



REGIONAL CONNECTORS STUDY

SCENARIO PLANNING WEBINAR #6

Agenda

- Where are we now?
- Greater Growth Employment Level
- Scenario Narrative Update
- Exploratory Scenario Planning: From Drivers to Model Levers
- Next Steps

Overview slide – where are we now



TASK 4	CONDUCT SCENARIO PLANNING	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV
4.1	Building the Base Data, Models, and Scenarios	 		 								
4.2	Defining Alternative Future Scenarios			 	  	 						
4.3	Defining Measures of Success					 	 					
4.4	Evaluate 2015 Current Regional Conditions						  					
4.5	Modeling the 2045 Baseline Alternative							  				
4.6	Building the Alternative Scenarios										 	

- Nearing the end of model and scenario development
- Need to agree on key components:
 - Scenario Narratives
 - Amount of Greater Growth
 - Draft Goals, Objectives and Performance Measures

Summary of input from May 21 workshop

- On the subject of Greater Growth Amount:
 - How much background congestion is there in the 2045 Baseline?
 - What are the pros and cons of moderate vs high growth level?
- Scenario Narratives and Scenario Drivers
 - General affirmation of the basic narratives
 - Some refinements to land use & travel behavior drivers
 - Recommend setting aside, or making neutral, drivers not directly applied in the models (ex: population groups)
 - Questions remain about technology drivers
 - Will need to have some flexibility to apply them as we better understand how the new travel demand model will work and the effects of our potential levers

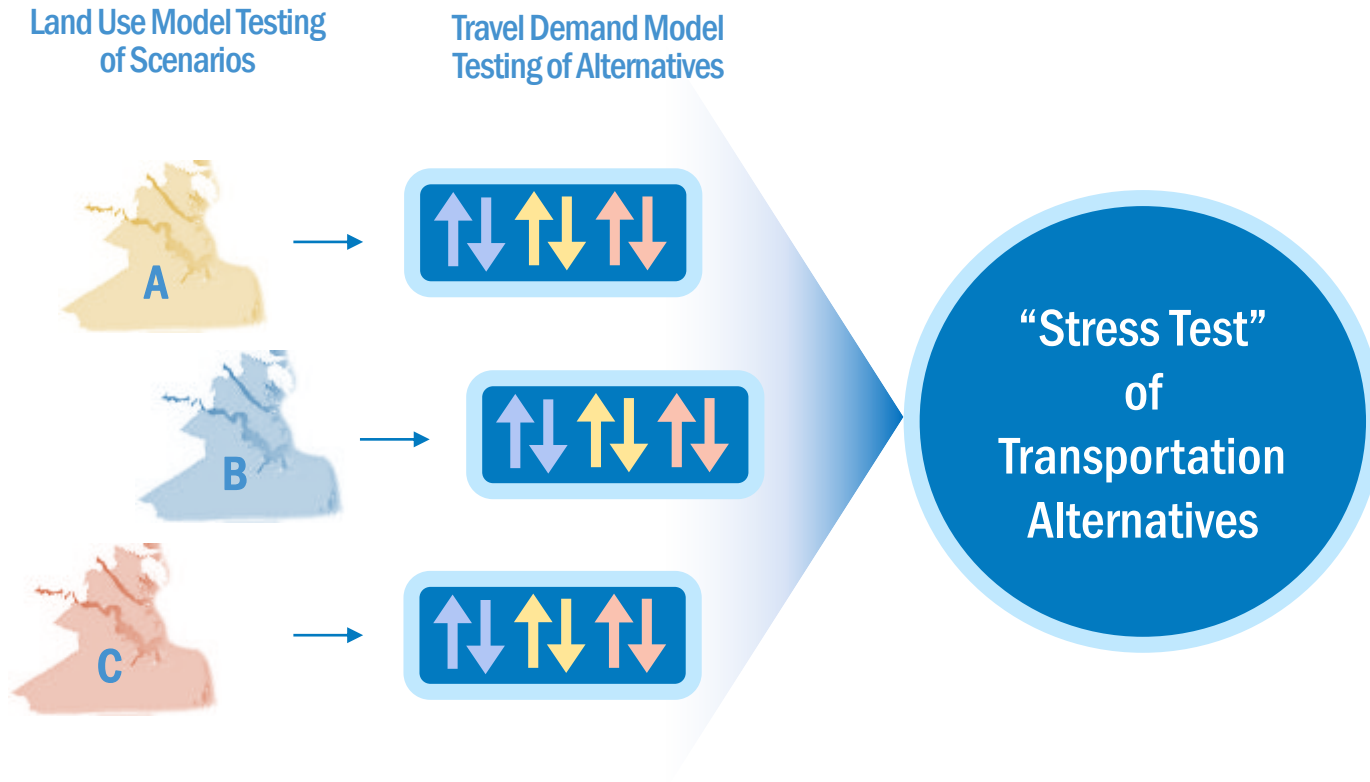


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GREATER GROWTH EMPLOYMENT LEVEL

Greater Growth Employment - Purpose

- To establish a Control Total for the “Greater Growth” Scenarios
- These will look at growth in addition to the 2045 Baseline of growth
- The purpose is not to try to predict what may happen in the future
- The purpose is to establish a threshold of additional growth against which to stress test the transportation alternatives



Approach: *How Much Greater Growth?*

Criteria:

- Need to have a sufficient increment of growth in the region to “move the needle” in the modeling
- Need to have not too much growth to “swamp the network” in the modeling
- Believable narrative - Within the realm of the “plausible” but not a “forecast”

