LINK21

CONNECT NORTHERN CALIFORNIA

MARKET ANALYSIS REPORT

APPENDIX I: UNCERTAINTY ANALYSIS

March 2022

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ISSUE AND REVISION RECORD

REVISION	DATE	PREPARER(S)	PMC REVIEWER(S) / BART/CCJPA REVIEWER(S)	APPROVER / BART/CCJPA APPROVER	DESCRIPTION/ NOTES
0	10/20/2021	Andrew Desautels, Steer	Elisa Tejedor, Steer	Sudhish Verma, HNTB	Working DRAFT submittal
	10/29/2021	---	Andrew Tang, Duncan Watry, Sadie Graham, BART; Camille Tsao, CCJPA	Andrew Tang, BART	Working DRAFT submittal review
1	03/18/2022	Derek Cheah, Steer	Elisa Tejedor, Steer	Sudhish Verma, HNTB	DRAFT submittal
					No review requirement

SHAREPOINT PATH

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ACRONYMS AND ABBREVIATIONS

ACRONYM/ABBREVIATION	DEFINITION
BART	San Francisco Bay Area Rapid Transit
CCJPA	Capitol Corridor Joint Powers Authority
BP	Baseline Projects
HG	Housing Growth
HJG	Housing and Job Growth
JG	Job Growth
MAST	Market Analysis Spreadsheet Tool
MPO	Metropolitan Planning Organizations
MTC	Metropolitan Transportation Commission
SF	San Francisco
TC	Travel Costs
WP	Working Patterns

LINK21 PROGRAM TEAM NAMES

TEAM NAME	TEAM MEMBERS
PMC	The HNTB Team
PMT	BART/CCJPA + PMC
Consultants	Consultants supporting program identification/project selection
Link21 Team	PMT + Consultants

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UNCERTAINTY ANALYSIS

Introduction

As described in Chapter 10, an uncertainty analysis was performed to ensure the corridors and segments identified as having strong unmet rail potential perform well under a variety of possible futures.

Uncertainty with respect to five key parameters was examined: housing growth and patterns, job growth and patterns, working patterns, travel costs, and baseline projects. Up to five scenarios were tested for each parameter by adjusting inputs to reflect the desired conditions, re-running the Market Analysis Spreadsheet Tool (MAST), and comparing the relative results of corridors and segments with those of the baseline scenario.

The goal of the Uncertainty Analysis is to compare relative performance across corridors and segments. This is achieved by looking at the changes in the rankings of corridors and segments between each of the uncertainty scenarios and the baseline Corridor Analysis. Any changes in relative rankings from the baseline were incorporated into the identification of corridors and segments with high unmet rail potential.

The subsequent sections detail the scenarios tested for each parameter and the methodology employed in the development of the scenarios along with the key findings from each scenario. These are also summarized in the tables and maps included throughout.

How to Interpret the Summary Maps and Tables

Results from the sensitivity tests are grouped by each of the five key parameters. For each scenario, the following are presented:

- Table of corridor/segment performance and rankings for each scenario (see **Figure 1** for an example)
- Key findings for each scenario and a table showing the scenario impacts by corridor/segment (these rankings of the corridors and segments are relative to the baseline)

Figure 1. Example Results Table

"Total", "Transbay", and "Non-Transbay" columns all refer to changes in unmet rail potential (not weighted by priority populations), compared to the baseline

"Total (Equity-weighted)" includes weighting by impacts on priority populations. This is the parameter used for rankings

"Baseline" column refers to the ranking of each corridor/segment in the baseline assumptions; The final column ranks corridor/segment in the scenario being tested

We separate the tests by region (West/East) and between full corridors or segments

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	BASELINE	SCENARIO
WEST	San Francisco-West	3%	5%	1%	3%	1	1
	San Francisco-Central	13%	18%	7%	15%	2	2
	San Francisco-East	6%	9%	1%	7%	3	3
	SEGMENT						
	Embarcadero-SF State	3%	3%	0%	3%	1	1
	Embarcadero-Bayshore	7%	8%	0%	8%	2	3
	Embarcadero-Balboa Park	21%			23%	3	2
	CORRIDOR						
EAST	Vallejo/Sacramento	7%			8%	1	1
	Fremont/Modesto	6%			6%	2	2
	San Jose	5%			6%	3	4
	Martinez/Stockton	9%			9%	4	3
	San Ramon/Modesto	4%	4%	2%	4%	5	5
	Walnut Creek/Stockton	11%	11%	10%	12%	6	6
	SEGMENT						
	Oakland-Bay Fair	6%	6%	3%	6%	1	1
	Oakland-Richmond	12%	13%	6%	13%	2	2

Percentages in each cell refer to the delta or change in unmet rail potential for this scenario compared to the baseline

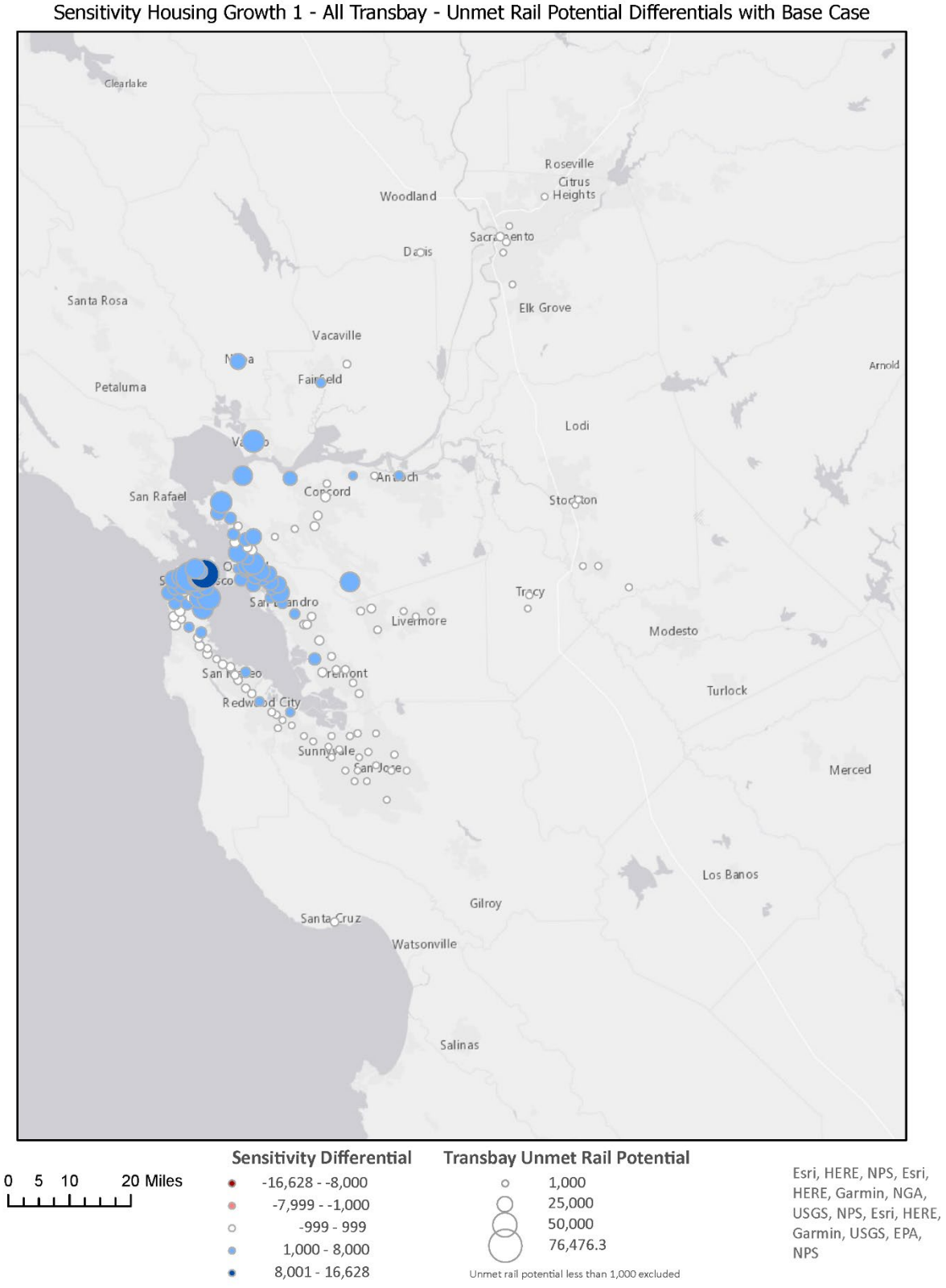
Rankings that change due to the uncertainty scenario are marked with color coded fills

Following the table is a map (see **Figure 2** for an example) showing the changes for each scenario compared to the baseline.

- Each cluster is represented by a circle.
- Area indicates the transbay equity-weighted unmet rail potential for the corresponding cluster.
- Color indicates the difference in transbay unmet demand from the baseline scenario.
- While the various maps have different colors and levels of shading, the relative pattern of bubbles is generally similar across all maps (i.e., in no case does any circle become much larger or much smaller relative to the other circles).

Note: Values shown in Figure 1 and Figure 2 are for illustrative purposes only.

Figure 2. Example Unmet Transbay Potential Map



Baseline Scenario

Table 1 presents the baseline unmet rail potential scenario, which is used as a basis for the percent changes presented throughout this appendix. Some corridors/segments have low unmet rail potential, so changes to these corridors/segments may result in larger percentage changes.

Table 1. Baseline Unmet Rail Potential

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)
WEST	San Francisco-West	305,234	190,480	114,754	449,316
	San Francisco-Central	201,761	121,341	80,420	308,042
	San Francisco-East	203,810	129,028	74,781	297,802
	SEGMENT				
	Embarcadero-SF State	178,277	146,215	32,062	257,117
	Embarcadero-Bayshore	101,986	93,655	8,331	145,213
	Embarcadero-Balboa Park	85,530	83,665	1,864	130,749
	CORRIDOR				
EAST	Vallejo/Sacramento	190,352	152,780	37,571	289,205
	Fremont/Modesto	166,694	134,772	31,922	258,792
	San Jose	161,043	129,325	31,719	251,569
	Martinez/Stockton	167,080	140,765	26,315	249,153
	San Ramon/Modesto	161,642	135,943	25,699	244,900
	Walnut Creek/Stockton	68,207	62,746	5,461	98,032
	SEGMENT				
	Oakland-Bay Fair	125,319	109,610	15,709	200,434
	Oakland-Richmond	90,849	81,129	9,720	136,717

Housing Growth and Patterns

Table 2 highlights the parameter definitions for each Housing Growth scenario and the corresponding descriptions.

Table 2. Housing Growth Scenarios

PARAMETER	SCENARIO	DESCRIPTION
Housing Growth (HG) and Patterns	HG1	High population growth (2x expected 2015-2040 growth from plans), increased clustering around rail stations by 10%
	HG2	High population growth, no change in clustering around rail stations
	HG3	No population growth, no change in clustering around rail stations
	HG4	No population growth in Bay Area, high population growth in outer Metropolitan Planning Organizations (MPO), no change in clustering around rail stations

A variety of assumptions were tested about future housing growth and patterns to evaluate the impact of different levels and distributions of population on unmet rail potential. This was accomplished by adjusting population values by cluster and by adjusting distance-weighting to represent increased population density around rail stations.

High and low growth values were based on professional judgment and examination of the 2015-2040 population growth levels included in MPO land use forecasts, and of the population growth levels included in the Metropolitan Transportation Commission (MTC) Horizon Futures scenarios.

There were few changes in relative performance of the housing growth scenarios from the baseline despite large changes to growth projections and resulting large changes in unmet rail potential. All changes in rankings were primarily due to similar levels of unmet rail potential in the baseline scenario—when two corridors or segments have very close levels of baseline unmet rail potential, even a minor difference in how a scenario impacts the two corridors or segments can cause one to overtake the other in the rankings. Each scenario is described below, and **Table 3** summarizes the rankings of corridors in the baseline and how these changed in the housing growth scenarios.

Table 3. Housing Growth Corridor/Segment Rankings

HOUSING GROWTH AND PATTERNS SCENARIOS						
	CORRIDOR	**BASELINE**	**HG1**	**HG2**	**HG3**	**HG4**
WEST	San Francisco-West	1	1	1	1	1
	San Francisco-Central	2	2	2	2	2
	San Francisco-East	3	3	3	3	3
	SEGMENT					
	Embarcadero-SF State	1	1	1	1	1
	Embarcadero-Bayshore	2	2	2	2	2
	Embarcadero-Balboa Park	3	3	3	3	3
	CORRIDOR					
EAST	Vallejo/Sacramento	1	1	1	1	1
	Fremont/Modesto	2	2	2	2	2
	San Jose	3	4	4	3	3
	Martinez/Stockton	4	3	3	4	5
	San Ramon/Modesto	5	5	5	5	4
	Walnut Creek/Stockton	6	6	6	6	6
	SEGMENT					
	Oakland-Bay Fair	1	1	1	1	1
	Oakland-Richmond	2	2	2	2	2

Housing Growth 1

SCENARIO DESCRIPTION

This scenario represented higher than expected population growth and increased clustering of the population throughout the Megaregion, but it was not intended to represent any specific cause for divergence from expected development patterns. Preparation of this scenario involved doubling the expected absolute 2015-2040 population growth at the zone level based on MPO forecast values. For zones with negative growth forecast, growth was set to zero. In addition, clustering of housing around rail stations was increased by 10%. This means that within a cluster, people who live an average of 10 minutes away from the station in the baseline scenario, live an average of 9 minutes away from the station in this scenario.

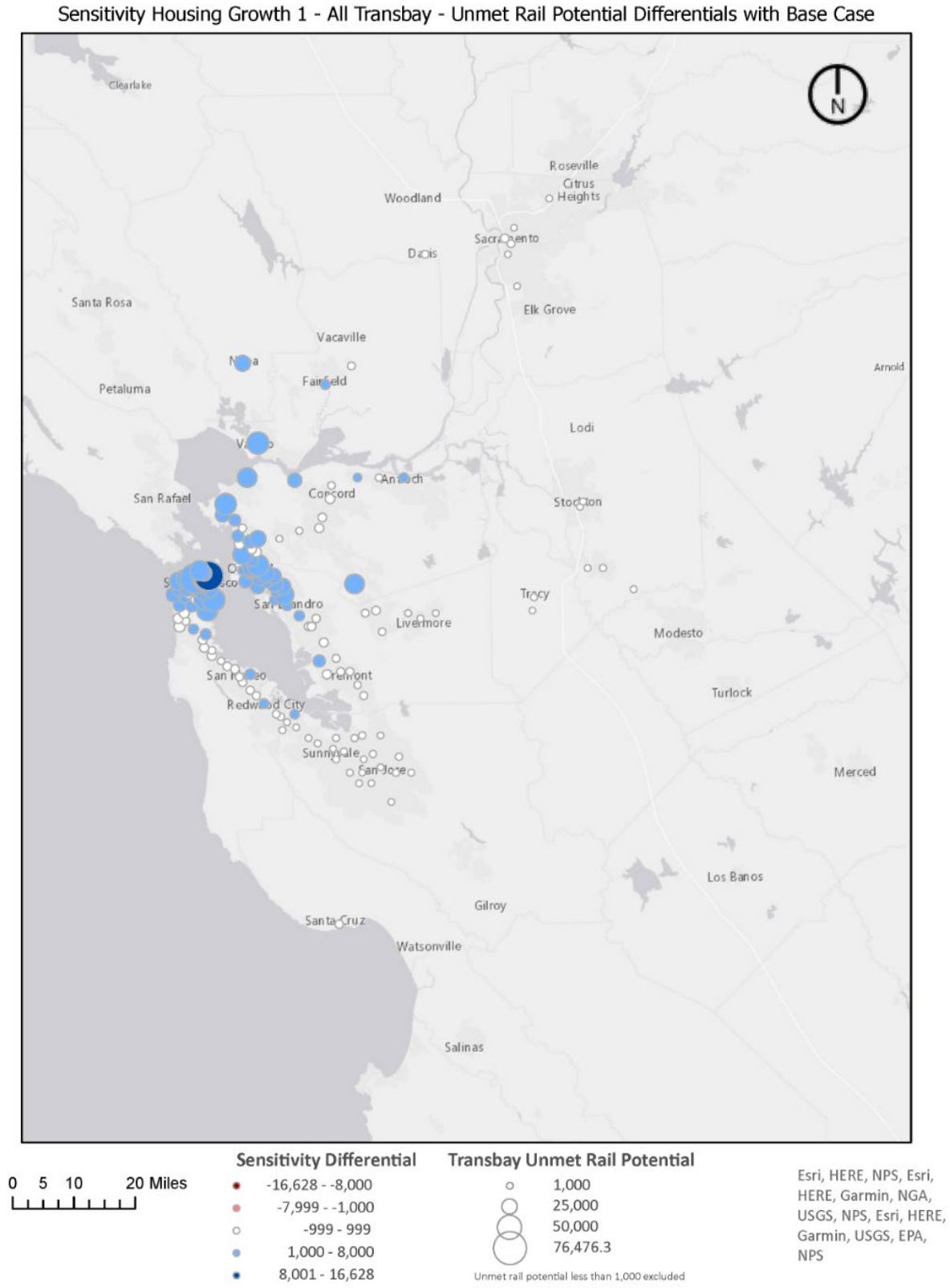
KEY FINDINGS

Table 4 summarizes the results for the Housing Growth 1 scenario. With overall population increasing by 23% in this scenario, relative to the baseline, equity-weighted unmet rail potential increased for all corridors and segments by 12-22%. The San Francisco West corridor had a smaller increase in unmet rail potential than the other West Bay corridors due to lower baseline growth. East Bay corridors/segments had similar impacts generally. The levels of unmet rail potential are shown in **Figure 3**.

