Motorcycles	\$100	\$300

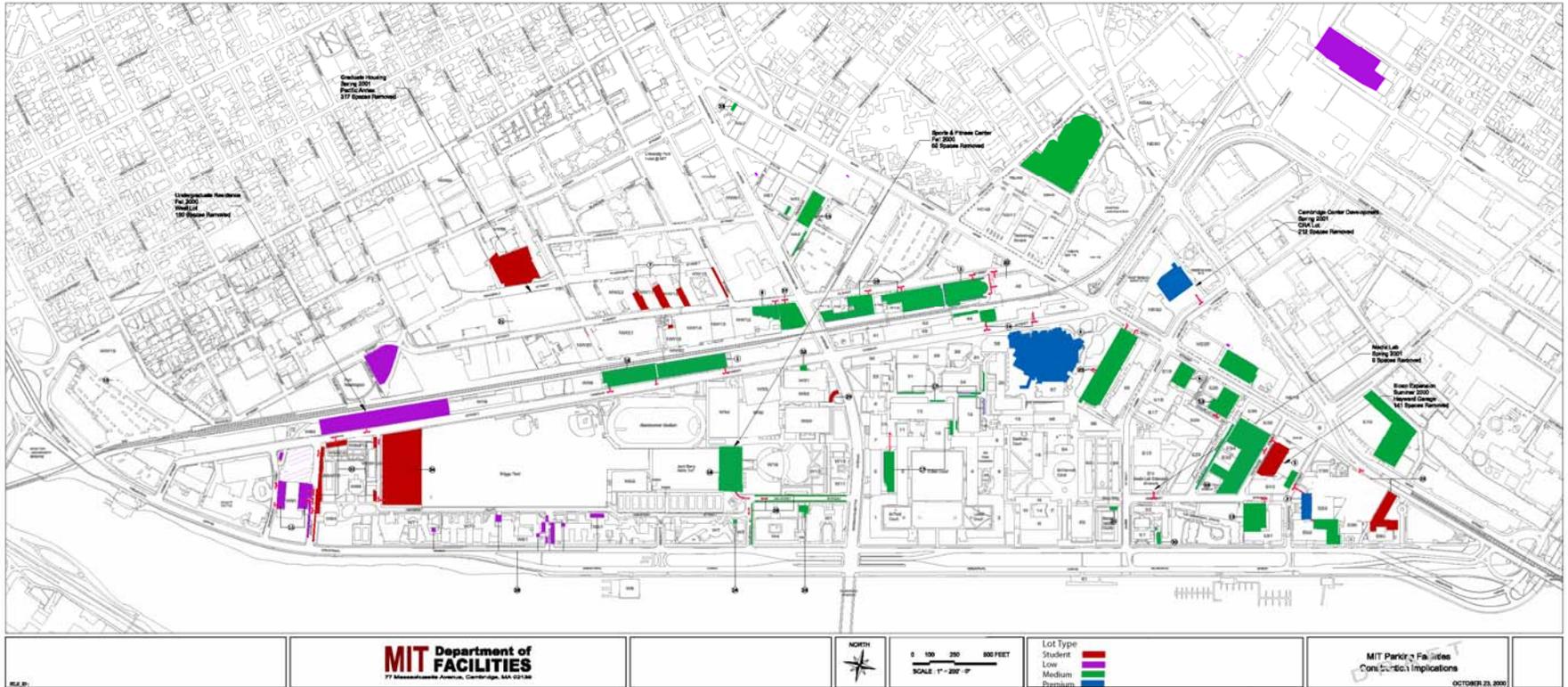
- Mobility pass is included in the annual pass price
- Annual pass price reflects annual 11% increase

# Differential Pricing Options 2, 3, & 4

	Tiers of Pricing	Zone 3 – Low	Zone 2 - Medium	Zone 1 - Premium
Option 2	3	\$2	\$4	\$6
Option 3	3	\$2	\$6	\$10
Option 4	2	\$2.25	\$2.25	\$7

- The current average daily rate is \$2.77
- \$2.25 plus \$15/mo is equivalent to the current annual pass price plus the standard 11% translated to daily rate (46 work weeks, 5 days a week)
- Guaranteed parking spots at selected garages for additional annual fee (\$200 - \$400/yr)

# Parking Lots by Price



	Student	Low	Medium	Premium
# of Spaces	640	980	1994	1084
% of Total	14%	21%	42%	23%

# Methodology/Results

# Methodology

- Based on October 2006 Transportation Survey:
  - Expanded and corrected for response bias
- Predict # of people switching to transit and carpool under each scenario based on:
  - Number of people parking on campus each day
    - Access to transit vs. no viable transit access
  - Conservative elasticities for transit and carpools
- Predict # of people opting out of program based on:
  - Distribution of individual spending on mass transit
- Predict total cost of program based on:
  - Demand for lots under each pricing regime
  - Expected reduction of drivers to campus

# Inputs: Parking And Passes

- 18,248 people on main campus who qualify for benefits
- 3,324 people drive to campus (and park in MIT spots) each weekday
  - Most pay ~\$2.70 per day on an annual basis
  - 359 of these have an occasional pass
    - Pay \$3.50 per day plus \$30/yr
  - About 900 have viable access to transit (<15 minutes travel time difference)
- 5,011 people participate in subsidized transit pass program
  - 609 of these are commuter rail users