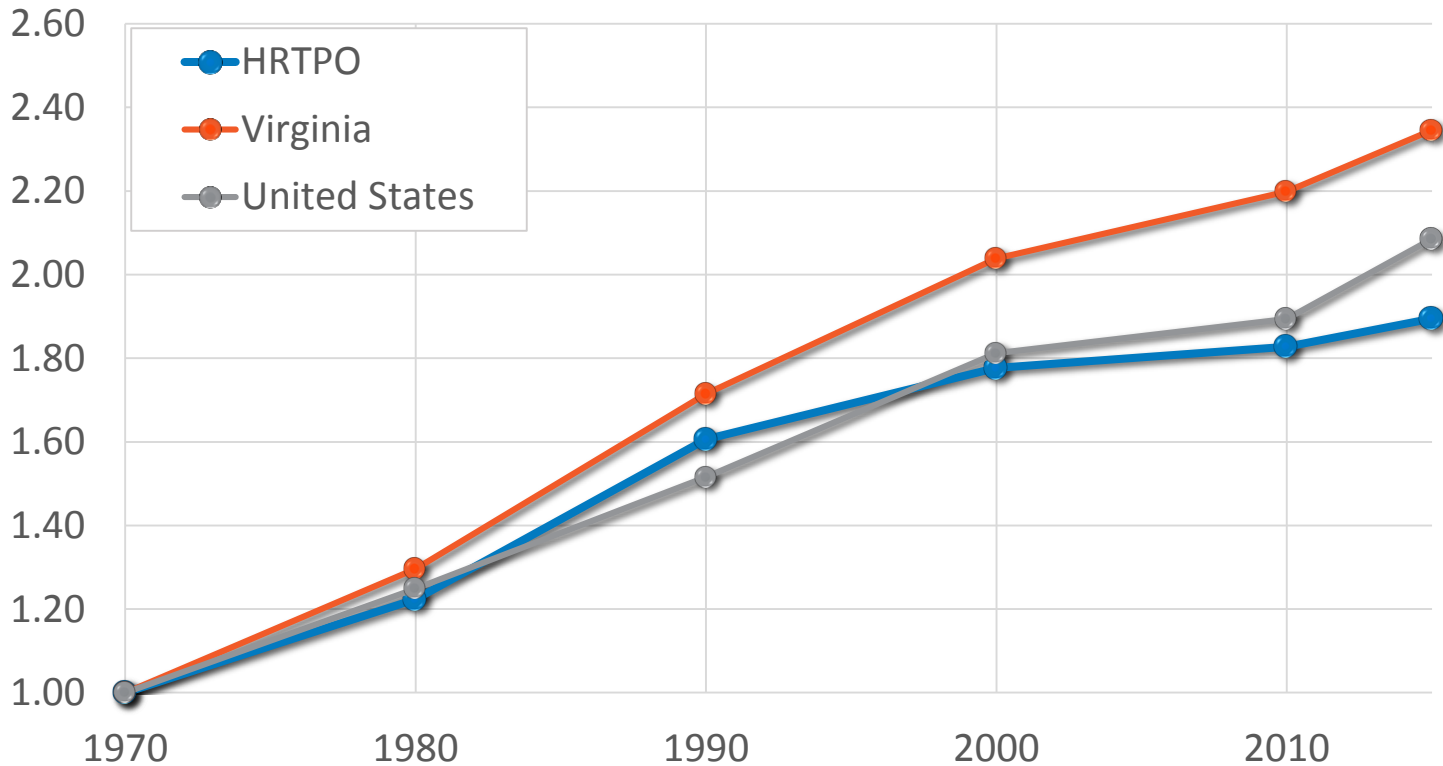
Inputs to the decision:

1. Retrospective: employment growth in the region, compared to VA & the US
2. 2045 Baseline forecast
3. Alternative future growth forecasts (HR, VA, US)
4. Exploration – what might a major “shock” to the economy, like Amazon HQ2 look like in terms of changes in growth trajectory?
5. Travel model sensitivity testing



Employment growth over time (retrospective)

Employment Growth (Indexed to 1970)



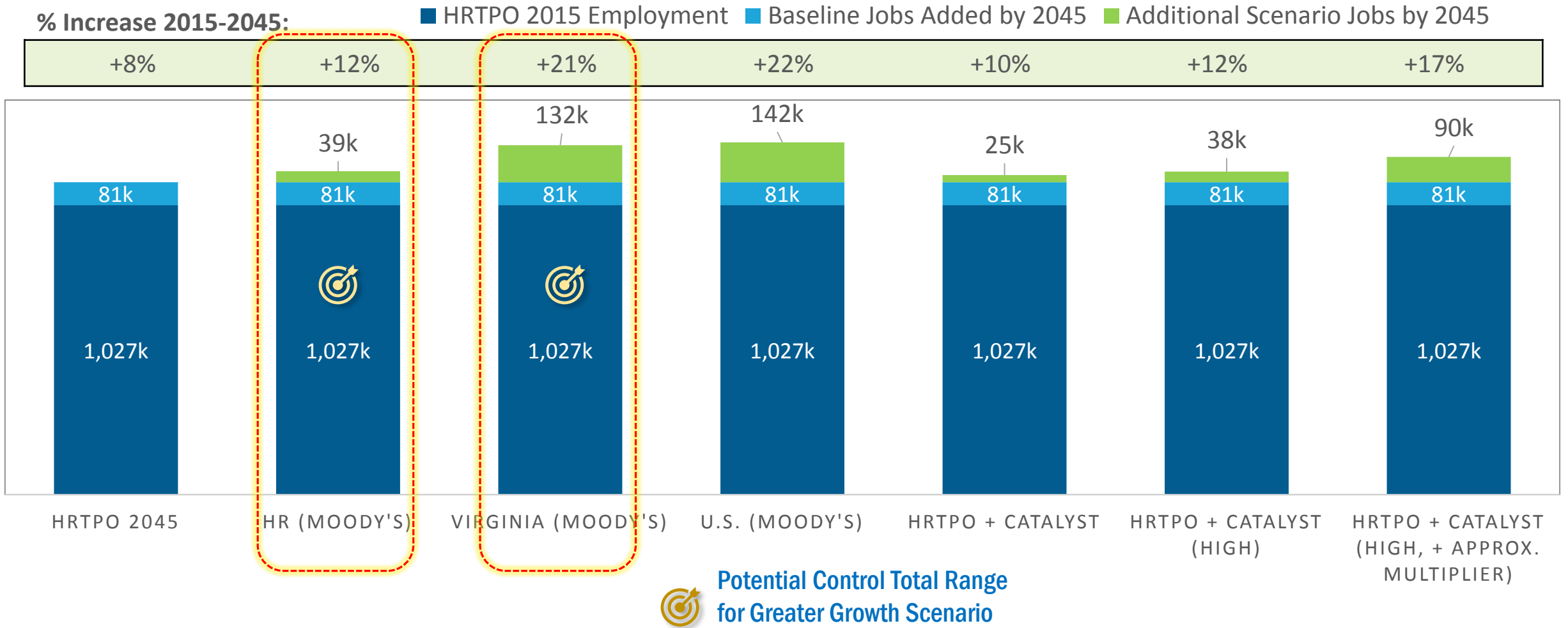
Relative to HRTPO:

- VA grew significantly faster
- US grew slightly faster on aggregate

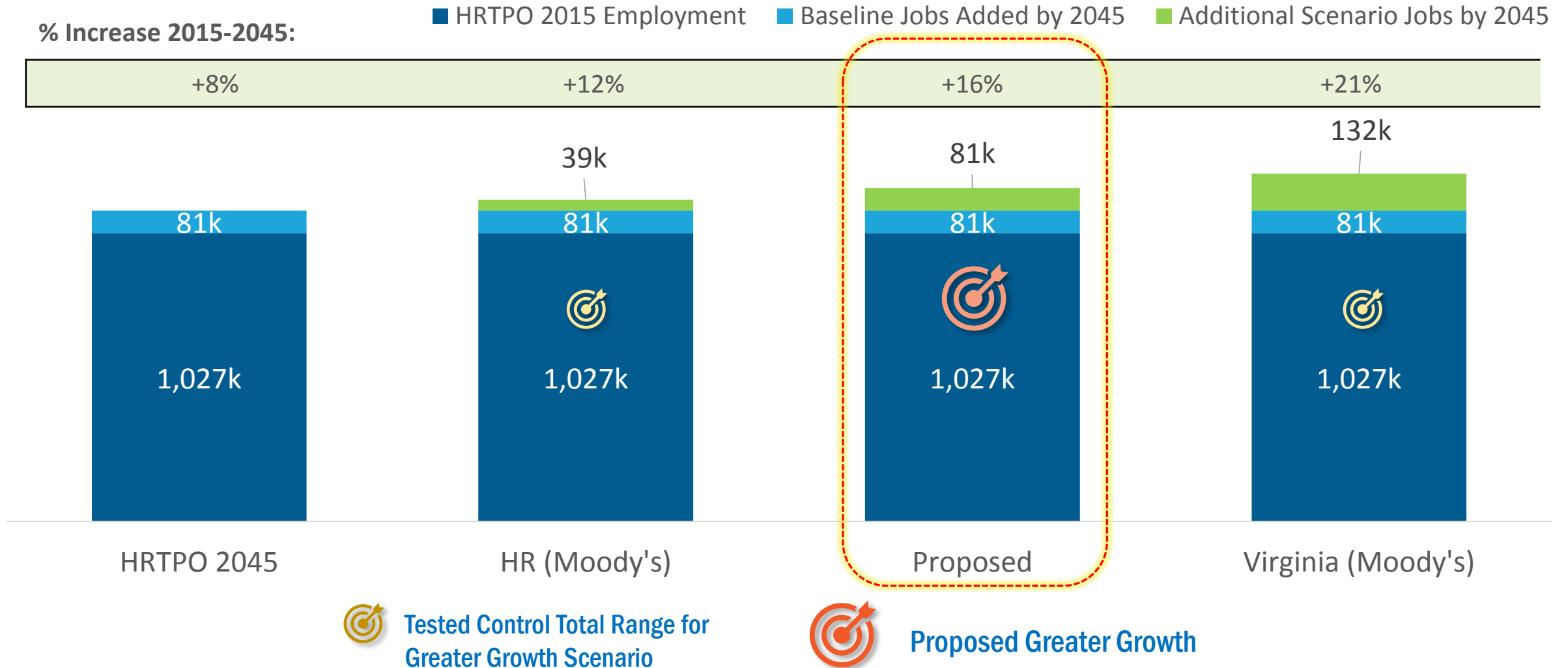
Nationally and in HR:
The next 30 years of employment growth are forecast to be significantly slower

Source: Bureau of Economic Analysis (HRTPO data as reported in 2045 Socioeconomic Forecast Report)

Regional Employment Added by 2045



Regional Employment Added by 2045



Alternative Growth Paths

- How long does it take to reach a given benchmark?

Forecast	2015-2045 % EMP Growth	CAGR*	EMP Added 2015-2045	EMP Added Above Baseline by 2045	Year to reach +21% above 2015 EMP at each CAGR
Keep Pace with Virginia (Moody's)	21%	0.63%	213k	132k	2045
Middle Ground	16%	0.49%	163k	81k	2053 (+8.5 more years)
Optimistic Regional (Moody's)	12%	0.37%	120k	39k	2066 (+21.1 more years)
Baseline (HRTPO)	8%	0.25%	81k	0	2089 (+44.2 more years)

**Compound Annual Growth Rate*

Travel Model Sensitivity Testing

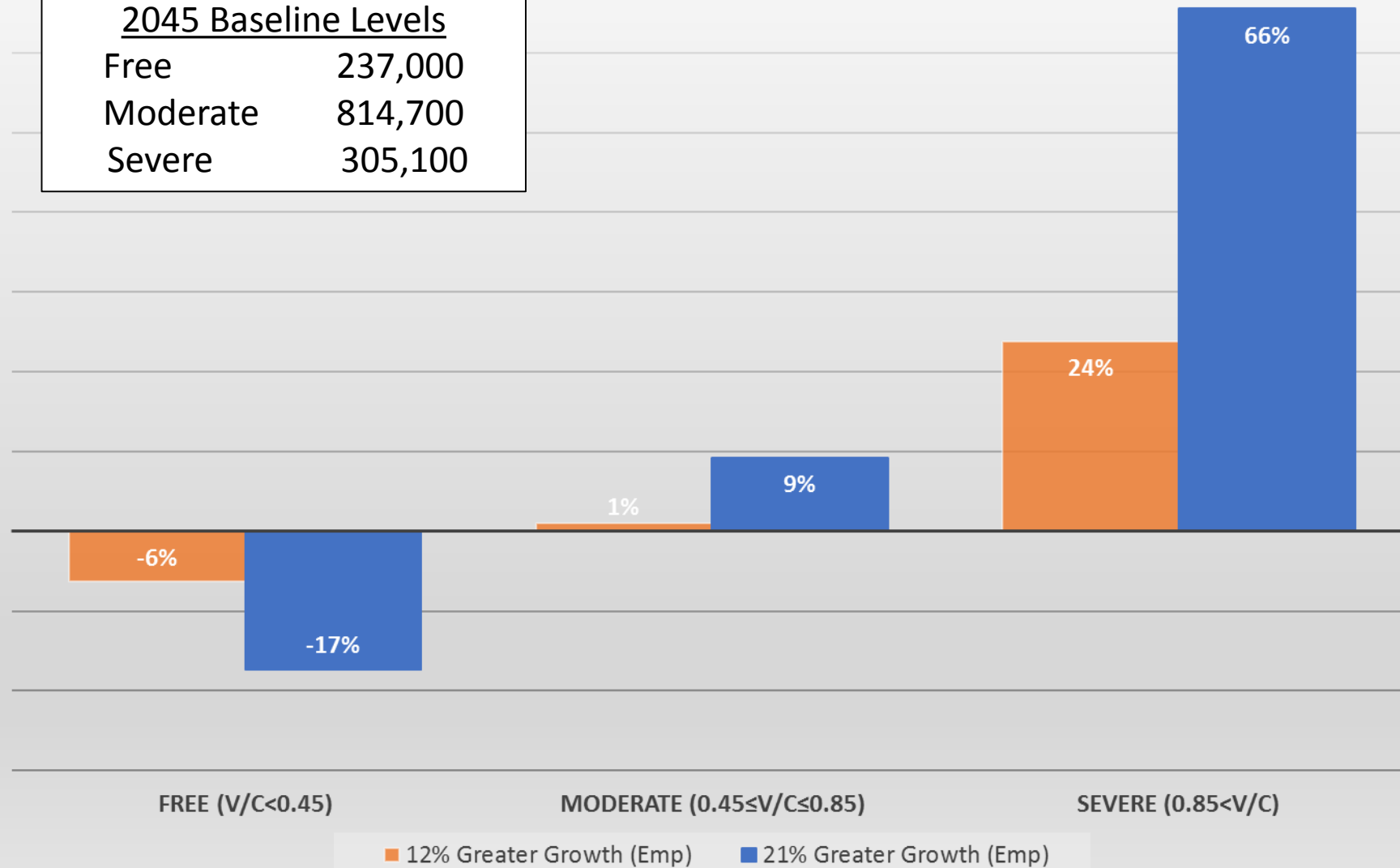
- Gauge regional reaction of the travel demand model to greater growth for 12% and 21% increases in employment over 2015
 - Applied employment growth proportionately to all TAZs
 - Maintained population/employment ratio in 2045 baseline forecasts
 - Maintained average household occupancy and vehicle availability
 - Adjusted I-E/E-I travel in accordance with resulting changes in TAZ trip generation
 - E-E travel held constant
- 2025/2026 E+C Network
- Examined changes in vehicle-hours traveled and roadway speeds* compared with the 2045 baseline