Table 4. Housing Growth 1 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO HG1
WEST	San Francisco-West	12%	13%	10%	12%	1	1
	San Francisco-Central	18%	20%	14%	18%	2	2
	San Francisco-East	17%	19%	14%	17%	3	3
	SEGMENT						
	Embarcadero-SF State	12%	13%	5%	12%	1	1
	Embarcadero-Bayshore	20%	21%	10%	19%	2	2
	Embarcadero-Balboa Park	22%	22%	23%	22%	3	3
CORRIDOR							
EAST	Vallejo/Sacramento	14%	14%	12%	14%	1	1
	Fremont/Modesto	13%	13%	12%	13%	2	2
	San Jose	13%	13%	12%	13%	3	4
	Martinez/Stockton	15%	15%	13%	15%	4	3
	San Ramon/Modesto	13%	13%	14%	13%	5	5
	Walnut Creek/ Stockton	17%	17%	16%	16%	6	6
	SEGMENT						
	Oakland-Bay Fair	13%	13%	13%	13%	1	1
	Oakland-Richmond	16%	17%	14%	17%	2	2

Figure 3. Housing Growth 1



Housing Growth 2

SCENARIO DESCRIPTION

This scenario represented higher than expected population growth throughout the Megaregion, but it was not intended to represent any specific cause for divergence from expected development patterns. Preparation of this scenario involved doubling the expected absolute 2015-2040 population growth at the zone level based on MPO forecast values. For zones with negative growth forecast, growth was set to zero. There were no changes to clustering of housing around stations in this scenario.

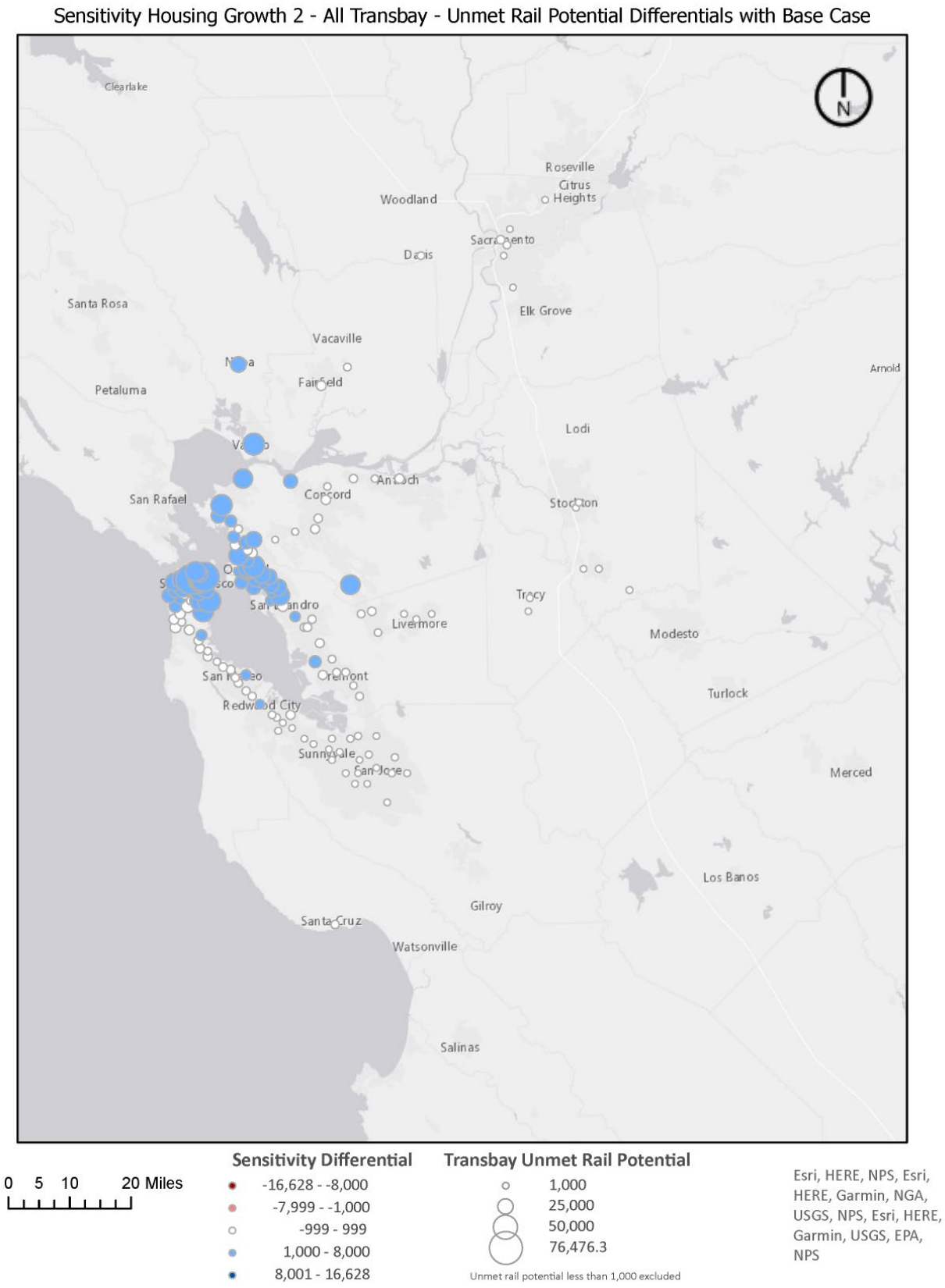
KEY FINDINGS

Table 5 summarizes the results for the Housing Growth 2 scenario. With overall population increasing by 23% in this scenario, relative to the baseline, equity-weighted unmet rail potential increased for all corridors and segments by 11-20%. These results are 1-2 percentage points lower than the corresponding Housing Growth 1 scenario results due to the lack of change in clustering. The levels of unmet rail potential are shown in **Figure 4**.

Table 5. Housing Growth 2 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO HG2
WEST	San Francisco-West	11%	12%	9%	11%	1	1
	San Francisco-Central	15%	17%	12%	16%	2	2
	San Francisco-East	16%	18%	12%	15%	3	3
	SEGMENT						
	Embarcadero-SF State	11%	12%	5%	11%	1	1
	Embarcadero-Bayshore	18%	19%	9%	17%	2	2
	Embarcadero-Balboa Park	19%	19%	21%	20%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	12%	13%	10%	13%	1	1
	Fremont/ Modesto	12%	12%	11%	12%	2	2
	San Jose	12%	12%	11%	12%	3	4
	Martinez/ Stockton	13%	14%	11%	13%	4	3
	San Ramon/ Modesto	12%	12%	12%	12%	5	5
	Walnut Creek/ Stockton	15%	16%	14%	15%	6	6
	SEGMENT						
	Oakland-Bay Fair	12%	12%	13%	13%	1	1
	Oakland-Richmond	15%	16%	13%	16%	2	2

Figure 4. Housing Growth 2



Housing Growth 3

SCENARIO DESCRIPTION

This scenario included no population growth between 2015 and 2040, and it was intended to represent a reasonable lower bound on population growth in the Megaregion. This was accomplished by applying zone-level 2015 population values directly to 2040. There were no changes to clustering in this scenario.

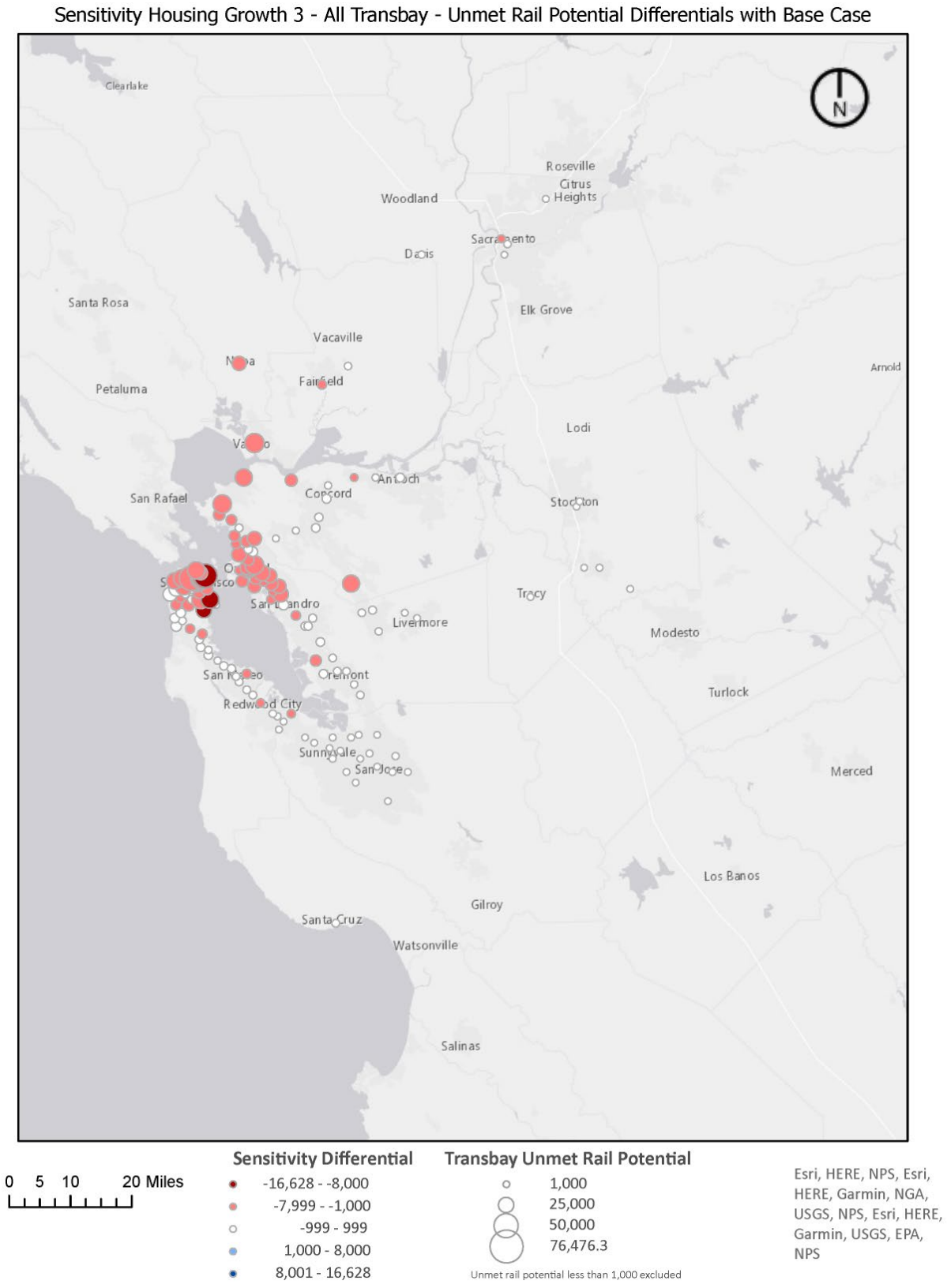
KEY FINDINGS

Table 6 summarizes the results for the Housing Growth 3 scenario. With overall population decreasing by 22% in this scenario, relative to the baseline, equity-weighted unmet rail potential decreased for all segments by 12-22%. The San Francisco West corridor had a smaller decrease in unmet rail potential than other West Bay corridors due to lower baseline growth. Impacts were similar across the East Bay corridors with changes in rankings due to similar levels of unmet rail potential in the baseline scenario. The larger impacts to transbay trips than non-transbay trips were due to higher baseline growth in the East Bay than in San Francisco. The levels of unmet rail potential are shown in **Figure 5**.

Table 6. Housing Growth 3 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO HG3
WEST	San Francisco-West	-12%	-13%	-9%	-12%	1	1
	San Francisco-Central	-17%	-20%	-12%	-17%	2	2
	San Francisco-East	-18%	-21%	-14%	-17%	3	3
	SEGMENT						
	Embarcadero-SF State	-12%	-13%	-4%	-12%	1	1
	Embarcadero-Bayshore	-22%	-23%	-10%	-20%	2	2
	Embarcadero-Balboa Park	-22%	-22%	-14%	-22%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	-14%	-15%	-11%	-15%	1	1
	Fremont/ Modesto	-13%	-14%	-11%	-13%	2	2
	San Jose	-13%	-14%	-11%	-13%	3	3
	Martinez/ Stockton	-16%	-16%	-13%	-16%	4	4
	San Ramon/ Modesto	-14%	-14%	-14%	-14%	5	5
	Walnut Creek/Stockton	-17%	-17%	-12%	-16%	6	6
	SEGMENT						
	Oakland-Bay Fair	-14%	-15%	-13%	-14%	1	1
	Oakland-Richmond	-18%	-19%	-14%	-18%	2	2

Figure 5. Housing Growth 3



Housing Growth 4

SCENARIO DESCRIPTION

This scenario represented a shift toward population growth only in the outer parts of the Megaregion and stagnation within the Bay Area but was not intended to represent any specific cause for divergence from expected development patterns. It included no population growth between 2015 and 2040 for the nine-county Bay Area, which was accomplished by applying zone-level 2015 population values directly to 2040. Elsewhere in the Northern California Megaregion (Megaregion), the expected absolute 2015-2040 population growth at the zone level was doubled based on MPO forecast values. For outer MPO zones with negative growth forecast, growth was set to zero. There were no changes to clustering in this scenario.

