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Personal Rapid Transit as an Alternative to Bus Service in Two Communities

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Outline

- Background
- Methodology
- Public Outreach
- City One
  - Ridership
  - Revenues and costs
- City Two
  - Ridership
  - Revenues and costs
- Conclusions

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Background

- Automated Transit Networks (ATN)
  - Small driverless vehicles operating on dedicated guideways (usually elevated)
  - Station are offline (on sidings)
    - Most trips are nonstop
  - AKA personal rapid transit (PRT), group rapid transit (GRT)
- Previous work indicated a city-wide system could pay for itself if it could attract enough riders
- *Could enough riders be attracted?*

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Methodology

- Conduct a public survey to determine modal disutiliy
- Layout suitable ATN stations and guideways
- Apply a Logit choice model to determine mode split car/ATN and car/bus based on weighted times
- Confirm the model works by comparing modeled bus mode split with known bus mode split
- Determine costs and revenues

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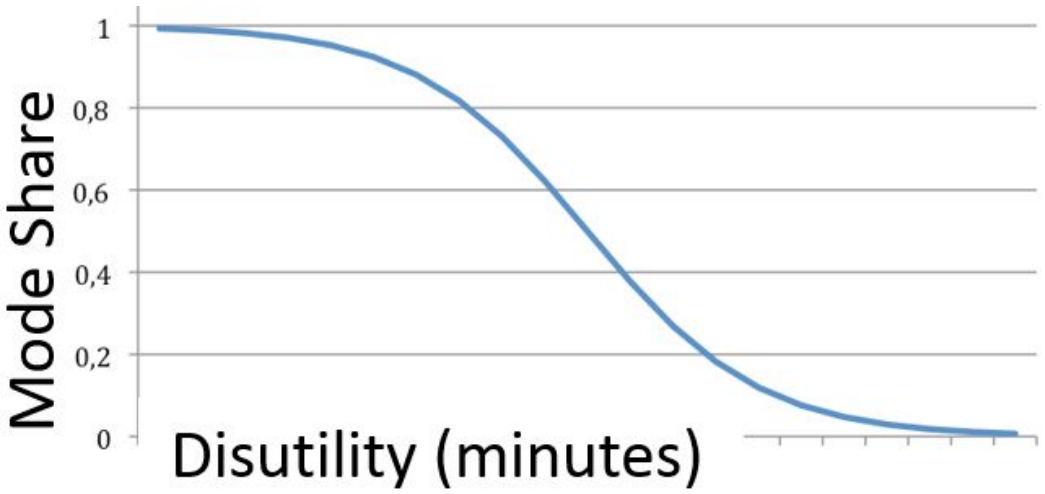
Methodology

- Ridership
  - Car, bus and ATN have differing trip times
  - Change in ridership based on non-linear demand elasticity by a Logit choice model



Mode share decreases as weighted travel time increases

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Public Outreach

- Workshops
  - Mode choice exercise
  - Stated preference survey
    - Times and costs
- Web-based survey
  - Stated preference survey
  - Times and costs

Mode Preference	
Mode	**Score**
GreenPod	457
Light Rail	410
Car	392
Bus Rapid Transit	356
Gondola	342
Bus	308
AutonomousShuttle	281
Streetcar	278

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City One

- City One Bus Route
  - 13 Miles
  - 36 Stops
  - 30 Minute frequency
  - 14 MPH average speed
- City One ATN Route
  - 25 Miles (one-way)
  - 48 Stops
  - 1 Minute frequency
  - 23 MPH average speed