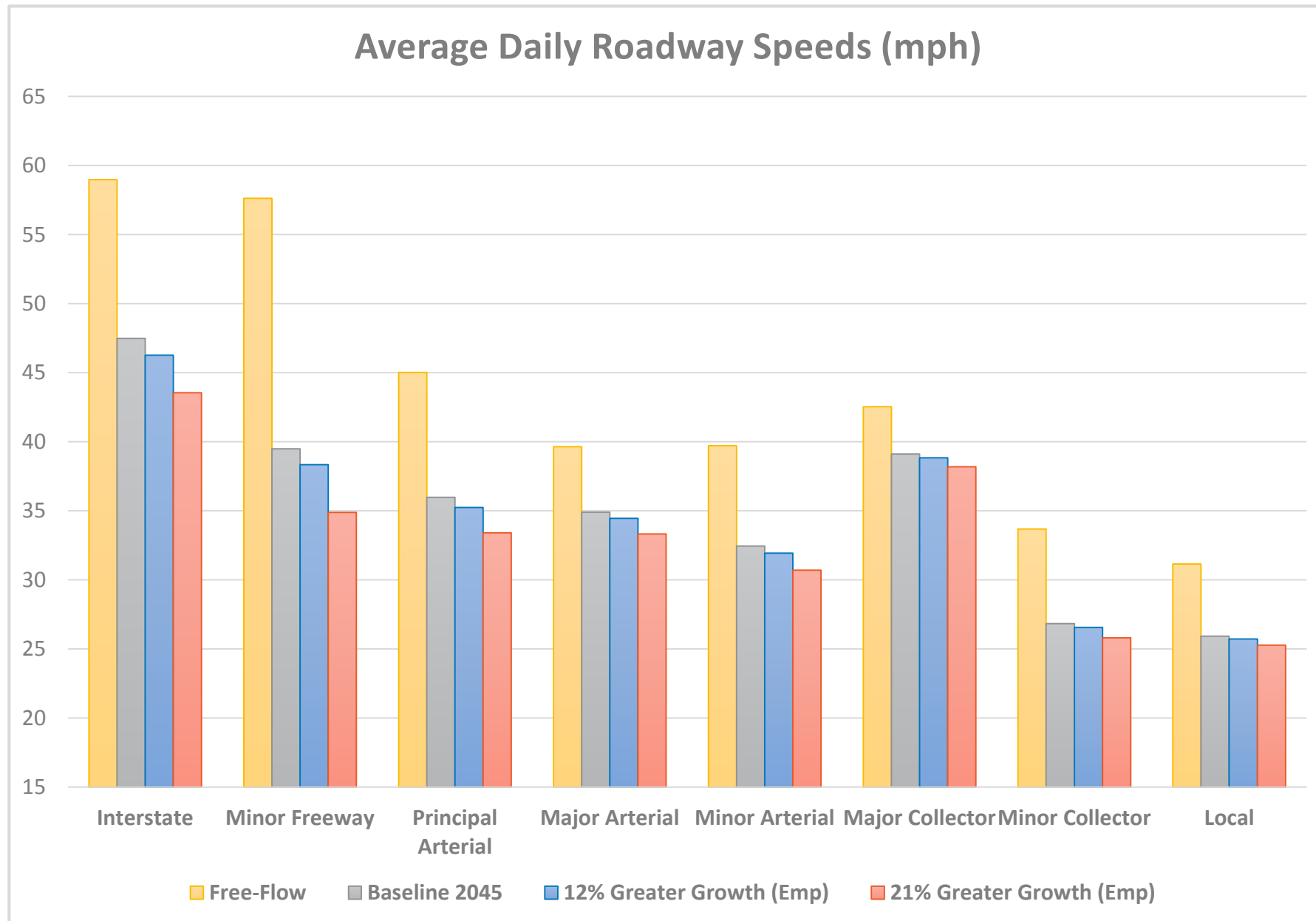
*Speeds are raw model output and are intended for comparison between growth scenarios only.

Daily Change in Regional Vehicle-Hours Traveled by Congestion Level

2045 Baseline Levels

Free	237,000
Moderate	814,700
Severe	305,100





Note: Speeds are raw model output and are intended for comparison between growth scenarios only.