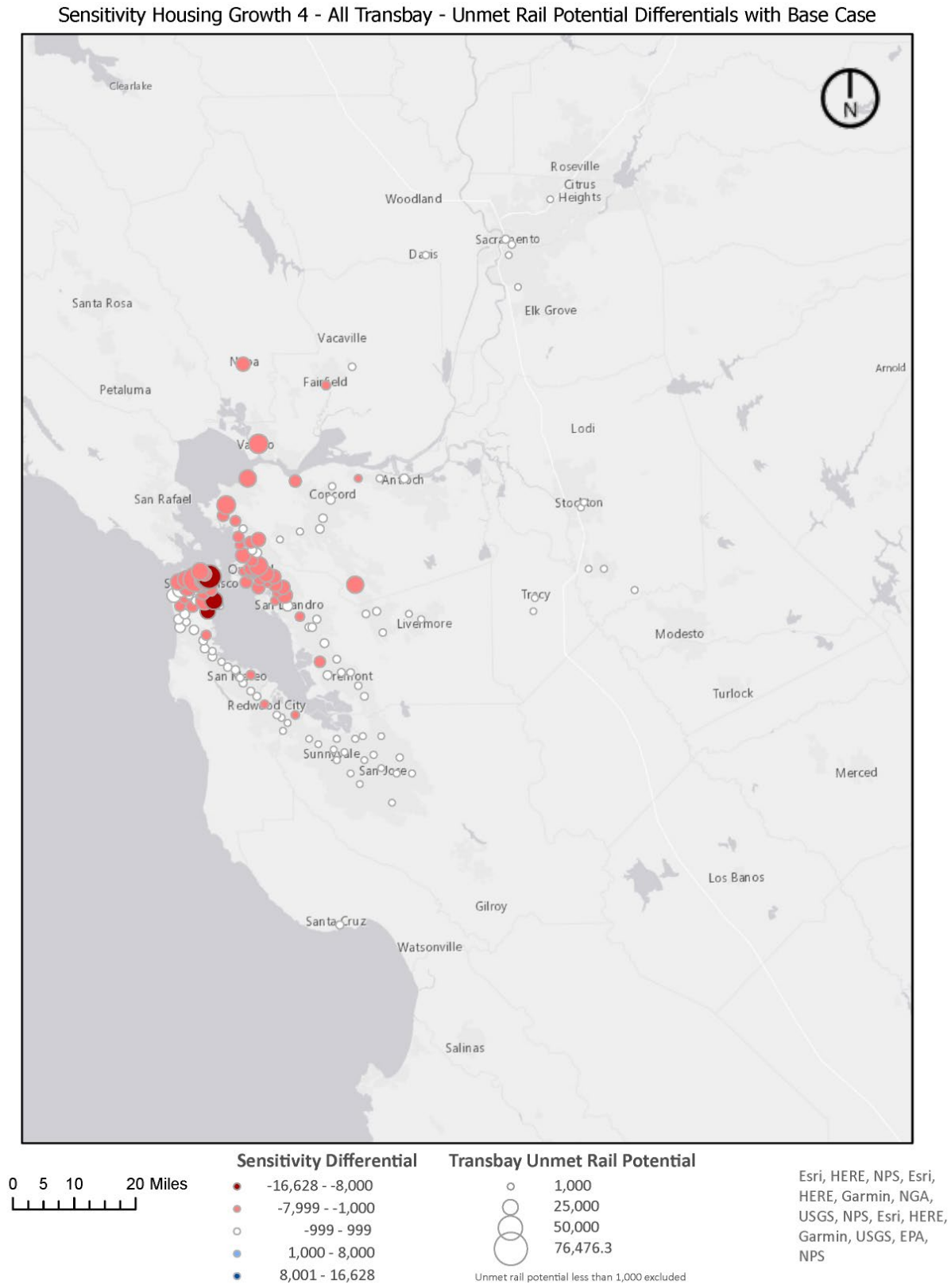
KEY FINDINGS

Table 7 summarizes the results for the Housing Growth 4 scenario. With overall population decreasing by 5%, relative to the baseline, equity-weighted unmet rail potential decreased for all segments by 11-22%. Non-transbay demand saw smaller reductions than transbay trips. Outer MPO growth resulted in higher unmet rail potential for travel within the East compared to the Housing Growth 3 scenario. The levels of unmet rail potential are shown in **Figure 6**.

Table 7. Housing Growth 4 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO HG4
WEST	San Francisco-West	-12%	-13%	-9%	-12%	1	1
	San Francisco-Central	-16%	-19%	-12%	-17%	2	2
	San Francisco-East	-18%	-20%	-14%	-17%	3	3
	SEGMENT						
	Embarcadero-SF State	-11%	-13%	-4%	-11%	1	1
	Embarcadero-Bayshore	-21%	-22%	-10%	-19%	2	2
	Embarcadero-Balboa Park	-21%	-21%	-14%	-22%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	-14%	-15%	-8%	-14%	1	1
	Fremont/ Modesto	-13%	-13%	-10%	-13%	2	2
	San Jose	-13%	-14%	-11%	-13%	3	3
	Martinez/ Stockton	-16%	-16%	-12%	-15%	4	5
	San Ramon/ Modesto	-14%	-14%	-12%	-14%	5	4
	Walnut Creek/ Stockton	-16%	-17%	-12%	-16%	6	6
	SEGMENT						
	Oakland-Bay Fair	-14%	-15%	-13%	-14%	1	1
	Oakland-Richmond	-18%	-19%	-14%	-18%	2	2

Figure 6. Housing Growth 4



Job Growth and Patterns

Table 8 highlights the parameter definitions for each Job Growth scenario and the corresponding descriptions.

Table 8. Job Growth Scenarios

PARAMETER	SCENARIO	DESCRIPTION
Job Growth (JG) and Patterns	JG1	High employment growth (2x expected 2015-2040 growth from plans), increased clustering around rail stations
	JG2	High employment growth, no change in clustering around rail stations
	JG3	No employment growth, no change in clustering around rail stations
	JG4	No employment growth in Bay Area, high employment growth in outer MPOs, no change in clustering around rail stations

A variety of assumptions were tested about future job growth and patterns to evaluate the impact of different levels and distributions of employment on unmet rail potential. This was accomplished by adjusting employment values by cluster and by adjusting distance-weighting to represent increased employment density around rail stations.

High- and low-growth values were based on professional judgment and inputs from the technical panel in addition to the examination of the 2015-2040 employment growth levels included in MPO land use forecasts and employment growth levels included in the MTC Horizon Futures scenarios.

None of the job growth scenarios resulted in major changes in relative performance against the baseline, and all changes in rankings were primarily due to small differences in baseline performance enabling minor impacts on unmet rail potential to alter the rankings. Each scenario is described below, and **Table 9** summarizes the rankings of corridors in the baseline and how these changed in the job growth scenarios. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario.

Table 9. Job Growth Corridor/Segment Rankings

JOB GROWTH SCENARIOS						
	CORRIDOR	BASELINE	JG1	JG2	JG3	JG4
WEST	San Francisco-West	1	1	1	1	1
	San Francisco-Central	2	2	2	2	2
	San Francisco-East	3	3	3	3	3
	SEGMENT					
	Embarcadero-SF State	1	1	1	1	1
	Embarcadero-Bayshore	2	2	2	2	2
	Embarcadero-Balboa Park	3	3	3	3	3
	CORRIDOR					
EAST	Vallejo/Sacramento	1	1	1	1	1
	Fremont/Modesto	2	2	2	2	2
	San Jose	3	4	4	3	3
	Martinez/Stockton	4	3	3	5	5
	San Ramon/Modesto	5	5	5	4	4
	Walnut Creek/Stockton	6	6	6	6	6
	SEGMENT					
	Oakland-Bay Fair	1	1	1	1	1
	Oakland-Richmond	2	2	2	2	2

Job Growth 1

SCENARIO DESCRIPTION

This scenario represented higher than expected employment growth and increased clustering of employment throughout the Megaregion, but it was not intended to represent any specific cause for divergence from expected development patterns. Preparation of this scenario involved doubling the expected absolute 2015-2040 employment growth at the zone level based on MPO forecast values. For zones with negative growth forecast, growth was set to zero. In addition, clustering of jobs around rail stations was increased by 10%. This means that if within a cluster, people work an average of
10 minutes away from the station in the baseline scenario, then they work an average of 9 minutes away from the station in this scenario.

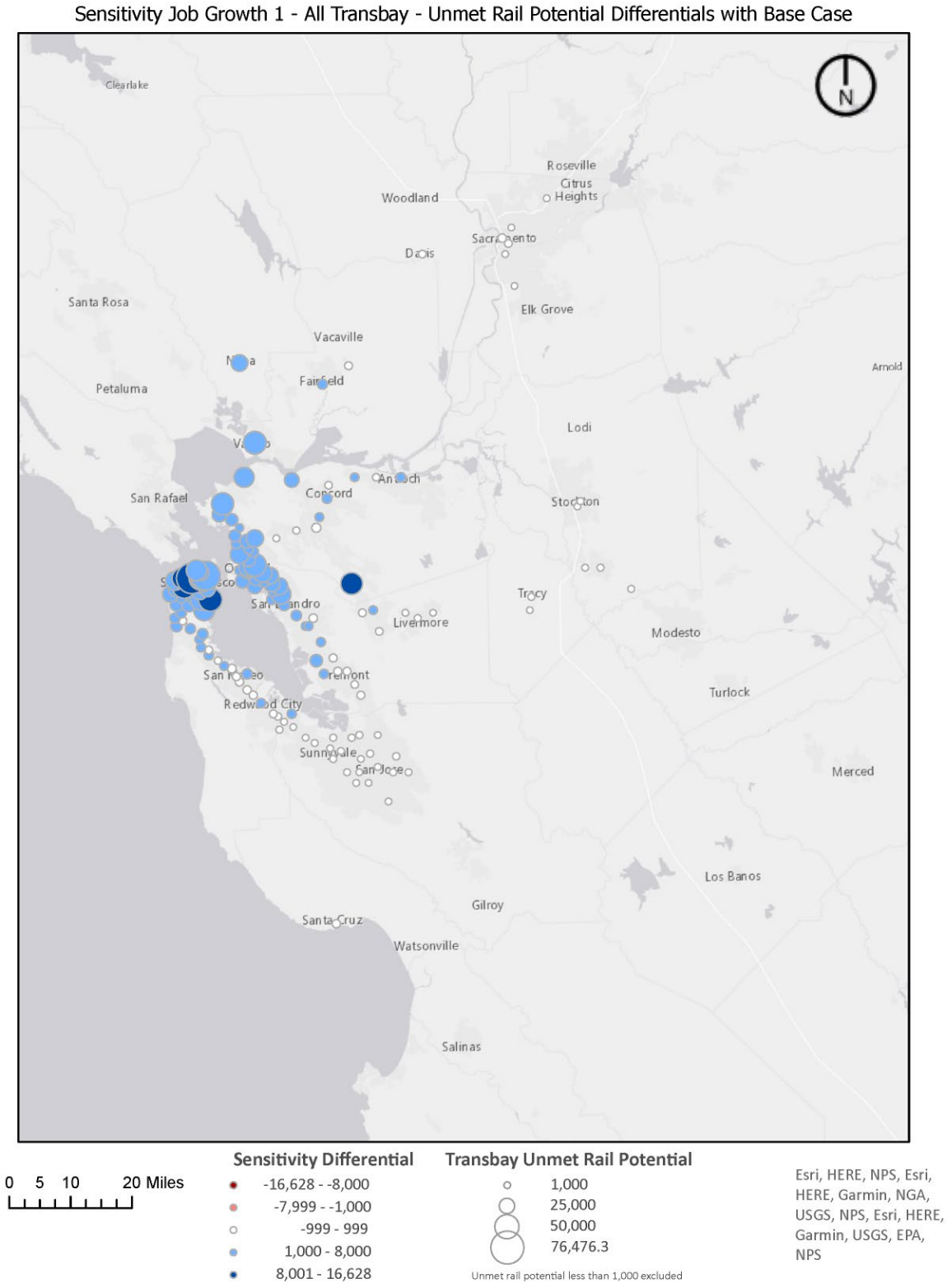
KEY FINDINGS

Table 10 summarizes the results for the Job Growth 1 scenario. With overall employment increasing by 31%, relative to the baseline, equity-weighted unmet rail potential increased for all segments by 17-23%. The Embarcadero-Balboa Park segment performed better than other San Francisco segments since higher baseline frequencies cause job growth to have a higher impact on unmet rail potential. The Oakland-Richmond segment performed better than the Oakland-Bay Fair segment since higher baseline frequencies cause job growth to have a higher impact on unmet rail potential. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 7**.

Table 10. Job Growth 1 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO JG1
WEST	San Francisco-West	17%	18%	15%	17%	1	1
	San Francisco-Central	19%	20%	18%	20%	2	2
	San Francisco-East	18%	19%	16%	18%	3	3
	SEGMENT						
	Embarcadero-SF State	17%	18%	12%	17%	1	1
	Embarcadero-Bayshore	20%	20%	11%	19%	2	2
	Embarcadero-Balboa Park	22%	21%	33%	22%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	19%	19%	19%	19%	1	1
	Fremont/ Modesto	18%	18%	20%	18%	2	2
	San Jose	18%	18%	20%	18%	3	4
	Martinez/ Stockton	20%	20%	23%	20%	4	3
	San Ramon/ Modesto	20%	19%	22%	19%	5	5
	Walnut Creek/ Stockton	21%	21%	25%	21%	6	6
	SEGMENT						
	Oakland-Bay Fair	18%	18%	22%	18%	1	1
	Oakland-Richmond	22%	22%	25%	23%	2	2

Figure 7. Job Growth 1



Job Growth 2

SCENARIO DESCRIPTION

This scenario represented higher than expected employment growth throughout the Megaregion, but it was not intended to represent any specific cause for divergence from expected development patterns. Preparation of this scenario involved doubling the expected absolute 2015-2040 employment growth at the zone level based on MPO forecast values. For zones with negative growth forecast, growth was set to zero. There were no changes to clustering in this scenario.

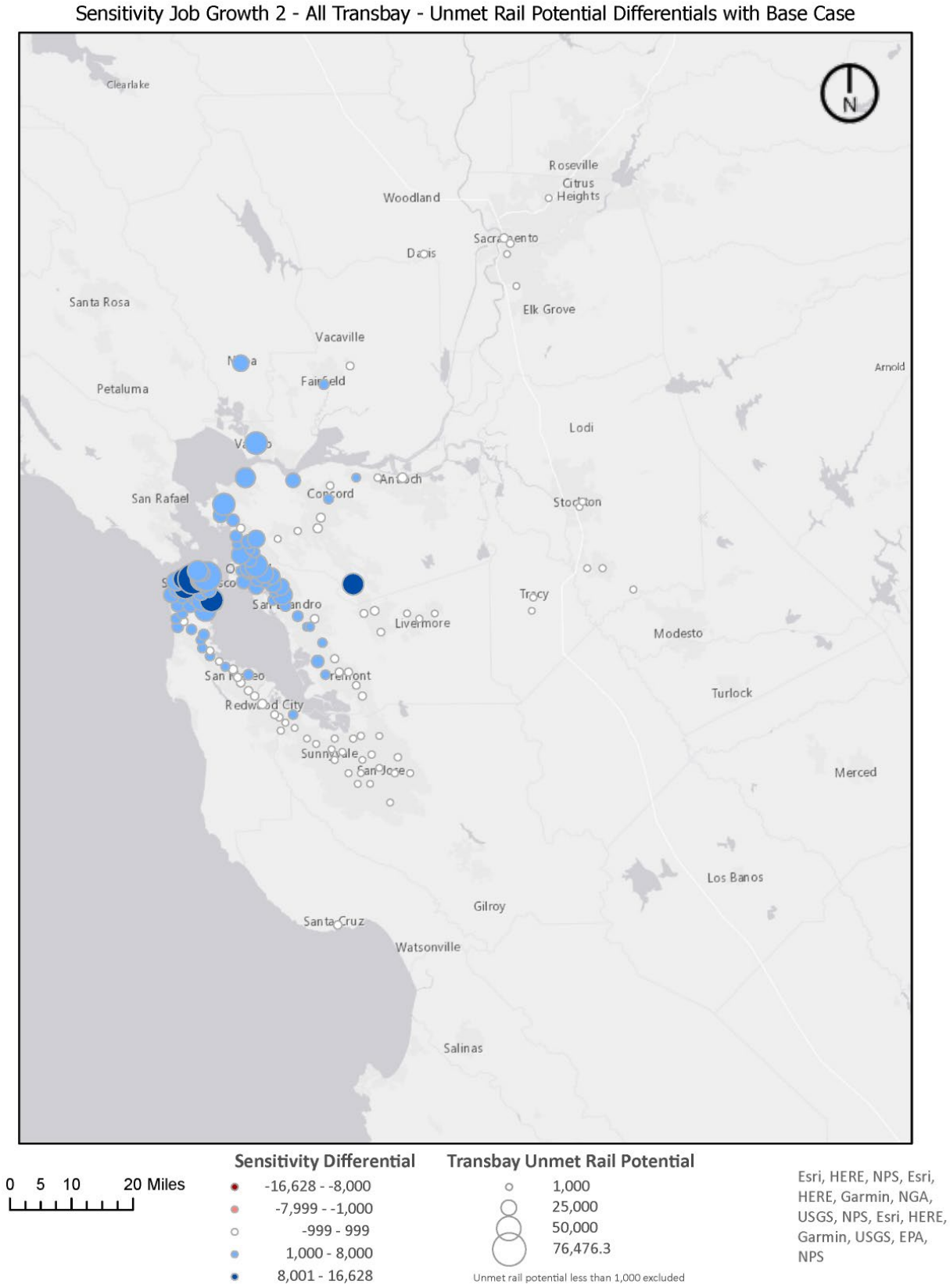
KEY FINDINGS

Table 11 summarizes the results for the Job Growth 2 scenario. With overall employment increasing by 31%, relative to the baseline, equity-weighted unmet rail potential increased for all segments by 15-22%. The impacts are less than those of the Job Growth 1 scenario by 1-3 percentage points due to the lack of changes to clustering. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 8**.