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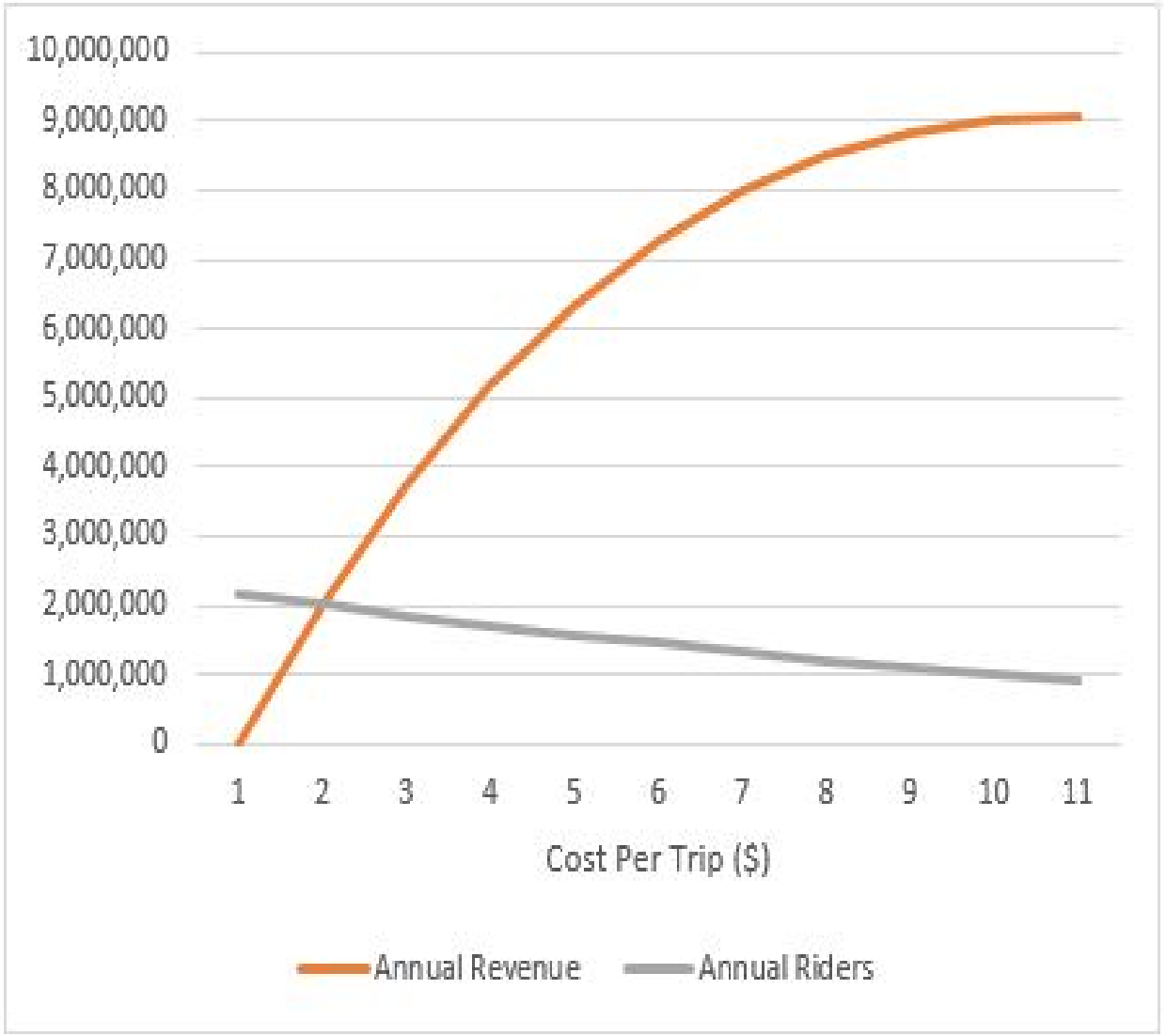
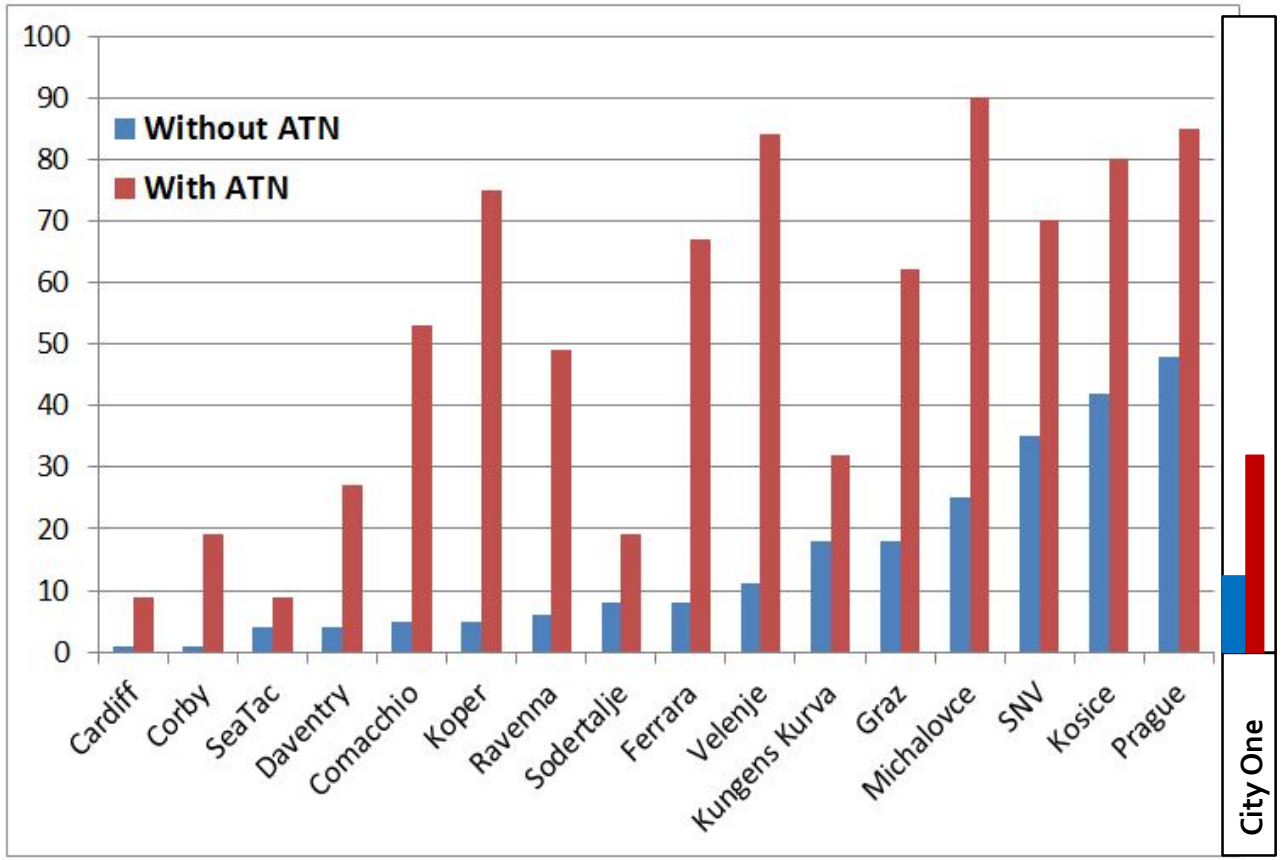
Fare Elasticity