Harbor Crossings

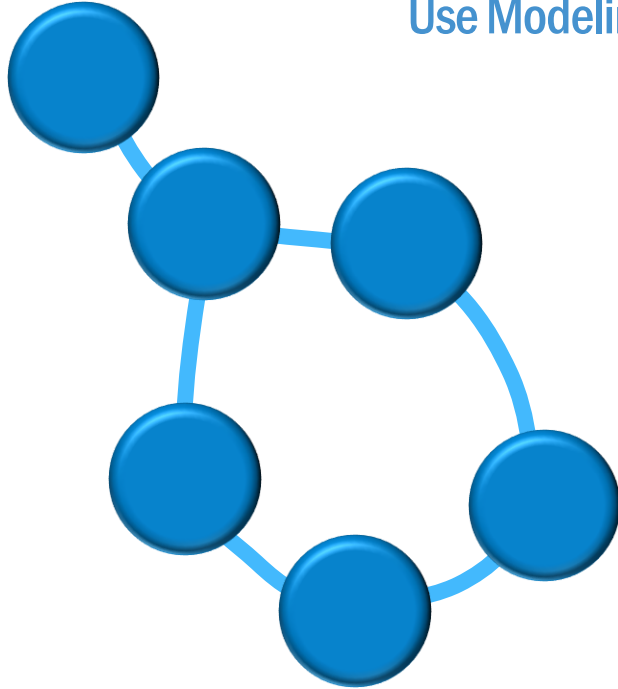
Daily Levels-of-Service

Crossing	Direction	Free-Flow Speed	Baseline 2045 Land Use		12% Greater Growth		21% Greater Growth	
			Congested Speed	V/C	Congested Speed	V/C	Congested Speed	V/C
Hampton Roads Bridge-Tunnel	GP - WB	60	17.3	1.09	16.3	1.10	14.5	1.13
	GP - EB	60	17.1	1.09	15.9	1.10	14.1	1.13
	Managed - WB	60	35.8	0.57	32.0	0.59	27.6	0.65
	Managed - EB	60	33.0	0.60	31.3	0.63	28.3	0.70
Monitor Merrimac Memorial Bridge-Tunnel	WB	60	33.7	0.80	31.4	0.82	28.3	0.87
	EB	60	32.0	0.82	30.0	0.83	27.3	0.88
James River Bridge	EB	52	33.1	0.75	26.2	0.78	23.1	0.84
	WB	52	32.5	0.72	25.5	0.75	22.6	0.81
TOTAL				0.84		0.87		0.91

Note: Speeds are raw model output and are intended for comparison between growth scenarios only.

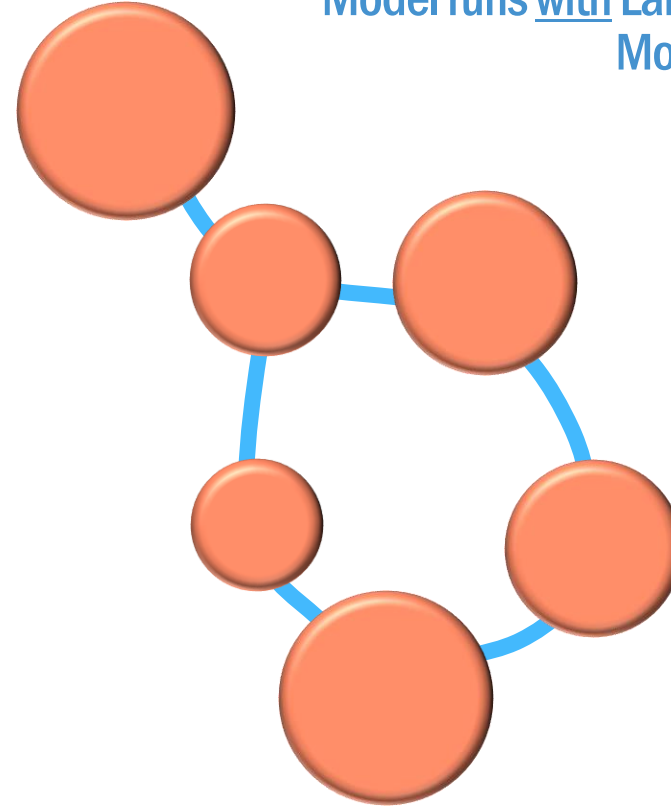
Limitations of Sensitivity testing

Sensitivity testing without Land Use Modeling



Growth in all TAZs is equal – doesn't test alternative futures (equal growth is not likely)

Model runs with Land Use Modeling



Growth is unequal across region based on Scenario Narratives (provides Stress test of potential Transportation Alternatives)

Land Use Model Sensitivity to Growth Amounts

- The Land Use Model results will be an input into the Travel Demand Model
 - The Land Use Model also generates its own measures to compare Scenarios to each other
- Greater or lesser growth amounts don't have the same impact on Land Use modeling as they do on Travel Demand Modeling
 - Since the Land Use metrics are comparisons across Scenarios, the size of the control totals won't adversely affect the performance of the Model (generally).
 - Comparisons will look at 100,000 ± new jobs rather than 1,000,000 ± existing plus new jobs in the TDM
- Less growth to allocate will distribute primarily to the “most attractive” areas across region, producing more pronounced differences between scenarios.
 - More growth to allocate will distribute across the region into less attractive areas as well – more typical perhaps, but less distinction between scenarios

Pros & Cons

BASE
 +8% or 81k above 2015 EMP by 2045
 0.25% CAGR

	+16% above 2015 EMP by 2045 0.49% Compound Annual Growth Rate +81k above the 2045 Base	+21% above 2015 EMP by 2045 0.63% Compound Annual Growth Rate +132k above the 2045 Base
Pros	Economic: Optimistic but believable growth for the region to achieve by 2045 to match expected E+C network commitments by 2045. Land Use: May produce more pronounced differences between scenario growth allocations (less growth to allocate will focus on most attractive areas) Transportation: The scenarios are more plausible in a 2045 timeframe with E+C as the base	Economic: If the region grew at 0.49% annually as implied by the 16% increment it would reach this level of growth anyway by midway through 2053 (8.5 years later) Land Use: Can produce more typical differences in the pattern of regional growth (more growth to allocate to less attractive areas) Transportation: Greater “stress test”
Cons	Economic: N/A Land Use: May not be as balanced regionally (will focus on most attractive areas) Transportation: While the E+C scenarios will likely have substantial congestion, it is unknown if this is the right level to show relief with new crossings.	Economic: Would require the region keep pace with Virginia to grow this much by 2045 (not likely) Land Use: N/A Transportation: May move the needle too much/swamp the network – could diminish the insights in comparing RCS alternatives.