Table 11. Job Growth 2 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO JG2
WEST	San Francisco-West	15%	16%	14%	15%	1	1
	San Francisco-Central	17%	18%	16%	17%	2	2
	San Francisco-East	16%	17%	14%	16%	3	3
	SEGMENT						
	Embarcadero-SF State	16%	17%	12%	16%	1	1
	Embarcadero-Bayshore	18%	19%	11%	18%	2	2
	Embarcadero-Balboa Park	20%	20%	31%	20%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	17%	17%	16%	17%	1	1
	Fremont/ Modesto	17%	16%	17%	16%	2	2
	San Jose	17%	16%	18%	17%	3	4
	Martinez/ Stockton	19%	18%	21%	19%	4	3
	San Ramon/ Modesto	18%	18%	20%	18%	5	5
	Walnut Creek/ Stockton	20%	19%	22%	19%	6	6
	SEGMENT						
	Oakland-Bay Fair	17%	17%	21%	17%	1	1
	Oakland-Richmond	21%	21%	24%	22%	2	2

Figure 8. Job Growth 2



Job Growth 3

SCENARIO DESCRIPTION

This scenario included no employment growth between 2015 and 2040, and it was intended to represent a reasonable lower bound on employment growth in the Megaregion. This was accomplished by applying zone-level 2015 employment values directly to 2040. There were no changes to clustering in this scenario.

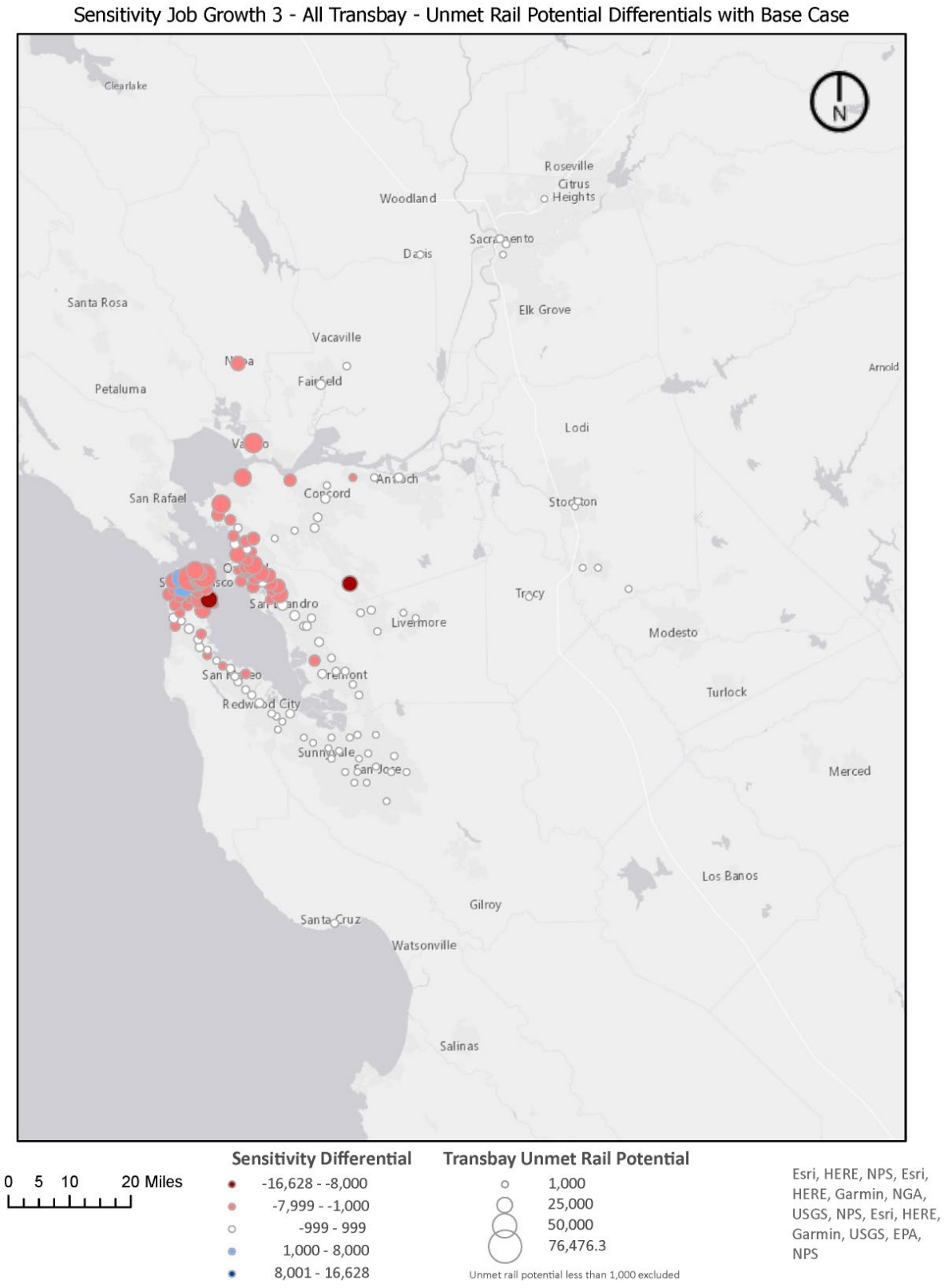
KEY FINDINGS

Table 12 summarizes the results for the Job Growth 3 scenario. With overall employment decreasing by 21%, relative to the baseline, equity-weighted unmet rail potential decreased by 10-23% for all corridors and segments. The San Francisco West corridor was less negatively impacted than other West Bay corridors because the baseline scenario presented a large reduction in employment for a few clusters. The Oakland-Richmond segment had the largest decrease in unmet rail potential due to generally higher baseline frequencies. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 9**.

Table 12. Job Growth 3 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO JG3
WEST	San Francisco-West	-10%	-11%	-9%	-10%	1	1
	San Francisco-Central	-15%	-17%	-12%	-15%	2	2
	San Francisco-East	-15%	-17%	-12%	-15%	3	3
	SEGMENT						
	Embarcadero-SF State	-10%	-11%	-6%	-10%	1	1
	Embarcadero-Bayshore	-18%	-18%	-12%	-18%	2	2
	Embarcadero-Balboa Park	-19%	-19%	-20%	-19%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	-17%	-17%	-17%	-17%	1	1
	Fremont/ Modesto	-15%	-15%	-14%	-14%	2	2
	San Jose	-15%	-15%	-14%	-14%	3	3
	Martinez/ Stockton	-19%	-18%	-21%	-19%	4	5
	San Ramon/ Modesto	-17%	-17%	-19%	-16%	5	4
	Walnut Creek/ Stockton	-19%	-19%	-21%	-19%	6	6
	SEGMENT						
	Oakland-Bay Fair	-15%	-15%	-17%	-15%	1	1
	Oakland-Richmond	-23%	-22%	-27%	-23%	2	2

Figure 9. Job Growth 3



Job Growth 4

SCENARIO DESCRIPTION

This scenario represented a shift toward employment growth only in the outer parts of the Megaregion and stagnation within the Bay Area but was not intended to represent any specific cause for divergence from expected development patterns. It included no employment growth between 2015 and 2040 for the nine-county Bay Area, which was accomplished by applying zone-level 2015 employment values directly to 2040. Elsewhere in the Megaregion, the expected absolute 2015-2040 employment growth at the zone level was doubled based on MPO forecast values. For outer MPO zones with negative growth forecast, growth was set to zero. There were no changes to clustering in this scenario.

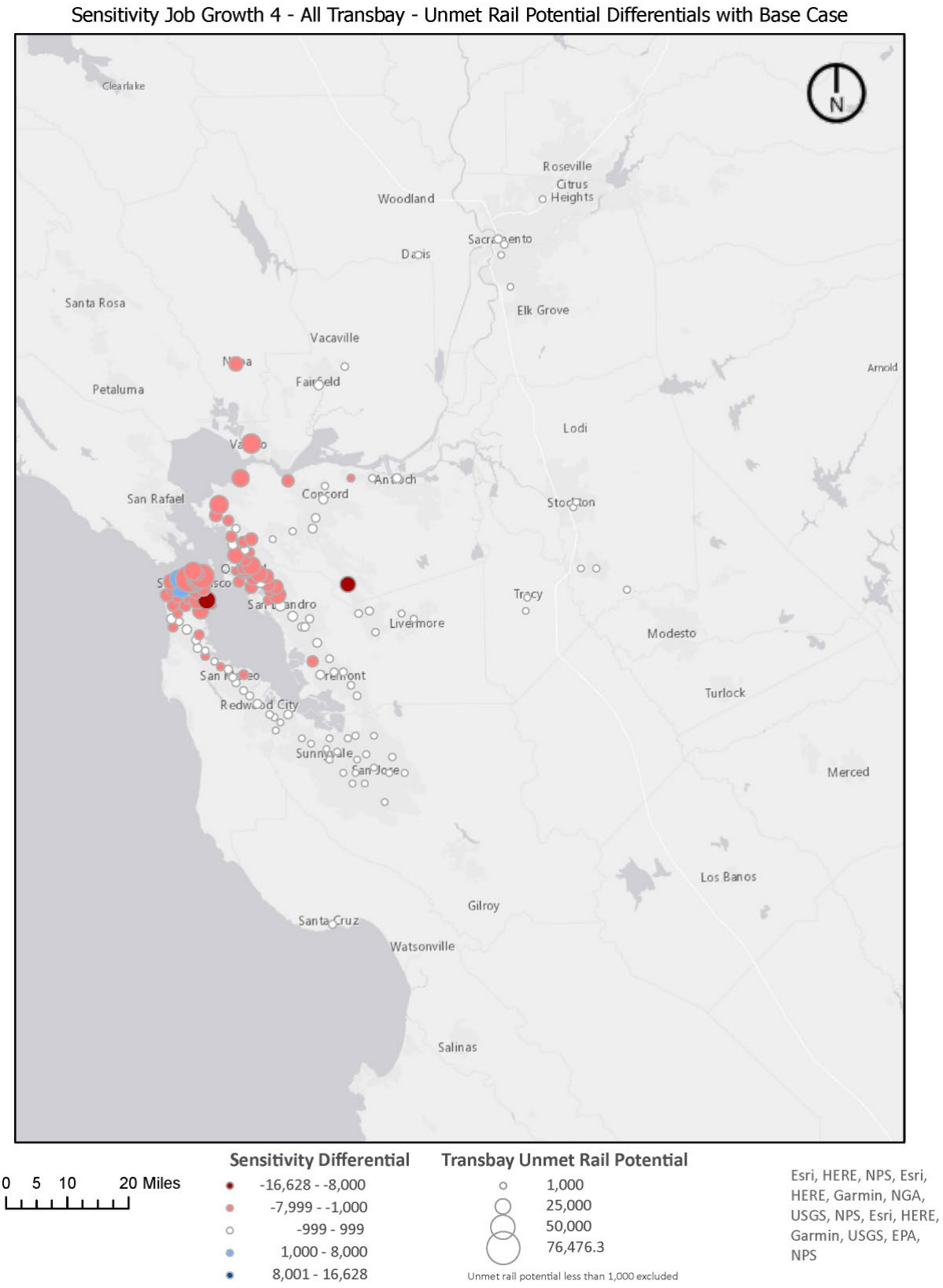
KEY FINDINGS

Table 13 summarizes the results for the Job Growth 4 scenario. With overall employment decreasing by 5%, relative to the baseline, equity-weighted unmet rail potential decreased by 9-23%. As in the Job Growth 3 scenario, East Bay corridors that extend to outer MPOs were less impacted than other East Bay corridors. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 10**.

Table 13. Job Growth 4 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO JG4
WEST	San Francisco-West	-10%	-11%	-9%	-10%	1	1
	San Francisco-Central	-14%	-16%	-12%	-14%	2	2
	San Francisco-East	-15%	-16%	-12%	-15%	3	3
	SEGMENT						
	Embarcadero-SF State	-10%	-10%	-6%	-9%	1	1
	Embarcadero-Bayshore	-17%	-18%	-12%	-17%	2	2
	Embarcadero-Balboa Park	-18%	-18%	-20%	-18%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	-16%	-17%	-13%	-16%	1	1
	Fremont/Modesto	-14%	-14%	-12%	-14%	2	2
	San Jose	-14%	-15%	-14%	-14%	3	3
	Martinez/Stockton	-19%	-18%	-21%	-19%	4	5
	San Ramon/ Modesto	-16%	-16%	-17%	-16%	5	4
	Walnut Creek/ Stockton	-19%	-18%	-21%	-18%	6	6
	SEGMENT						
	Oakland-Bay Fair	-15%	-15%	-17%	-15%	1	1
	Oakland-Richmond	-23%	-22%	-27%	-23%	2	2

Figure 10. Job Growth 4



Working Patterns

Table 14 highlights the parameter definitions for each Working Patterns scenario and the corresponding descriptions.

Table 14. Working Patterns Scenarios

PARAMETER	SCENARIO	DESCRIPTION
Working Patterns (WP)	WP1	60% of remote-eligible work performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely; no change in non-work trips
	WP2	20% of remote-eligible work performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely; no change in non-work trips
	WP3	60% of remote-eligible work performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely; 20% increase in non-work trips by remote workers
	WP4	20% of remote-eligible work performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely; 20% increase in non-work trips by remote workers

Our main focus for this parameter was remote-eligible work (i.e., work that was not remote pre-COVID and not work that must be done in person). The impacts of changes were tested in the amount of remote-eligible work taking place remotely by adjusting propensity to make rail trips proportionally to the expected change in trips under each scenario. Since some studies have suggested that non-work trips have increased as work trips have decreased during COVID, we also considered scenarios where non-work trips by remote workers increase.

The working patterns scenarios resulted in no relative changes in corridor rankings from the baseline. Each scenario is described below, and **Table 15** summarizes the rankings of corridors in the baseline and working patterns scenarios.

Table 15. Working Patterns Corridor/Segment Rankings

WORKING PATTERNS SCENARIOS						
	CORRIDOR	BASELINE	WP1	WP2	WP3	WP4
WEST	San Francisco-West	1	1	1	1	1
	San Francisco-Central	2	2	2	2	2
	San Francisco-East	3	3	3	3	3
	SEGMENT					
	Embarcadero-SF State	1	1	1	1	1
	Embarcadero-Bayshore	2	2	2	2	2
	Embarcadero-Balboa Park	3	3	3	3	3
	CORRIDOR					
EAST	Vallejo/Sacramento	1	1	1	1	1
	Fremont/Modesto	2	2	2	2	2
	San Jose	3	3	3	3	3
	Martinez/Stockton	4	4	4	4	4
	San Ramon/Modesto	5	5	5	5	5
	Walnut Creek/Stockton	6	6	6	6	6
	SEGMENT					
	Oakland-Bay Fair	1	1	1	1	1
	Oakland-Richmond	2	2	2	2	2

Working Patterns 1

SCENARIO DESCRIPTION

This scenario corresponds to 60% of remote-eligible work being performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely. This scenario has no change in non-work trips. This is achieved through the process outlined below for each market segment.