An average fare of $3.50 per trip was used



Mode split

	Modeled	Actual
Bus/car	14%	13%
ATN/car	32%	-



Daily Ridership

	Person Trips
Bus	3,239
ATN	8,423

Peak Hour Simulation Results

Parameter	Result
Number of vehicles	65
Average wait time (mins)	2.6
Passengers carried per vehicle hour	5.9
Average occupancy	1.1

Revenues and Costs

Item	Cost ($ M)
Capital Cost	253
Annualized Capital Cost (@ 5%)	16.2
Annual O&M Cost	2.7
Total Annual Costs	18.9
Annual Revenue	7.9
Annual Surplus	(11.0)
Fare-box Recovery Ratio	2.92

Feasibility Compared to Light Rail

Item	Average FTA LRT Project	City One
Capital amortization cost per passenger	$18.35	$7.87
Operating cost per passenger	$3.60	$1.18
Total cost per passenger	21.95	9.05

Conclusions

- ATN will:
  - Reduce congestion by removing 23% of car trips along the route
  - Reduce road transportation facility requirements
  - Improve mobility and accessibility
  - Uplift real estate values
  - Improve the economy
  - Increase safety
  - Improve resiliency and sustainability
- ATN will more than pay for its own operating costs

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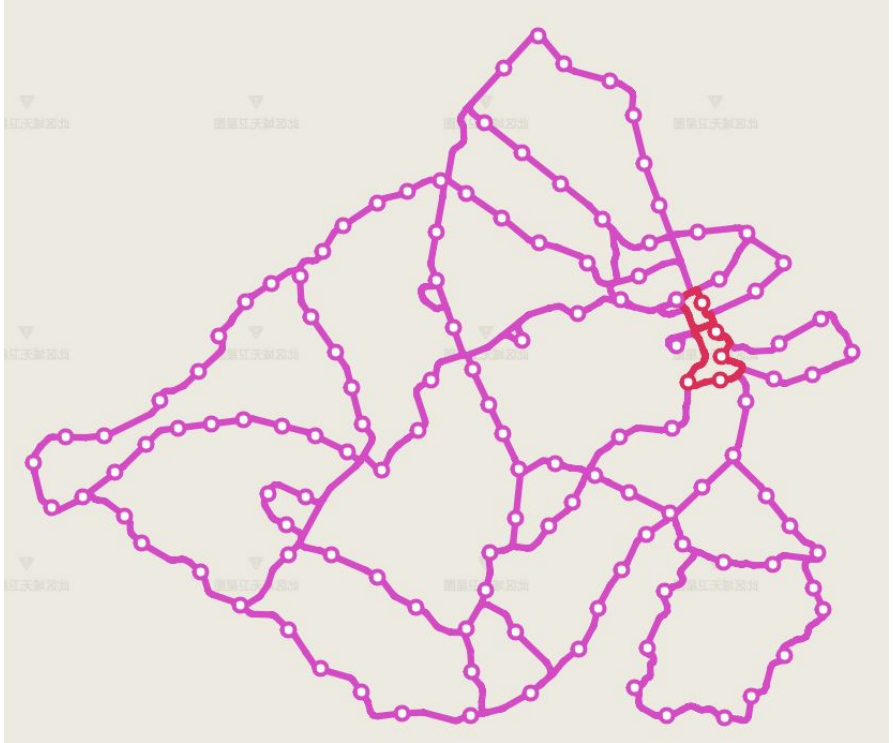
City Two



- City Two ATN Route
  - 75 Miles (one-way)
  - 141 Stops
  - 1 Minute frequency
  - 24 MPH average speed