Summary & Discussion

- There is substantial congestion region-wide under the 2045 Baseline
- Sensitivity testing in the travel model shows that:
 - 12% growth above 2015 has an effect relative to the baseline, but it is mild
 - 21% growth above 2015 shows a more significant increase in severe congestion
- 21% growth would imply that the region keeps pace with Virginia (and Northern Virginia) over the next 30 years
- However, historically Hampton Roads has had more moderate growth
- **Therefore, propose a middle ground of 16% growth above 2015**
 - Appears to be enough to move the needle without swamping the network
 - Believable story line
 - **Doubles** the 2045 baseline employment growth forecast (+ another 81k jobs)
- ALSO, there is potential for further adjustment if this level of growth does not move the needle as expected on the Greater Growth scenario runs

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EXPLORATORY SCENARIO PLANNING UPDATED DRAFT SCENARIO NARRATIVES

Scenarios Organized around Spatial Themes

DRAFT

Greater Growth on the Water

What happens if jobs focus on the waterfront, housing choices are varied, and transportation technology adoption is moderate?

Greater Growth in Urban Centers

What happens if jobs and housing focus in urban areas, with greater multimodal availability and high adoption of connected vehicle technology?

Greater Suburban/Greenfield Growth

What happens if jobs and housing are developed in dispersed activity centers, with a higher level of truck transportation and high adoption of autonomous vehicle technology?

Updated Scenario Narratives

DRAFT

Greater Growth on the Water

Growth in water-oriented activity. Port of Virginia becomes even more competitive with freight more multimodal. More dispersed housing locations. Moderate assumptions for CAV adoption and network adaptation.

Greater Growth in Urban Centers

Significant economic diversification. Low space requirements per job. Large role for “digital port.” New professionals prefer to live/work in urban settings. High level of CV adoption and low auto ownership/high TNC mode.

Greater Suburban/Greenfield Growth

Growth is suburban/ exurban, but growth includes walkable mixed use centers. Port of Virginia becomes even more competitive. “Digital port” brings additional jobs. Housing is more suburban. High level of AV adoption and network adaptation.

WHAT THESE WILL HELP US TEST

Test greater cross-harbor travel in particular.

Test more urban and multimodal travel patterns.

Test more overall regional travel.

NOTE: Sea Level Rise assumed as 3 ft. in all Scenarios

Summary of Working Group Input / Next Steps

- General buy-in to the scenario narratives
 - Specifying activity center component of Greater Suburban/Greenfield growth
- Setting aside some drivers that can't be truly modeled
 - Retiree Population, Military Population, Environmental Regulation

Next Steps

- Further defining the drivers that remain
- Retaining flexibility to develop technology drivers as we know more about the travel model
- Connecting Drivers to modeling inputs

Snapshot of next phase of Driver Development

Example Drivers in Greater Growth in Urban Centers Scenario

Driver	Trend Assumption	Explanation of Driver Assumption for this Scenario	Modeling Method
Dispersed Employment The geographic dispersal of jobs throughout the region	↓	Office, retail, and service jobs are concentrated in urban areas of the region as part of the growing urbanization assumption of this scenario	Higher density and mixed use place types will be assigned greater attractiveness in the Land Use Model; Capacity in urban locations will be increased
Dispersed Housing The geographic dispersal of all housing types throughout the region	↓	Housing is assumed to locate closer to jobs, particularly in urban areas of the region	Higher density and mixed use place types will be assigned greater attractiveness in the Land Use Model; Capacity in urban locations will be increased; Capacity outside urban and suburban centers will be decreased; single use/lower density place types will be assigned less attractiveness.
Preference for Compact Development Residents' preference for higher density, mixed use development patterns	↑	The urbanization and the lack of dispersed housing assumptions in this scenario, lead to preferences for compact development, favoring multi-family, mixed-use, and transit-oriented development over suburban, single-family development	Higher density and mixed use place types will be assigned greater attractiveness in the Land Use Model. Proximity to transit stops and city centers will be assigned as more attractive for growth.

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EXPLORATORY SCENARIO PLANNING – FROM DRIVERS TO MODEL LEVERS

Exploratory Scenario Planning Framework

Drivers

Economic | Lifestyle/Demographic | Technology | Environment
Discussed in early webinars (Feb/March)

Scenarios

Drivers organized into three **Greater Growth Scenarios**, starting with the **Economic Narratives**