1. Establish the baseline (pre-COVID) share of work performed remotely based on MOSAIC consumer segmentation data.
2. Establish the share of work that is remote-eligible based on MOSAIC consumer segmentation data and Bureau of Labor Statistics survey data.
3. Subtract the baseline remote work share from eligible share to obtain the share of work that could be performed remotely but is not currently.
4. Multiply the target share of above-baseline remote work (60% in this scenario) by the result of Step 3 to obtain the percent reduction in work trips.
5. Multiply the percent reduction in work trips by the work share of total trips (from MPO trip table data) to obtain the percent reduction in total trips.
6. Apply the percent reduction in total trips calculated above to the baseline value of propensity to make rail trips included in the MAST.

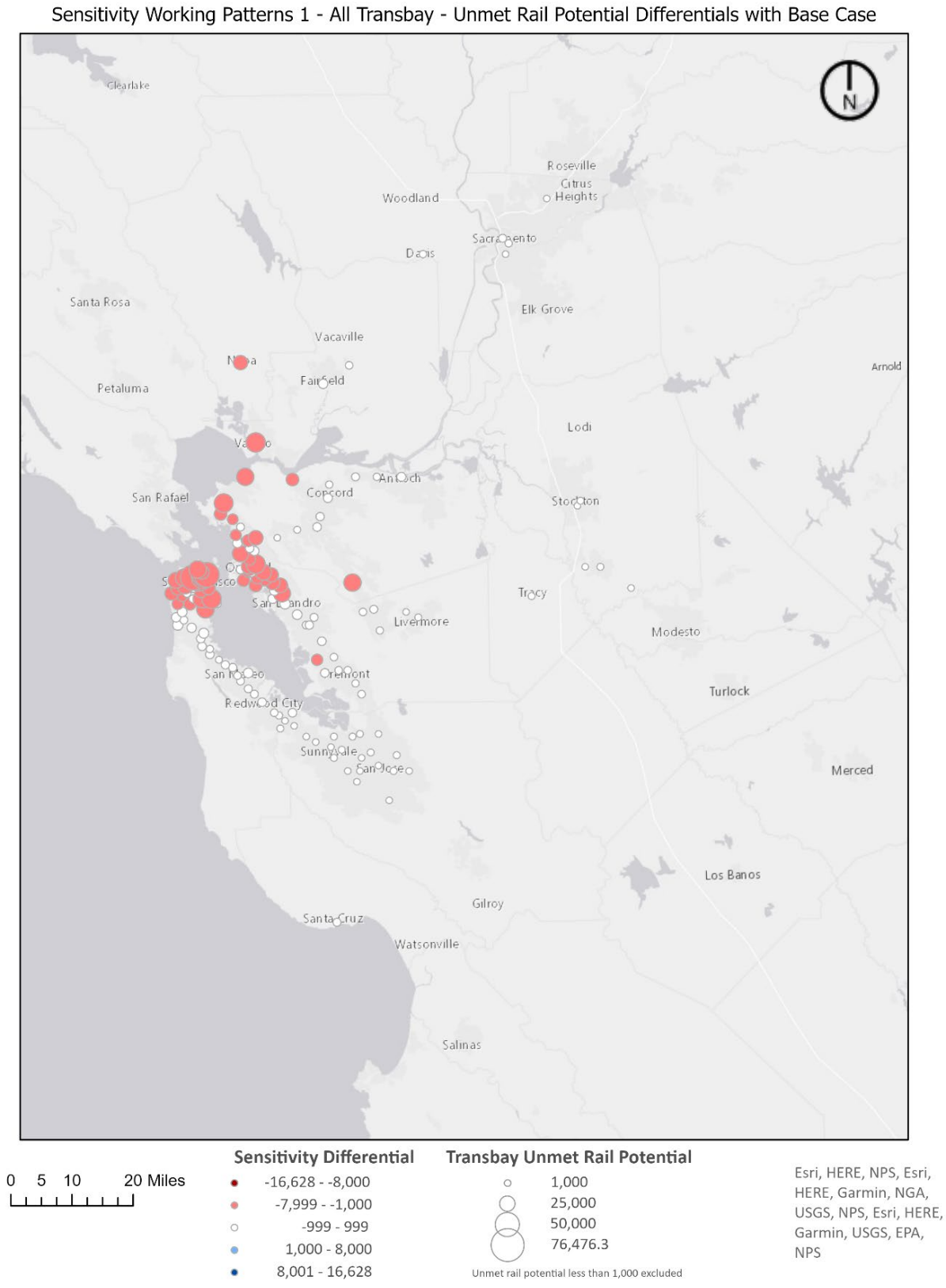
KEY FINDINGS

Table 16 summarizes the results for the Working Patterns 1 scenario. Equity-weighted unmet rail potential decreased for all corridors and segments by 7-9%, relative to the baseline. This corresponds to 4-28% of work, depending on population segment, switching to telework. The levels of unmet rail potential are shown in **Figure 11**.

Table 16. Working Patterns 1 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO WP1
WEST	San Francisco-West	-8%	-7%	-8%	-7%	1	1
	San Francisco-Central	-8%	-9%	-7%	-8%	2	2
	San Francisco-East	-7%	-7%	-7%	-7%	3	3
	SEGMENT						
	Embarcadero-SF State	-8%	-8%	-8%	-8%	1	1
	Embarcadero-Bayshore	-7%	-7%	-7%	-7%	2	2
	Embarcadero-Balboa Park	-9%	-9%	-11%	-9%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	-9%	-9%	-8%	-8%	1	1
	Fremont/Modesto	-7%	-7%	-7%	-7%	2	2
	San Jose	-7%	-7%	-7%	-7%	3	3
	Martinez/Stockton	-7%	-7%	-8%	-7%	4	4
	San Ramon/ Modesto	-7%	-7%	-7%	-7%	5	5
	Walnut Creek/ Stockton	-8%	-8%	-8%	-8%	6	6
	SEGMENT						
	Oakland-Bay Fair	-7%	-7%	-7%	-7%	1	1
	Oakland-Richmond	-8%	-8%	-9%	-8%	2	2

Figure 11. Working Patterns 1



Working Patterns 2

SCENARIO DESCRIPTION

This scenario corresponds to 20% of remote-eligible work being performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely. This scenario has no change in non-work trips. The methodology for developing this scenario is similar to that described for the Working Patterns 1 scenario.

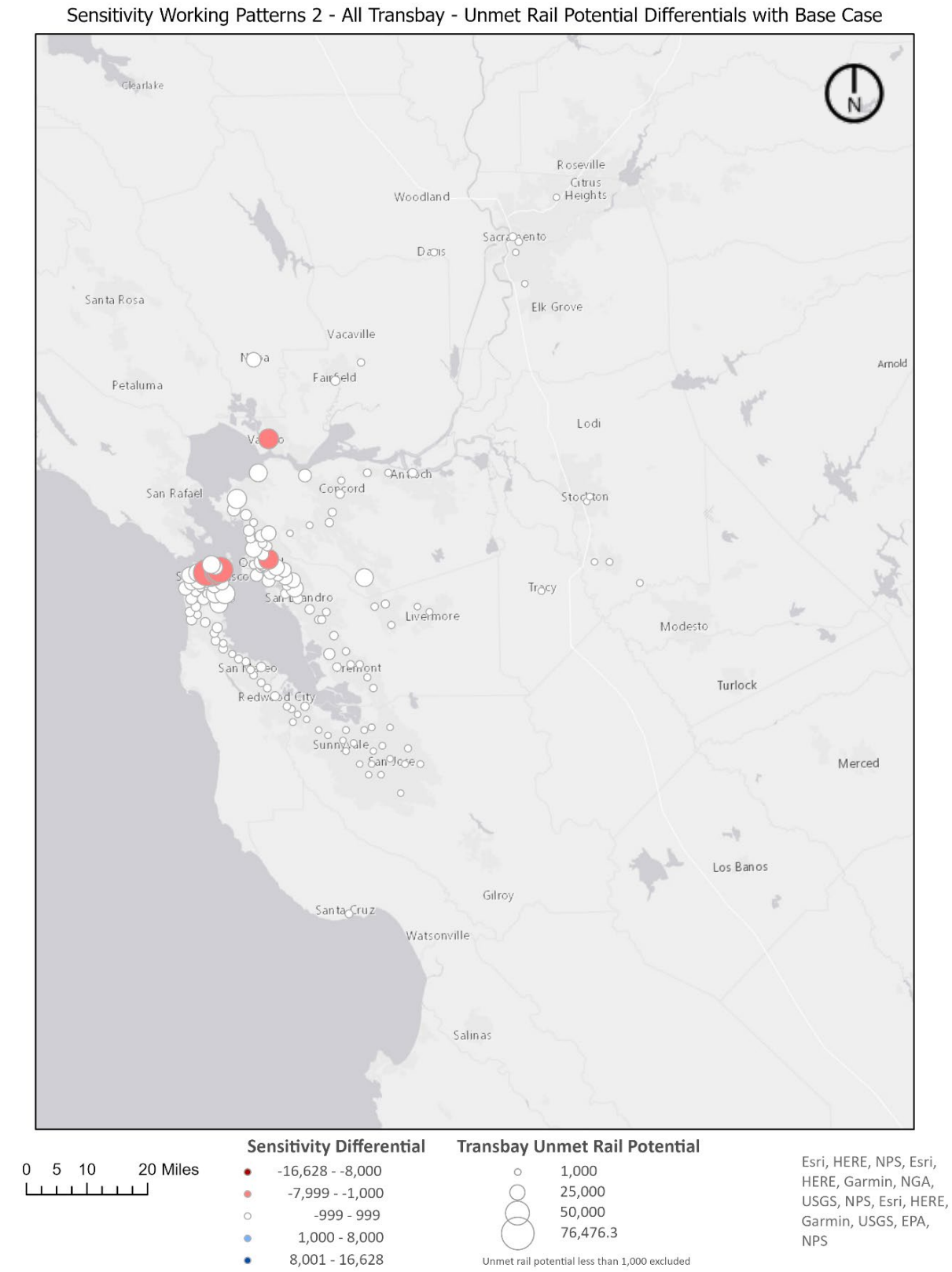
KEY FINDINGS

Table 17 summarizes the results for the Working Patterns 2 scenario. Equity-weighted unmet rail potential decreases for all corridors and segments by 2-4%, which corresponds to 1-9% of work, depending on the population segment, switching to telework. The levels of unmet rail potential are shown in **Figure 12**.

Table 17. Working Patterns 2 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO WP2
WEST	San Francisco-West	-2%	-3%	-2%	-2%	1	1
	San Francisco-Central	-3%	-3%	-2%	-3%	2	2
	San Francisco-East	-2%	-3%	-2%	-2%	3	3
	SEGMENT						
	Embarcadero-SF State	-3%	-3%	-2%	-3%	1	1
	Embarcadero-Bayshore	-3%	-3%	-2%	-3%	2	2
	Embarcadero-Balboa Park	-3%	-3%	-4%	-4%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	-3%	-3%	-2%	-3%	1	1
	Fremont/Modesto	-2%	-2%	-2%	-2%	2	2
	San Jose	-2%	-2%	-2%	-2%	3	3
	Martinez/Stockton	-3%	-3%	-2%	-3%	4	4
	San Ramon/Modesto	-2%	-2%	-2%	-2%	5	5
	Walnut Creek/ Stockton	-3%	-3%	-3%	-3%	6	6
	SEGMENT						
	Oakland-Bay Fair	-2%	-2%	-2%	-2%	1	1
	Oakland-Richmond	-3%	-3%	-3%	-3%	2	2

Figure 12. Working Patterns 2



Working Patterns 3

SCENARIO DESCRIPTION

This scenario corresponds to 60% of remote-eligible work being performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely. In addition, non-work trips are assumed to increase by 20% for newly remote workers. The methodology for developing this scenario is identical to that described above for the Working Patterns 1 scenario with the added steps of calculating the effective increase in total trips due to the increase in non-work trips by remote workers and incorporating that into the adjustment of rail propensity values.

KEY FINDINGS

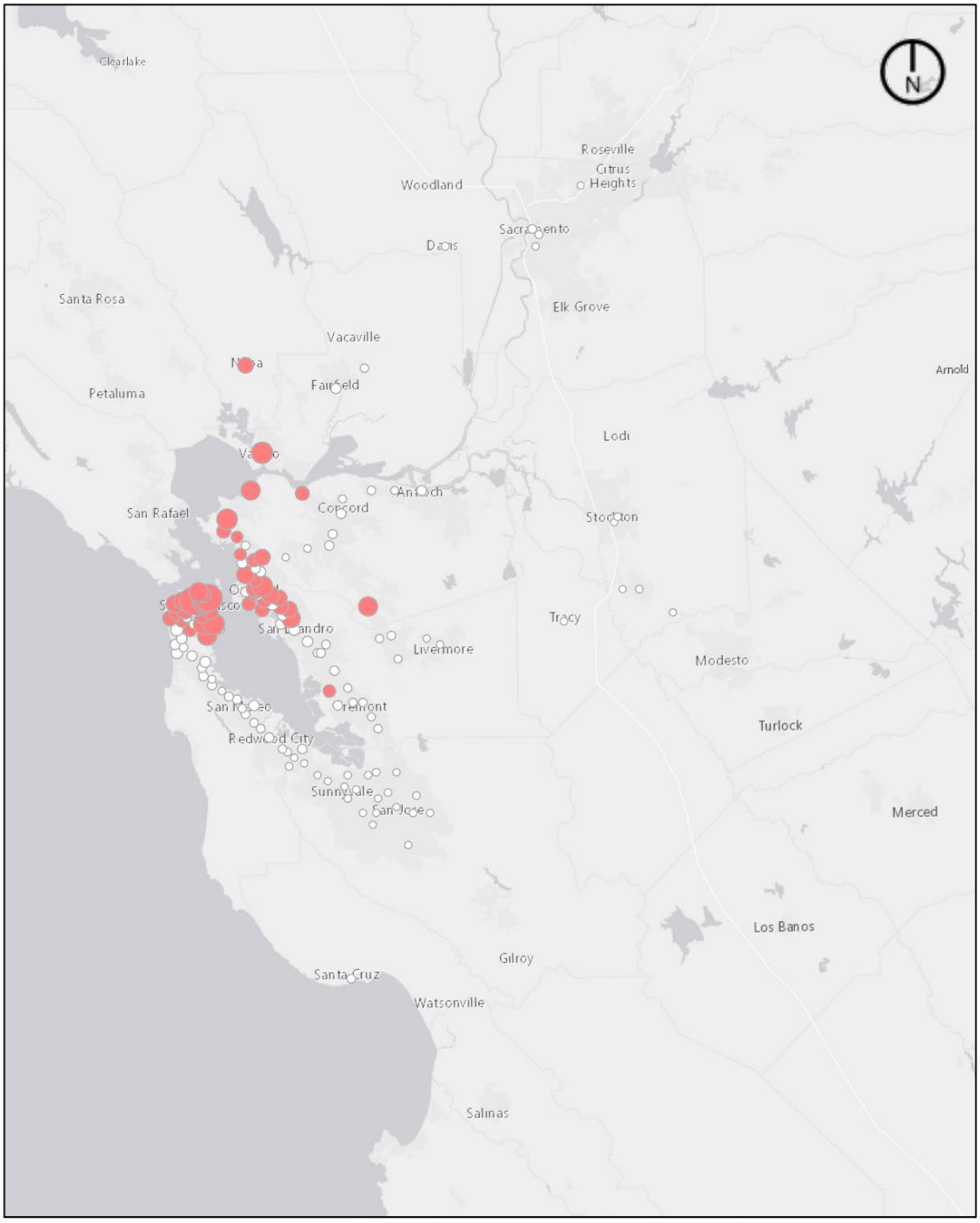
Table 18 summarizes the results for the Working Patterns 3 scenario. Equity-weighted unmet rail potential decreases for all corridors and segments by 6-9%, relative to the baseline. Impacts were approximately one percentage point less than those in the Working Patterns 1 scenario due to the increase in non-work trips. The levels of unmet rail potential are shown in **Figure 13**.