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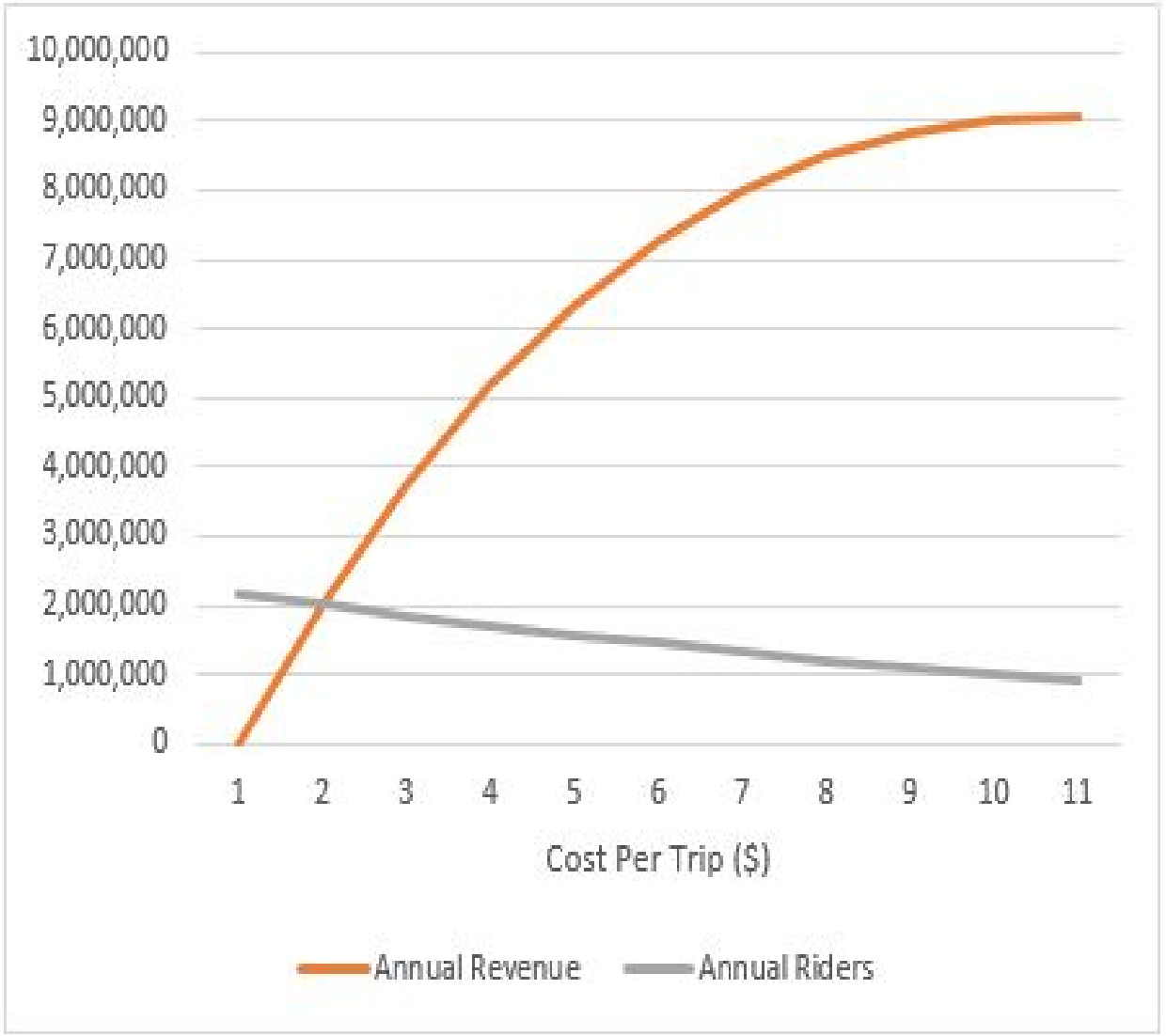