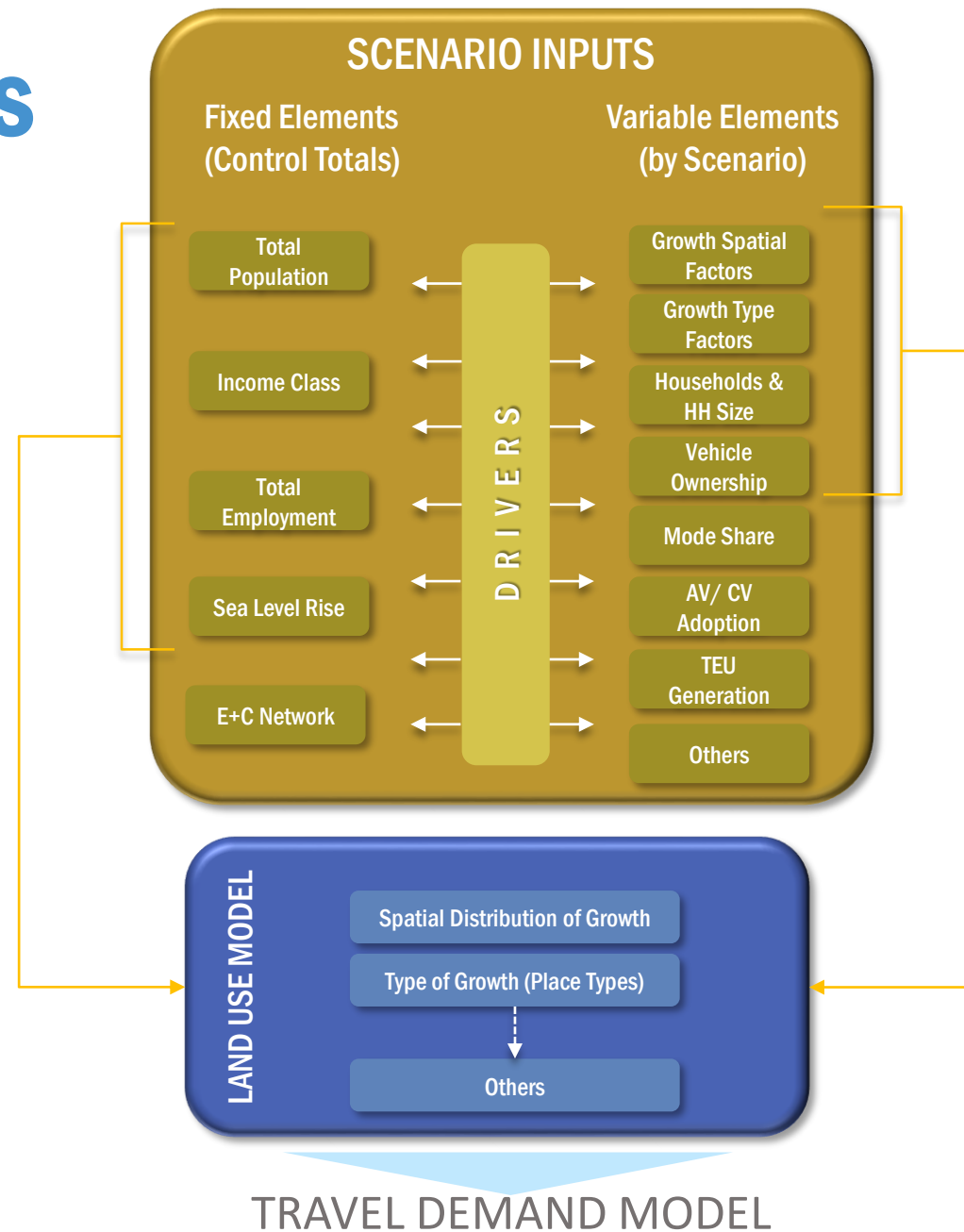
Inputs

Control totals, and **assumptions** about the drivers, translated through **Levers** in the land use and travel demand models.

Outcomes

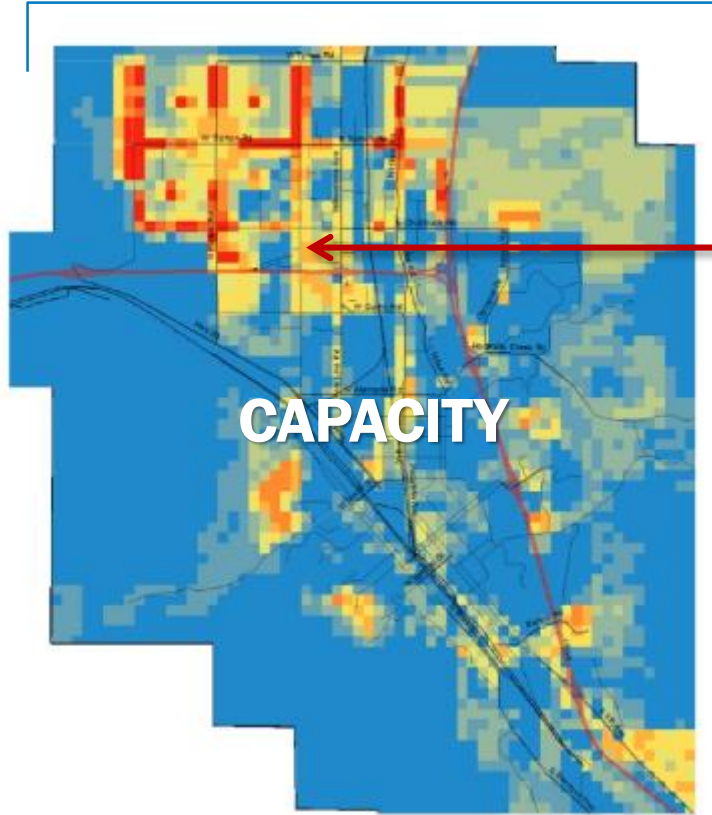
Performance Measures, based on the study Goals and Objectives and produced by the land use, travel demand, and economic models

Land Use Model Drivers & Inputs



Land Use Model Growth Allocation

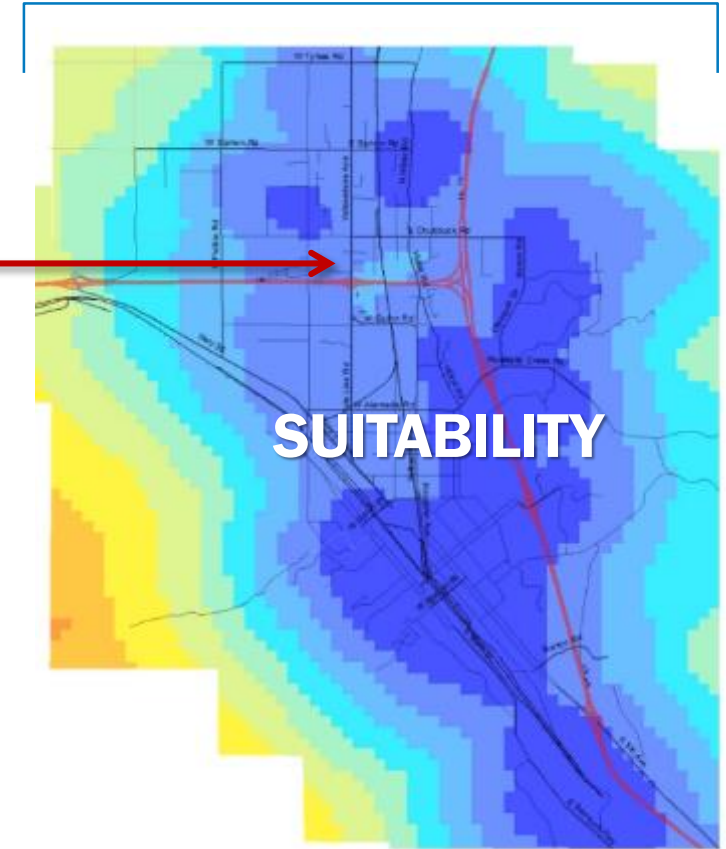
Place Types are allocated across a region and each Place Type has a certain Capacity



Each polygon is a Place Type with a certain capacity for growth

Place Type assignments based on the 2045 Regional Future Land Use

Each Place Types gets allocated a certain amount of growth according to its Suitability



The Suitability Mapping will dictate how much of the growth goes to each polygon

Suitability is based on each Scenario Narrative

GROWTH
ALLOCATOR

The Land Use Model has an automatic Growth Allocator that combines Capacity and Suitability to allocate growth in the Region

How Drivers Influence Growth Allocations

ECONOMICS	
Assumption	
Federal/Military	➡
Tourism/Arts & Culture	⬆
Marine/Transportation Technology	⬆
Water Technologies	➡
Distribution	➡
Shared Services	➡
Software Development and IT	➡
Data Port-Oriented Development	➡
Advanced Manufacturing	➡
Port Containerized Volume (TEUs)	⬆
Port Rail & Barge Mode Share	⬆
Port Truck Mode Share	⬇