Table 18. Working Patterns 3 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO WP3
WEST	San Francisco-West	-7%	-7%	-7%	-7%	1	1
	San Francisco-Central	-8%	-8%	-7%	-8%	2	2
	San Francisco-East	-7%	-6%	-7%	-6%	3	3
	SEGMENT						
	Embarcadero-SF State	-7%	-7%	-8%	-7%	1	1
	Embarcadero-Bayshore	-7%	-7%	-7%	-6%	2	2
	Embarcadero-Balboa Park	-9%	-9%	-10%	-9%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	-8%	-8%	-7%	-8%	1	1
	Fremont/Modesto	-6%	-6%	-7%	-6%	2	2
	San Jose	-6%	-6%	-7%	-6%	3	3
	Martinez/Stockton	-7%	-7%	-7%	-7%	4	4
	San Ramon/ Modesto	-7%	-7%	-7%	-7%	5	5
	Walnut Creek/ Stockton	-7%	-7%	-8%	-7%	6	6
	SEGMENT						
	Oakland-Bay Fair	-7%	-6%	-7%	-6%	1	1
	Oakland-Richmond	-8%	-8%	-8%	-8%	2	2

Figure 13. Working Patterns 3

Sensitivity Working Patterns 3 - All Transbay - Unmet Rail Potential Differentials with Base Case



Working Patterns 4

SCENARIO DESCRIPTION

This scenario corresponds to 20% of remote-eligible work being performed remotely, in addition to the baseline (pre-COVID) level of work that was already being performed remotely. In addition, non-work trips are assumed to increase by 20% for newly remote workers. The methodology for developing this scenario is similar to that described for the Working Patterns 3 scenario.

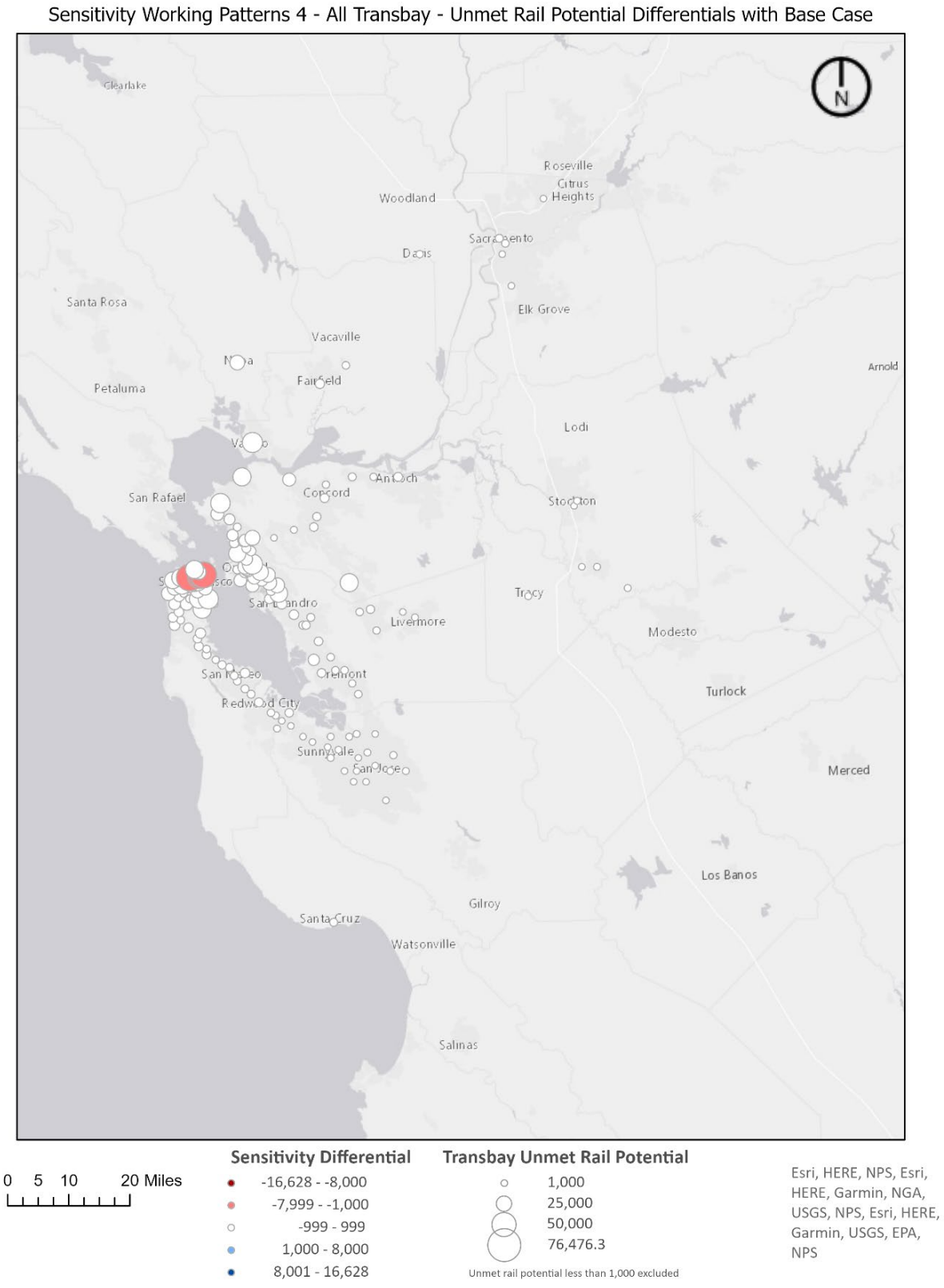
KEY FINDINGS

Table 19 summarizes the results for the Working Patterns 4 scenario. Equity-weighted unmet rail potential decreased for all corridors and segments by 2-3%, relative to the baseline. Impacts were slightly less than those in the Working Patterns 2 scenario due to the increase in non-work trips. The levels of unmet rail potential are shown in **Figure 14**.

Table 19. Working Patterns 4 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO WP4
WEST	San Francisco-West	-2%	-2%	-2%	-2%	1	1
	San Francisco-Central	-3%	-3%	-2%	-3%	2	2
	San Francisco-East	-2%	-2%	-2%	-2%	3	3
	SEGMENT						
	Embarcadero-SF State	-2%	-2%	-2%	-2%	1	1
	Embarcadero-Bayshore	-2%	-2%	-2%	-2%	2	2
	Embarcadero-Balboa Park	-3%	-3%	-4%	-3%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	-2%	-3%	-2%	-2%	1	1
	Fremont/Modesto	-2%	-2%	-2%	-2%	2	2
	San Jose	-2%	-2%	-2%	-2%	3	3
	Martinez/Stockton	-2%	-3%	-2%	-2%	4	4
	San Ramon/ Modesto	-2%	-2%	-2%	-2%	5	5
	Walnut Creek/ Stockton	-3%	-3%	-3%	-3%	6	6
	SEGMENT						
	Oakland-Bay Fair	-2%	-2%	-2%	-2%	1	1
	Oakland-Richmond	-3%	-3%	-3%	-3%	2	2

Figure 14. Working Patterns 4



Travel Cost

Table 20 highlights the parameter definitions for each Travel Cost scenario and the corresponding descriptions.

Table 20. Travel Cost Scenarios

PARAMETER	SCENARIO	DESCRIPTION
Travel Costs (TC)	TC1	Increased rail fares (50% increase)
	TC2	Reduced rail fares (50% decrease)
	TC3	Reduced rail fares (50% decrease) for cluster pairs with high priority population shares (proxy for means-based fare policy)
	TC4	Reduced rail fares (50% decrease) for trips to/from downtown San Francisco (proxy for auto congestion pricing)
	TC5	Regional rail fares adjusted to use the San Francisco Bay Area Rapid Transit (BART) fare formula

The impacts of both major and incremental changes to tolling and fare policies and changes to mode choice preferences drive the travel cost sensitivities. This was tested by adjusting regression model rail cost inputs by cluster pair. The scenarios evaluated a blanket increase and reduction in rail fares, including for cluster pairs with high priority population shares (as a proxy for means-based fare policy) and for trips to/from San Francisco (as a proxy for auto congestion pricing). Also, the BART fare formula was evaluated for regional rail fares to bring consistency to rail fares throughout the Megaregion.

There were no major changes to relative performance in the Travel Cost scenarios from the baseline. All changes in rankings were primarily due to small differences in baseline unmet rail potential enabling minor impacts on unmet rail potential to alter the rankings. Each scenario is described below, and **Table 21** summarizes the rankings of corridors in the baseline and how these changed in the travel cost scenarios. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario.

Table 21. Travel Cost Corridor/Segment Rankings

TRAVEL COST SCENARIOS							
	CORRIDOR	BASELINE	TC1: +50% FARE	TC2: -50% FARE	TC3: -50% FARE FOR HIGH PP* SHARE CLUSTER PAIRS	TC4: -50% FARE TO/FROM SF CONGESTION PRICING ZONE	TC5: BART FARE FORMULA APPLIED TO REGIONAL RAIL
WEST	San Francisco-West	1	1	1	1	1	1
	San Francisco-Central	2	2	2	2	2	2
	San Francisco-East	3	3	3	3	3	3
	SEGMENT						
	Embarcadero-SF State	1	1	1	1	1	1
	Embarcadero-Bayshore	2	2	2	3	2	2
	Embarcadero-Balboa Park	3	3	3	2	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	1	1	1	1	1	1
	Fremont/Modesto	2	2	2	2	2	2
	San Jose	3	3	4	4	4	3
	Martinez/Stockton	4	4	3	3	3	4
	San Ramon/ Modesto	5	5	5	5	5	5
	Walnut Creek/ Stockton	6	6	6	6	6	6
	SEGMENT						
	Oakland-Bay Fair	1	1	1	1	1	1
	Oakland-Richmond	2	2	2	2	2	2

**priority populations*

Travel Cost 1

SCENARIO DESCRIPTION

The aim of the Travel Cost 1 scenario was to understand the impact on unmet rail potential of an increase in the cost of rail travel relative to the cost of auto travel. This was achieved by increasing rail fares by 50% to represent the change relative to auto costs.

KEY FINDINGS

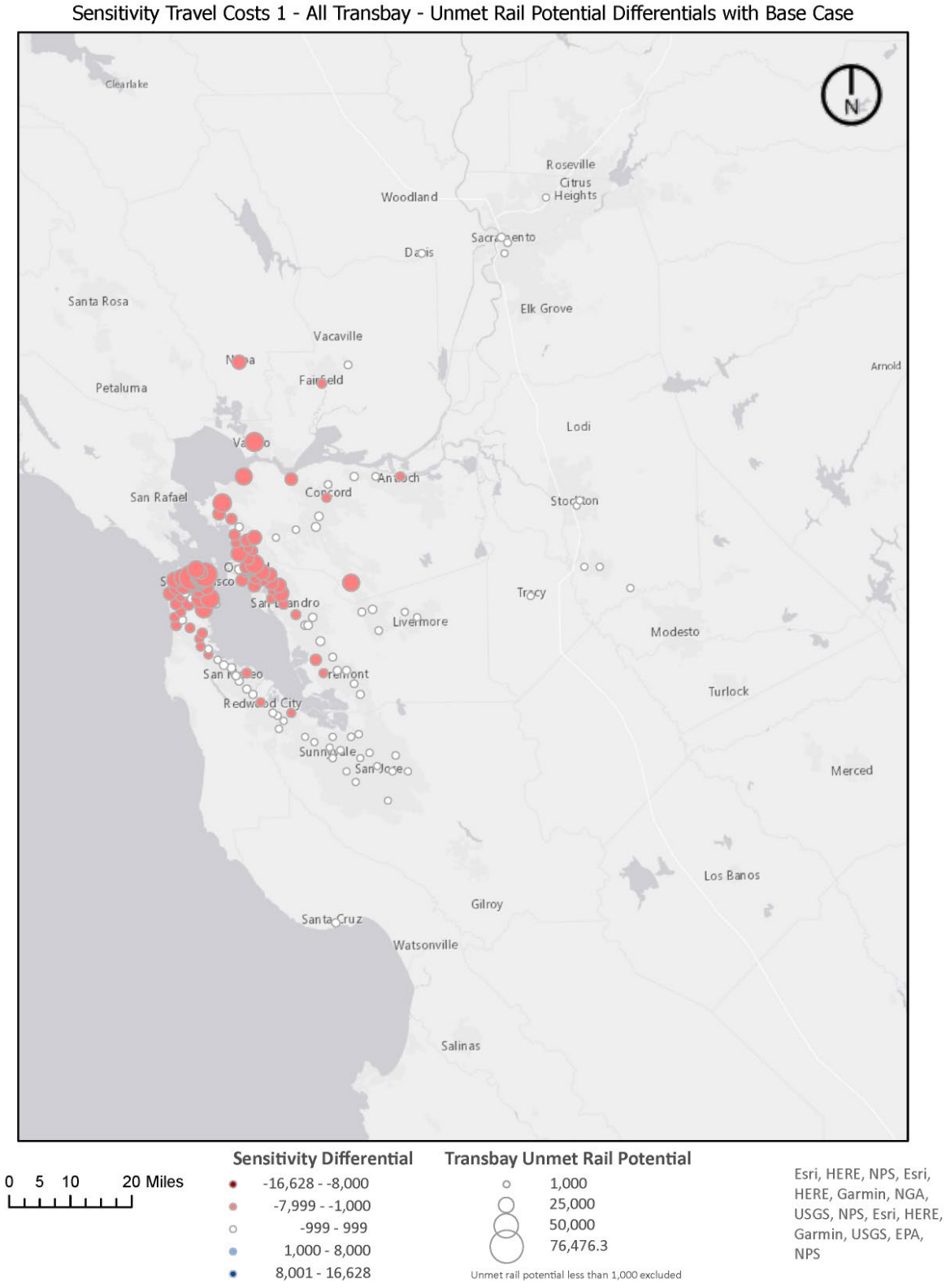
Table 22 summarizes the results of the Travel Cost 1 scenario. Equity-weighted unmet rail potential decreased for all corridors and segments by 14-20%, relative to the baseline. The implied elasticity is generally consistent with the rail cost regression model parameter. Embarcadero-Balboa Park and Oakland-Richmond were the most impacted segments due to generally higher baseline frequencies, which cause changes in travel cost to have a greater impact.[1] Impacts to other corridors and segments were generally similar. The levels of unmet rail potential are shown in **Figure 15**.

[1] Corridors/segments with higher baseline frequencies have limited additional rail potential from further increasing frequencies. As a result, unmet rail potential is generally driven by other factors such as population/employment levels and fares, causing changes to these inputs to result in greater relative impacts on unmet rail potential. This is particularly true of the Embarcadero-Balboa Park and Oakland-Richmond segments mentioned here and to a lesser extent the containing corridors. This applies to several of the scenarios tested.

Table 22. Travel Cost 1 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO TC1
WEST	San Francisco-West	-14%	-14%	-13%	-14%	1	1
	San Francisco-Central	-16%	-18%	-14%	-17%	2	2
	San Francisco-East	-15%	-15%	-13%	-14%	3	3
	SEGMENT						
	Embarcadero-SF State	-14%	-15%	-13%	-14%	1	1
	Embarcadero-Bayshore	-16%	-16%	-13%	-16%	2	2
	Embarcadero-Balboa Park	-20%	-20%	-20%	-20%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	-15%	-15%	-13%	-15%	1	1
	Fremont/Modesto	-14%	-14%	-14%	-14%	2	2
	San Jose	-14%	-14%	-13%	-14%	3	3
	Martinez/Stockton	-15%	-15%	-14%	-15%	4	4
	San Ramon/ Modesto	-14%	-14%	-14%	-14%	5	5
	Walnut Creek/ Stockton	-16%	-16%	-14%	-15%	6	6
	SEGMENT						
	Oakland-Bay Fair	-14%	-14%	-13%	-14%	1	1
	Oakland-Richmond	-17%	-17%	-14%	-17%	2	2

Figure 15. Travel Cost 1



Travel Cost 2

SCENARIO DESCRIPTION

The aim of the Travel Cost 2 scenario was to understand the impact on unmet rail potential if there was a decrease in the cost of rail travel relative to the cost of auto travel. This was achieved by decreasing rail fares by 50% to represent the change relative to auto costs.