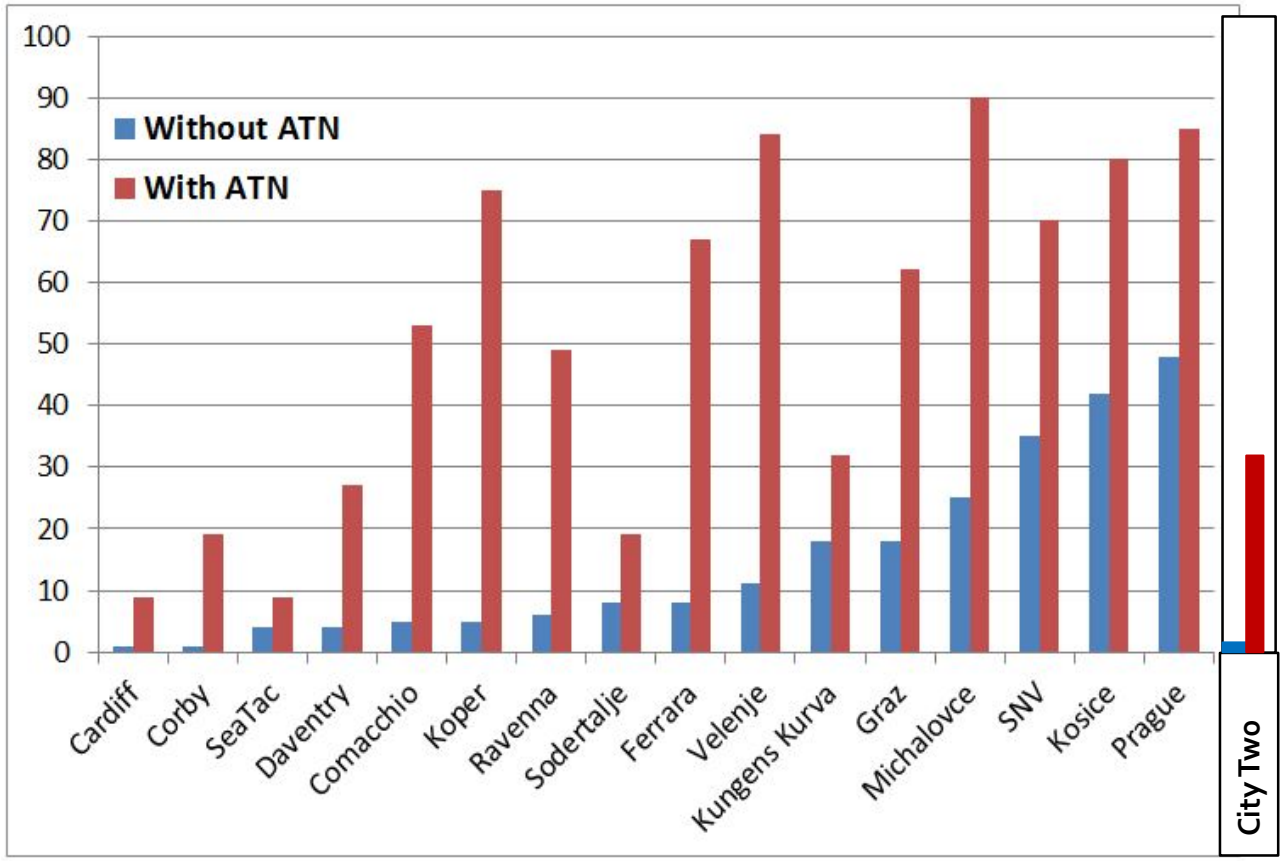
Fare Elasticity