# Costs and Revenue

- Parking recovers \$2.1m of costs
- Transit Subsidy Costs
  - MIT contributes \$1.9m per year
  - Participants contribute \$2.2m
    - Spend additional \$250k on non-qualified transportation
  - Non-participants spend \$2.8m per year
  - Overall MBTA receives about \$7m from people who qualify for subsidized transit program

## Note:

- If all non-parking non-passholders signed up for LinkPass would cost MIT additional \$3.3m

# Cost to Provide Parking and Mobility Pass:

## Cost

- Cost of providing parking
- Payment to MBTA for Mobility Pass
- Cost for additional gate equipment

## Revenue

- Parking revenue from new fee structure
  - Minus Mode Switch
- Parking revenue from visitors and exempt users
- Mobility Pass charges
  - Minus opt-outs

# Estimated Impacts of Alternatives

(50% subsidy)

Program	11% increase	\$2 / \$4 / \$6	\$2 / \$6 / \$10	\$2.25 / \$7
Switch to Transit	64	131	270	89
Switch to Carpool	13	55	144	29
Total Spaces Saved	77	186	414	118
% of Current Daily Drivers	2%	6%	12%	4%
<b>Additional subsidy from current</b>	<b>\$ 1,057,776</b>	<b>\$ 466,239</b>	<b>-\$ 1,106,900</b>	<b>\$ 975,103</b>
MIT's savings from ending leased parking <small>*Included in subsidy</small>	\$ 177,136	\$ 425,408	\$ 946,059	\$ 271,409

- Total subsidy currently \$10m
- 11% of staff and students opt-out

# Other Estimated Impacts

- \$1.3m above current for Mobility Pass only with 50% commuter rail subsidy
- 50% --> 100% commuter rail subsidy
  - Increase cost by \$1m
  - Saves an additional 30 parking spaces
- < \$70k to provide free carpool spaces

Tiered Costs to Park per day	Revenue vs. 11% annual increase
\$2 / \$4 / \$6	\$450k
\$2 / \$6 / \$10	\$1.6m
\$2.25 / \$7	-

# Program Comparison

All programs include mobility pass

Cost to Park (Commuter Rail Subsidy)	Mode Switch	Cost to MIT	Equity
11% Annual Increase (50%)	Yellow	Light Red	Light Red
11% Annual Increase (100%)	Yellow	Red	Light Red
Tier: \$2 / \$4 / \$6 (50%)	Green	Yellow	Yellow
Tier: \$2 / \$4 / \$6 (100%)	Green	Yellow	Light Green
Tier: \$2 / \$6 / \$10 (50%)	Green	Green	Yellow
Tier: \$2 / \$6 / \$10 (100%)	Green	Green	Yellow
Tier: \$2.25 / \$7 (50%)	Light Green	Yellow	Green
Tier: \$2.25 / \$7 (100%)	Light Green	Yellow	Green

# Impact on Different Groups

- ↑↑ **Transit Commuters:** More service options; lower price
- ↑↑ **Walk or Bike Commuters:** New low-cost transit option with opt-out
- ↑↑ **Carpoolers:** Lower-cost parking with new transit options

## Drive Alone

- ↑↑ Lower 25%: Same cost with new transit option
- ↑↑ Middle 50%: Slightly higher cost with new transit option
- ↔ Top 25%: Higher cost with new transit option and premium location spaces

# Impact on Institution

## **All Staff and students**

↑↑ Free use of MBTA for non-commute trips and option to park at any time

## **MIT as institution**

↑↑ Major new benefit for both students and staff

↑↑ Recognition as a regional leader

↑↑ Moderates a very expensive trend towards underground parking

# Can current transportation policies support an additional 1,000 employees?

- At 37% mode share, requires parking for an additional 370 people
- Since lots and garages exist on the most desirable buildable space, would require further decreasing the parking supply (estimate: 400)
- MIT will likely only build underground spaces, at a cost of more than \$100,000 per space (~\$10,000 per year at 8% over 30 years)
  - Must build spaces to replace those lost to construction (400)
  - And spaces to house new employees (370)
- There is a cap on the number of spaces MIT can provide without need to negotiate with Cambridge

**Total Cost: \$7,700,000 per year**

Plus: Increased Congestion, Issues with Cambridge

# An alternate future

- Option 3b (Tiered Pricing of \$2, \$6, \$10 plus Mobility Pass that includes Commuter Rail)
- Decreased demand from new employees (33% drive alone or less)
- 280 Additional Underground Spaces required
  - Replacement of surface or structured parking (estimate: 400)
  - Plus additional demand (estimate: 330)
  - Minus spaces saved for current employees (estimate: 450)
- Increased costs for Mobility Pass
- Increased Revenue from Parking Prices

**Total cost: \$2,800,000 per year**

Plus: Decreased congestion, long-term residential switch to transit, no issues with Cambridge

# Where does MIT want to be in 10 years?

Given growth and switch to underground parking

## No Changes

- Increased congestion
- Conflict with Cambridge Planning

## Proposed Changes

- More employees with shorter commutes
- No conflict with Cambridge Planning
- Flexibility to change prices equitably