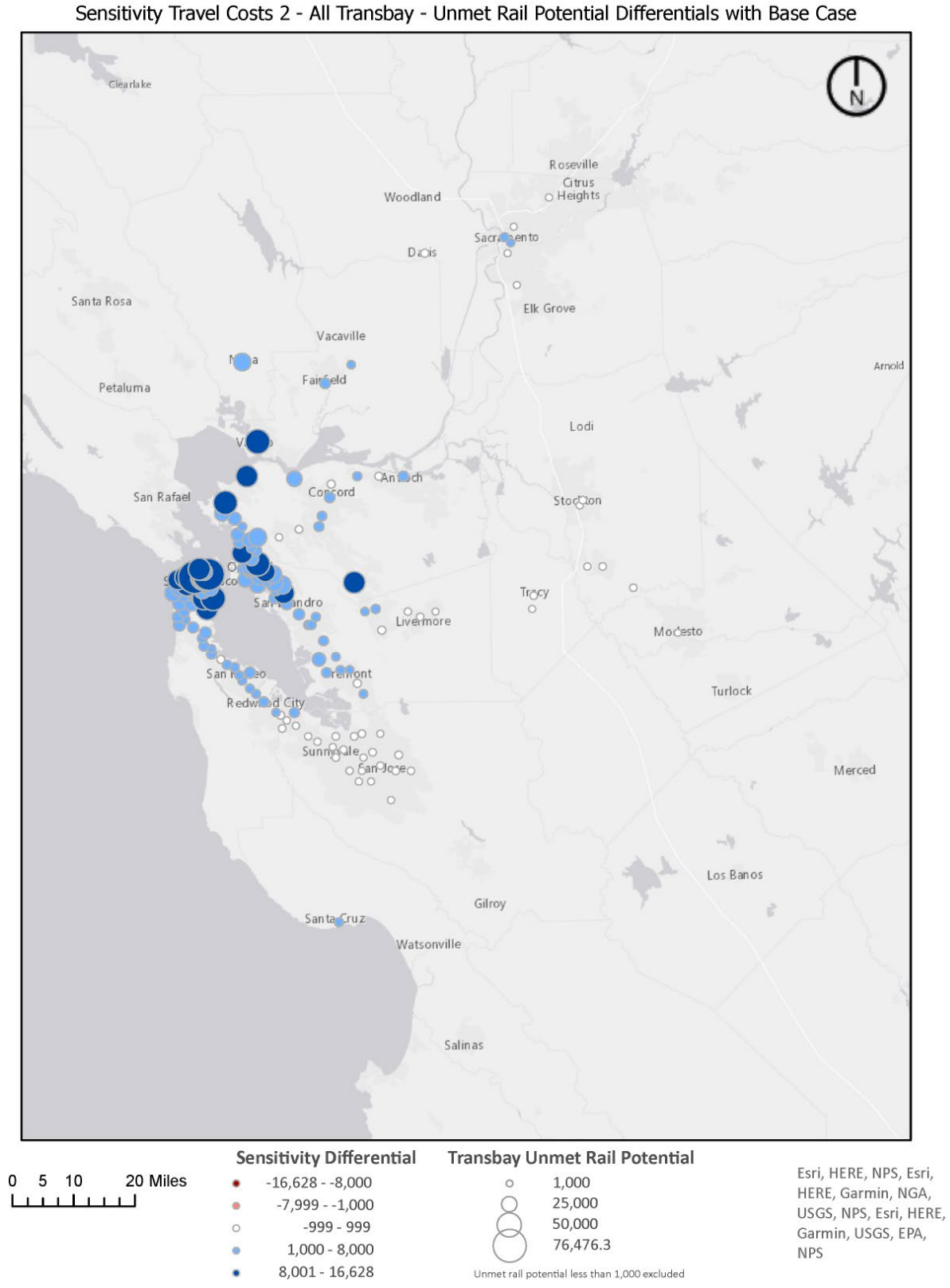
KEY FINDINGS

Table 23 summarizes the results for the Travel Cost 2 scenario. Equity-weighted unmet rail potential increased for all corridors and segments by 29-44%, relative to the baseline. The implied elasticity is generally consistent with the rail cost regression model parameter and with that of the Travel Cost 1 scenario. As in the Travel Cost 1 scenario, Embarcadero-Balboa Park and Oakland-Richmond were most impacted segments due to higher baseline frequencies, which cause changes in travel cost to have a greater impact. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 16**.

Table 23. Travel Cost 2 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO TC2
WEST	San Francisco-West	30%	31%	28%	30%	1	1
	San Francisco-Central	36%	39%	31%	36%	2	2
	San Francisco-East	31%	33%	28%	31%	3	3
	SEGMENT						
	Embarcadero-SF State	31%	31%	28%	30%	1	1
	Embarcadero-Bayshore	34%	35%	28%	33%	2	2
	Embarcadero-Balboa Park	44%	43%	65%	44%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	31%	31%	29%	31%	1	1
	Fremont/Modesto	29%	29%	30%	30%	2	2
	San Jose	29%	30%	29%	29%	3	4
	Martinez/Stockton	31%	32%	30%	31%	4	3
	San Ramon/ Modesto	29%	29%	29%	29%	5	5
	Walnut Creek/ Stockton	36%	35%	38%	35%	6	6
	SEGMENT						
	Oakland-Bay Fair	30%	30%	31%	30%	1	1
	Oakland-Richmond	34%	34%	32%	34%	2	2

Figure 16. Travel Cost 2



Travel Cost 3

SCENARIO DESCRIPTION

The Travel Cost 3 scenario reduced rail fares by 50% for cluster pairs with high priority population shares. This scenario was intended as a high-level proxy for a means-based fare policy. Cluster pairs with a priority population index of 1.5 or greater in the MAST were identified, and a 50% reduction in rail costs from the baseline was applied.

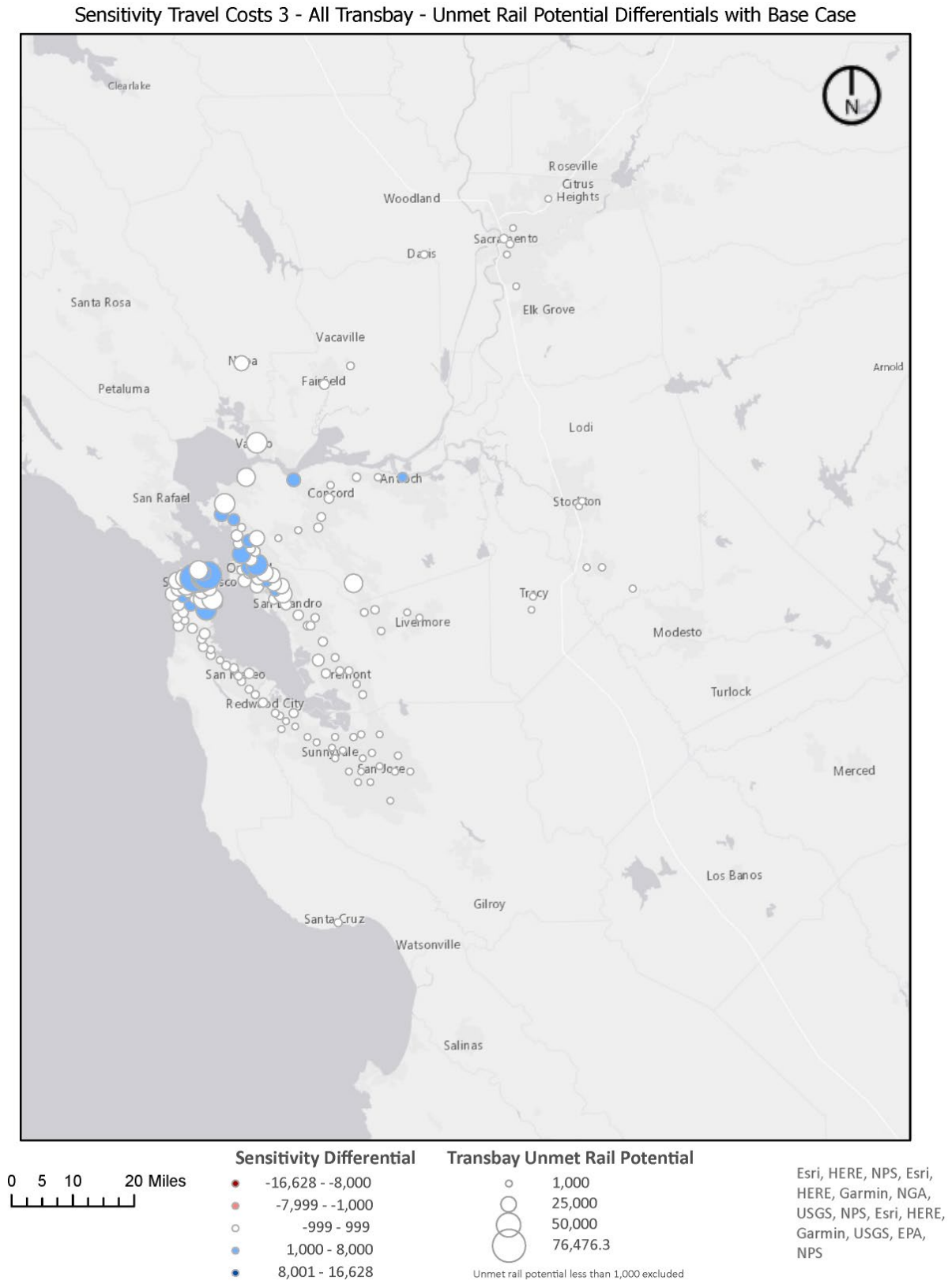
KEY FINDINGS

Table 24 summarizes the results for the Travel Cost 3 scenario. Equity-weighted unmet rail potential increased for all corridors and segments by 3-23%, relative to the baseline. Embarcadero-Balboa Park saw a higher impact than other West Bay segments due to a higher share of priority populations and higher baseline frequencies. The Oakland-Richmond segment saw a higher impact than the Oakland-Bay Fair segment due to higher baseline frequencies, which cause changes in travel cost to have a greater impact. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 17**.

Table 24. Travel Cost 3 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO TC3
WEST	San Francisco-West	3%	5%	1%	3%	1	1
	San Francisco-Central	13%	18%	7%	15%	2	2
	San Francisco-East	6%	9%	1%	7%	3	3
	SEGMENT						
	Embarcadero-SF State	3%	3%	0%	3%	1	1
	Embarcadero-Bayshore	7%	8%	0%	8%	2	3
	Embarcadero-Balboa Park	21%	20%	36%	23%	3	2
	CORRIDOR						
EAST	Vallejo/Sacramento	7%	8%	4%	8%	1	1
	Fremont/Modesto	6%	6%	4%	6%	2	2
	San Jose	5%	6%	3%	6%	3	4
	Martinez/Stockton	9%	9%	5%	9%	4	3
	San Ramon/ Modesto	4%	4%	2%	4%	5	5
	Walnut Creek/ Stockton	11%	11%	10%	12%	6	6
	SEGMENT						
	Oakland-Bay Fair	6%	6%	3%	6%	1	1
	Oakland-Richmond	12%	13%	6%	13%	2	2

Figure 17. Travel Cost 3



Travel Cost 4

SCENARIO DESCRIPTION

Travel Cost 4 involved a reduction of rail fares by 50% for trips to and from downtown San Francisco. This scenario was established as a high-level proxy for the implementation of auto congestion pricing in San Francisco. The reduced rail fares were applied to cluster pairs where one (and only one) end of a trip was within the proposed congestion pricing zone to represent auto costs increasing relative to rail costs for these trips.

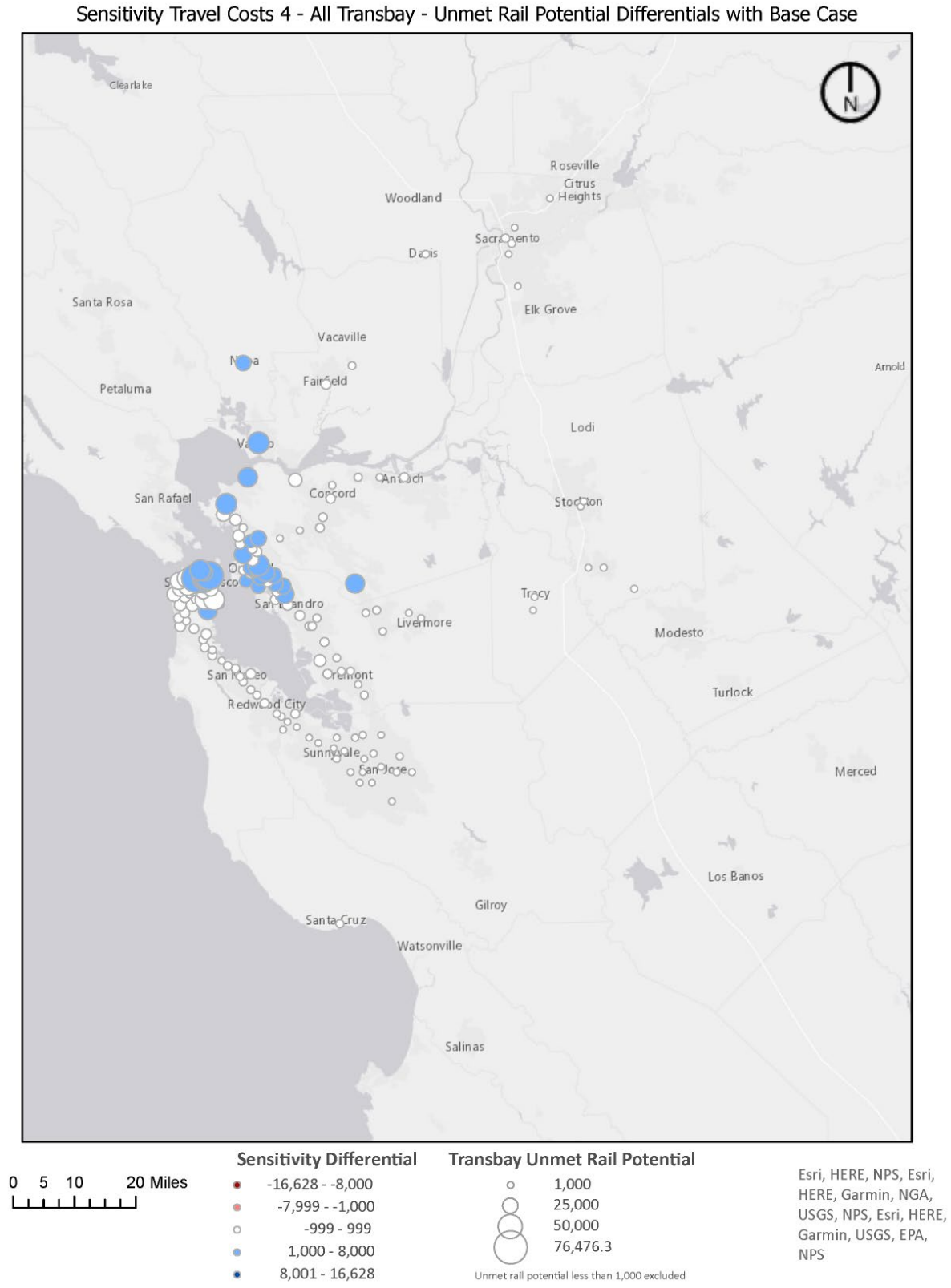
KEY FINDINGS

Table 25 summarizes the results for the Travel Cost 4 scenario. Equity-weighted unmet rail potential increased for all corridors and segments by 6%-23%, relative to the baseline. The Embarcadero-Balboa Park segment had the largest increase. As expected, transbay trips in the East Bay were more impacted than non-transbay trips. The highlighted cells in the table refer to a change in corridor ranking for each specific scenario. The levels of unmet rail potential are shown in **Figure 18**.