An average fare of $3.50 per trip was used



Mode split

	Modeled	Actual
Bus/car	-	≈1%
ATN/car	32%	-



Daily Ridership

	Person Trips
Bus	?
ATN	99,885

Peak Hour Simulation Results

Parameter	Result
Number of vehicles	1,610
Average wait time (mins)	2.9
Passengers carried per vehicle hour	6.5
Average occupancy	1.51

Revenues and Costs

Item	Cost ($ M)
Capital Cost	1,281
Annualized Capital Cost (@ 5%)	82.5
Annual O&M Cost	48.8
Total Annual Costs	131.2
Annual Revenue	118.5
Annual Surplus	(12.7)
Fare-box Recovery Ratio	2.43

A fare of $3.70 per ride breaks even over the project life cycle

Feasibility Compared to Light Rail

Item	Average FTA LRT Project	City Two
Capital amortization cost per passenger	$18.35	$3.26
Operating cost per passenger	$3.60	$1.23
Total cost per passenger	21.95	4.49

Conclusions

- ATN will:
  - Reduce congestion by removing 72,000 daily car trips
  - Reduce road transportation facility requirements
  - Improve mobility and accessibility
  - Uplift real estate values
  - Improve the economy
  - Increase safety
  - Improve resiliency and sustainability
- ATN could pay for its own capital and operating costs in a community with a population density of about 2,500 per square mile (3.9 per acre).

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