Table 25. Travel Cost 4 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO TC4
WEST	San Francisco-West	6%	7%	6%	6%	1	1
	San Francisco-Central	11%	16%	5%	12%	2	2
	San Francisco-East	7%	9%	4%	6%	3	3
	SEGMENT						
	Embarcadero-SF State	9%	8%	15%	9%	1	1
	Embarcadero-Bayshore	12%	11%	17%	11%	2	2
	Embarcadero-Balboa Park	22%	22%	35%	23%	3	3
	CORRIDOR						
EAST	Vallejo/ Sacramento	7%	9%	0%	7%	1	1
	Fremont/Modesto	6%	8%	1%	6%	2	2
	San Jose	6%	8%	0%	6%	3	4
	Martinez/Stockton	8%	9%	0%	8%	4	3
	San Ramon/ Modesto	6%	7%	0%	6%	5	5
	Walnut Creek/Stockton	10%	10%	3%	9%	6	6
	SEGMENT						
	Oakland-Bay Fair	7%	8%	1%	7%	1	1
	Oakland-Richmond	9%	10%	1%	9%	2	2

Figure 18. Travel Cost 4



Travel Cost 5

SCENARIO DESCRIPTION

The Travel Cost 5 scenario adjusted rail fares in regional rail markets to use the BART fare formula. The aim of this scenario was to estimate the impacts on unmet rail potential of a consistent fare formula between both BART services and regional rail services. Fares were calculated based on the BART fare formula implemented in 2018: $2.00 for trips less than 6 miles; $2.05 + $0.15 per mile for trips between 6 and 14 miles; $3.22 + $0.09 per mile for trips greater than 14 miles. For simplicity, no surcharges were included, and fares were discounted based on the Consumer Price Index (CPI) to year 2000 dollars to be consistent with fares obtained from the MTC Travel Model.

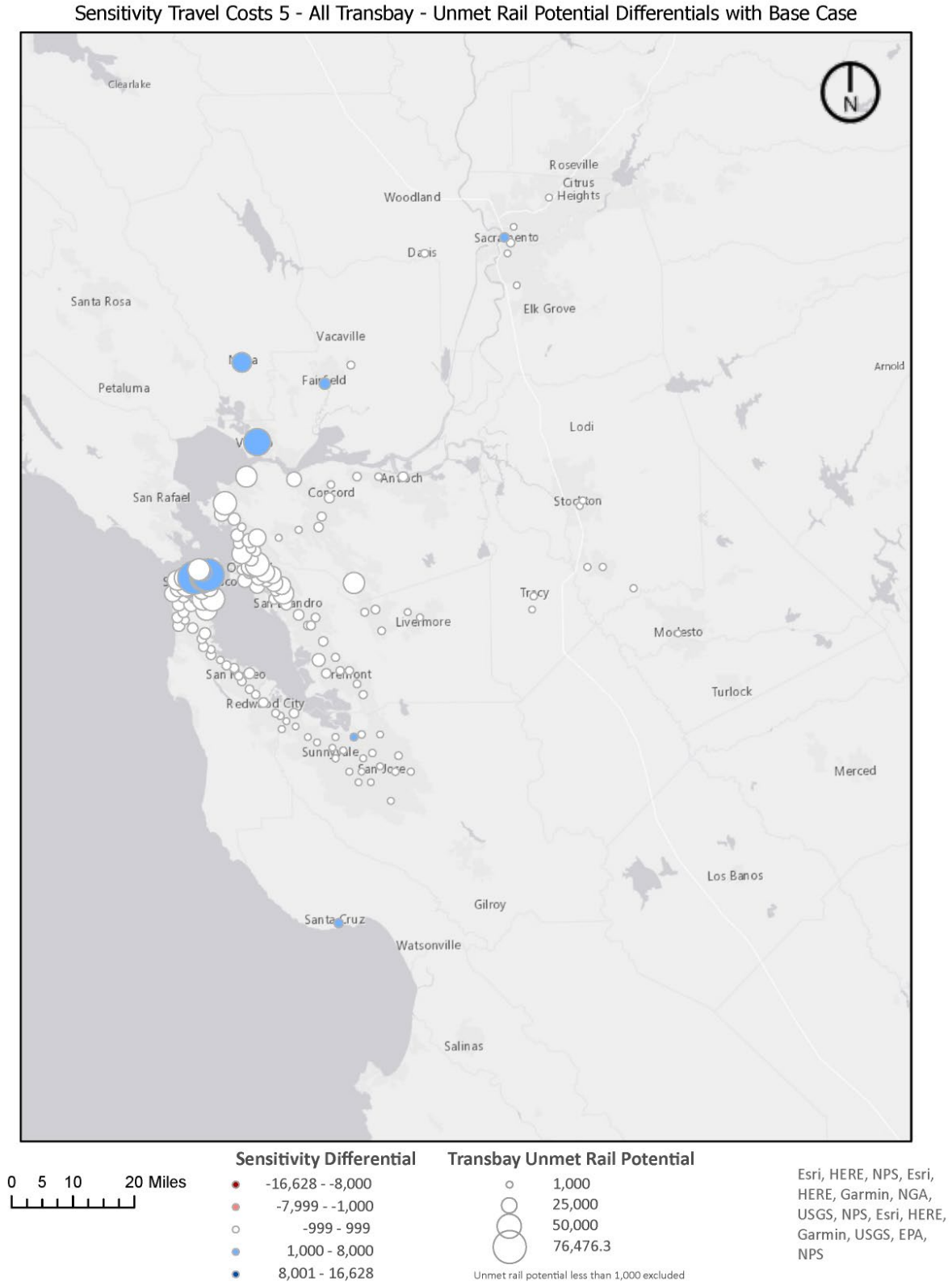
KEY FINDINGS

Table 26 summarizes the results for the Travel Cost 5 scenario. Equity-weighted unmet rail potential increased for all corridors and segments by 1-21%, relative to the baseline. The Vallejo-Sacramento corridor had the greatest increase in unmet rail potential as it had the greatest fare reductions due to existing Capitol Corridor fares being much higher than BART fares. The levels of unmet rail potential are shown in **Figure 19**.

Table 26. Travel Cost 5 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO TC5
WEST	San Francisco-West	6%	9%	3%	6%	1	1
	San Francisco-Central	12%	16%	5%	12%	2	2
	San Francisco-East	9%	13%	2%	9%	3	3
	SEGMENT						
	Embarcadero-SF State	8%	10%	0%	7%	1	1
	Embarcadero-Bayshore	15%	16%	0%	14%	2	2
	Embarcadero-Balboa Park	21%	21%	29%	21%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	11%	12%	7%	11%	1	1
	Fremont/Modesto	2%	2%	3%	2%	2	2
	San Jose	1%	1%	0%	1%	3	3
	Martinez/Stockton	1%	1%	0%	1%	4	4
	San Ramon/ Modesto	2%	1%	3%	2%	5	5
	Walnut Creek/ Stockton	2%	2%	1%	2%	6	6
	SEGMENT						
	Oakland-Bay Fair	1%	1%	0%	1%	1	1
	Oakland-Richmond	1%	1%	0%	1%	2	2

Figure 19. Travel Cost 5



Housing and Job Growth

Table 27 highlights the parameter definitions for the Housing and Job Growth scenario and its corresponding description.

Table 27. Housing and Job Growth Scenario

PARAMETER	SCENARIO	DESCRIPTION
Housing and Job Growth (HJG) and Patterns	HJG1	Low population growth (0.5x expected growth from plans), high employment growth (2x expected) in SF; no change in expected growth elsewhere

Scenario Description

The Housing and Job Growth scenario was a hybrid scenario that combined population and employment growth to determine the impacts on unmet rail potential of rapid job growth in San Francisco in combination with lower-than-expected population growth in San Francisco. This was achieved by doubling the expected 2015-2040 employment growth and reducing population growth to 50% of expected 2015-2040 growth in San Francisco on a zone basis and maintaining the expected 2040 population and employment levels elsewhere in the Megaregion. The same general process was used to develop the scenario inputs as described previously in the Housing Growth and Patterns and Job Growth and Patterns sections.

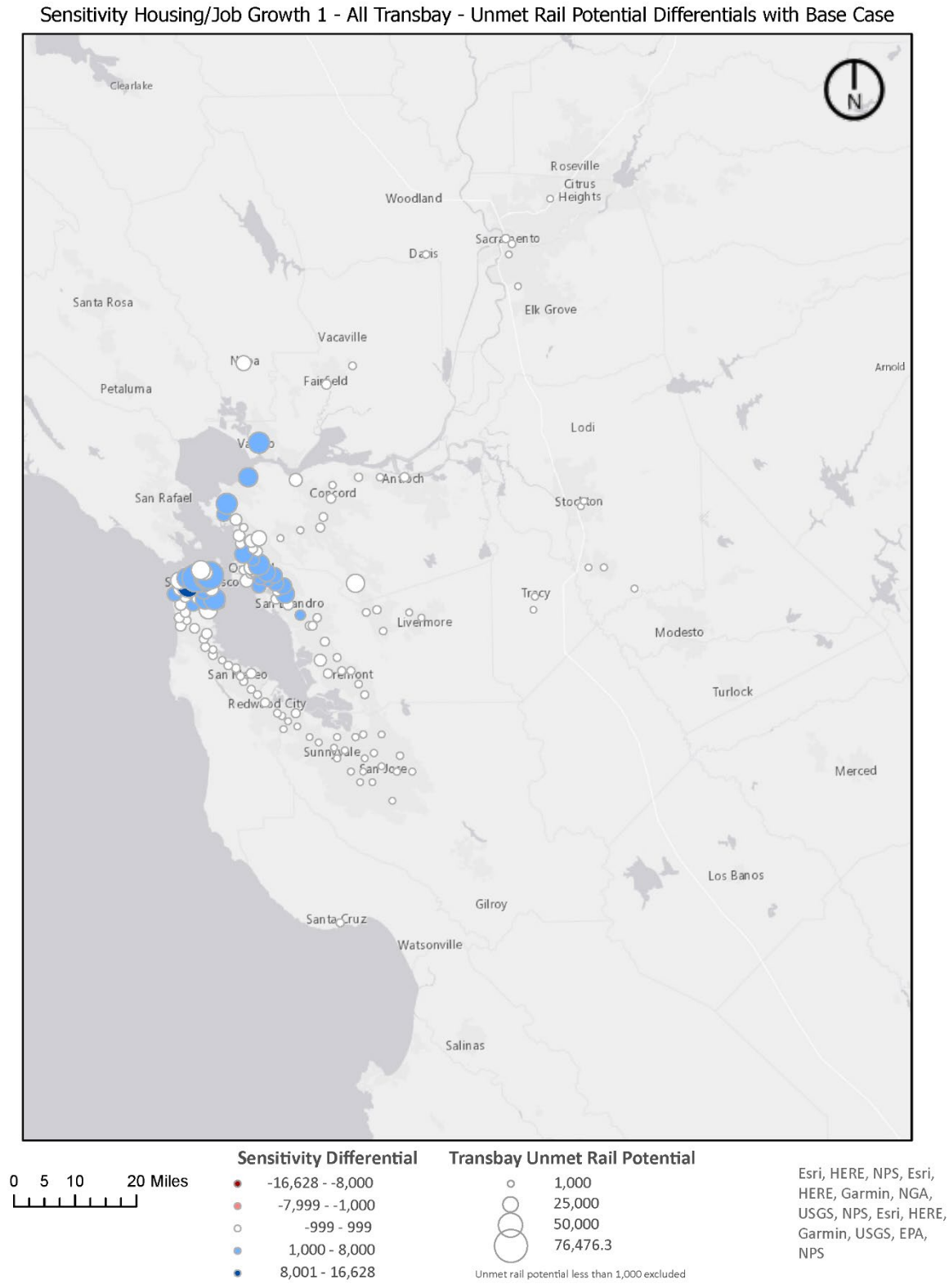
Key Findings

Table 28 demonstrates with low population growth and high employment growth in San Francisco, equity-weighted unmet rail potential increased for all corridors and segments by 3-9%, relative to the baseline. These impacts were greatest for transbay trips and for trips within San Francisco. The levels of unmet rail potential are shown in **Figure 20**.

Table 28. Housing and Job Growth 1 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO HJG1
WEST	San Francisco-West	4%	4%	4%	4%	1	1
	San Francisco-Central	5%	6%	2%	5%	2	2
	San Francisco-East	3%	4%	1%	3%	3	3
	SEGMENT						
	Embarcadero-SF State	6%	5%	9%	6%	1	1
	Embarcadero-Bayshore	5%	5%	6%	6%	2	2
	Embarcadero-Balboa Park	8%	8%	19%	9%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	4%	4%	0%	4%	1	1
	Fremont/Modesto	5%	6%	0%	5%	2	2
	San Jose	5%	6%	0%	5%	3	3
	Martinez/Stockton	5%	6%	0%	5%	4	4
	San Ramon/ Modesto	4%	5%	0%	4%	5	5
	Walnut Creek/ Stockton	6%	6%	1%	5%	6	6
	SEGMENT						
	Oakland-Bay Fair	6%	6%	0%	6%	1	1
	Oakland-Richmond	5%	6%	1%	6%	2	2

Figure 20. Housing and Job Growth 1



Baseline Projects

Table 29 highlights the parameter definitions for the Baseline Projects scenario and its corresponding description.

Table 29. Baseline Projects Scenario

PARAMETER	SCENARIO	DESCRIPTION
Baseline Projects (BP)	BP1	Rail projects scheduled for implementation after 2035 were removed

Scenario Description

The Baseline Projects scenario was intended to test the impacts to unmet rail potential if some other rail projects were not completed as planned. In the scenario, rail projects scheduled for implementation after 2035 were removed. The project implementation dates used were based on MTC's *Plan Bay Area 2050 Final Blueprint* and adopted plans for other MPOs. While it was originally expected that this would result in the removal of multiple projects, it only resulted in the removal of frequency improvements on the Caltrain corridor. It was also not possible to switch to an earlier threshold year due to the nature of the data received.

Key Findings

This scenario resulted in small changes in equity-weighted unmet rail potential in both directions ranging from -2% to 1%, as shown in **Table 30**. No cluster had a change in unmet rail potential greater than 1,000 trips in either direction. The levels of unmet rail potential are shown in **Figure 21**.

Table 30. Baseline Projects 1 Corridor/Segment Results

	CORRIDOR	TOTAL	TRANSBAY	NON-TRANSBAY	TOTAL (EQUITY-WEIGHTED)	CORE SCENARIO	SCENARIO BP1
WEST	San Francisco-West	1%	0%	3%	1%	1	1
	San Francisco-Central	1%	-1%	4%	1%	2	2
	San Francisco-East	1%	-1%	4%	1%	3	3
	SEGMENT						
	Embarcadero-SF State	0%	0%	0%	0%	1	1
	Embarcadero-Bayshore	-1%	-1%	1%	-1%	2	2
	Embarcadero-Balboa Park	-2%	-2%	-2%	-2%	3	3
	CORRIDOR						
EAST	Vallejo/Sacramento	0%	-1%	0%	-1%	1	1
	Fremont/Modesto	-1%	-1%	0%	-1%	2	2
	San Jose	-1%	-1%	1%	-1%	3	3
	Martinez/Stockton	-1%	-1%	0%	-1%	4	4
	San Ramon/ Modesto	0%	0%	0%	0%	5	5
	Walnut Creek/ Stockton	-1%	-1%	0%	-1%	6	6
	SEGMENT						
	Oakland-Bay Fair	0%	-1%	0%	0%	1	1
	Oakland-Richmond	-1%	-1%	0%	-1%	2	2

Figure 21. Baseline Projects 1