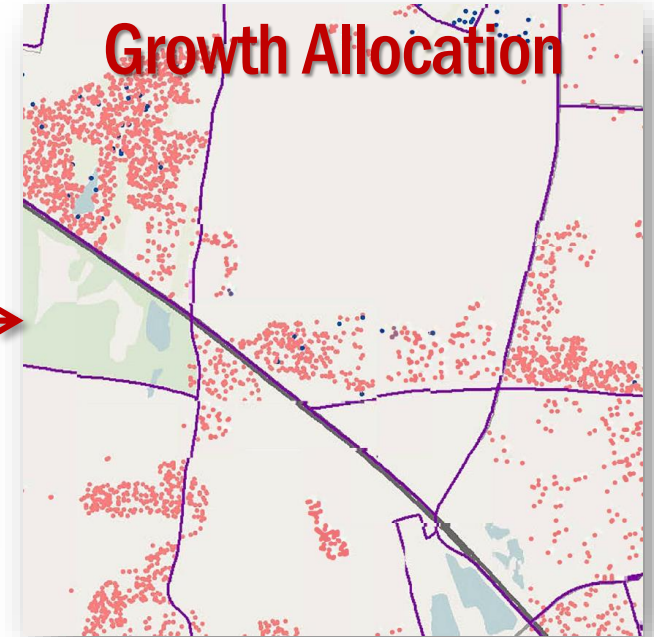
Scenario Drivers



Drivers influence Suitability Factors



Suitability Map for a given Scenario



Growth Allocator is driven by Suitability (provided there is capacity)

Setting Suitability in the Model

Any of the Place Types can be weighted to make them attractive to growth

Graphical Tabular

Scenario: Active (Base Scenario)

Use Vacant ☒ Yes ☐ No

Vacant Weight 0 5 10 5.0

Use Vacant2 ☒ Yes ☐ No

Vacant Weight2 0 5 10 5.0

Use Target areas ☒ Yes ☐ No

Target areas Weight 0 5 10 5.0

Use Wetlands ☒ Yes ☐ No

Wetlands Weight 0 5 10 5.0

Suitability Factors can be turned off/on and “weighted”



Code and Name	Examples	Size*	Min Area	Min	People / Acre	Min / Acre	Description	Metrics	Info	Yes
RD	Rural Cluster	25 ac.	1-5	-	3-13	0-1	Rural cluster housing development surrounded by undeveloped rural lands			
CH	Concentrated Neighborhood	15 ac.	3-5	1-3	8-13	0-3	Mixed housing neighborhood with small lot singles and attached housing around community amenities			
UR	Urban Residential	9 ac.	15-30	3-10	40-80	5-20	High density multifamily developments along major arterials designed to host walkable streetscapes			
CC	Community Center	9 ac.	-	3-20	-	14-50	Mixed retail, office and mixed use along major arterials designed to host walkable streetscapes			
SC	Suburban Town Center	45 ac.	15-30	3-20	40-80	14-50	High density walkable mixed use center in a suburban context			
UC	Urban Town Center	40 ac.	20+	4+	30+	50+	Very high density walkable mixed use center in an urban context			
TC	Town Center	25 ac.	40+	10+	100+	100+	High density mixed use urban center with walkable access to downtown transit station			
RI	Regional Industrial Center	100 ac.	-	1-4	-	5+	Large site industrial center with regional market			
PI	Port Industrial	100 ac.	-	1-3	-	5+	Port related industrial development			



Spatial Suitability can be:

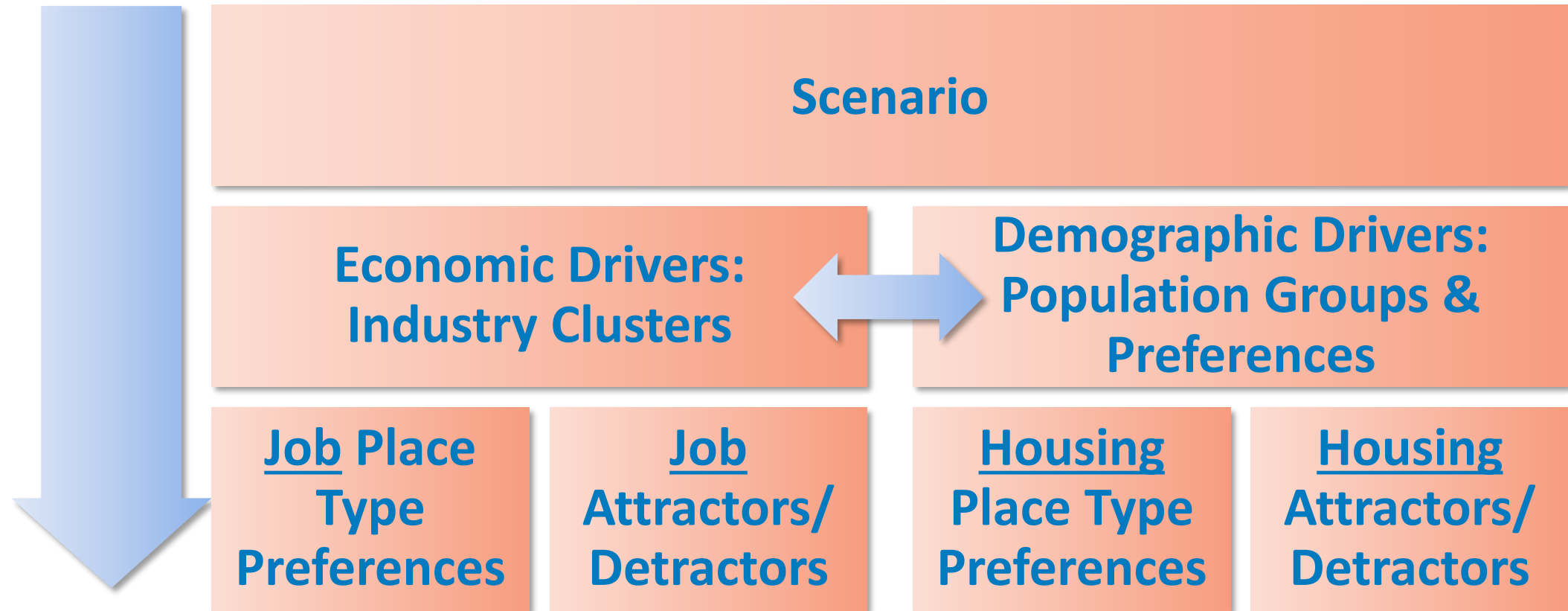
Attractor Examples:

- Proximity to Transit
- Proximity to Port
- Vacant or Redevelopable Land

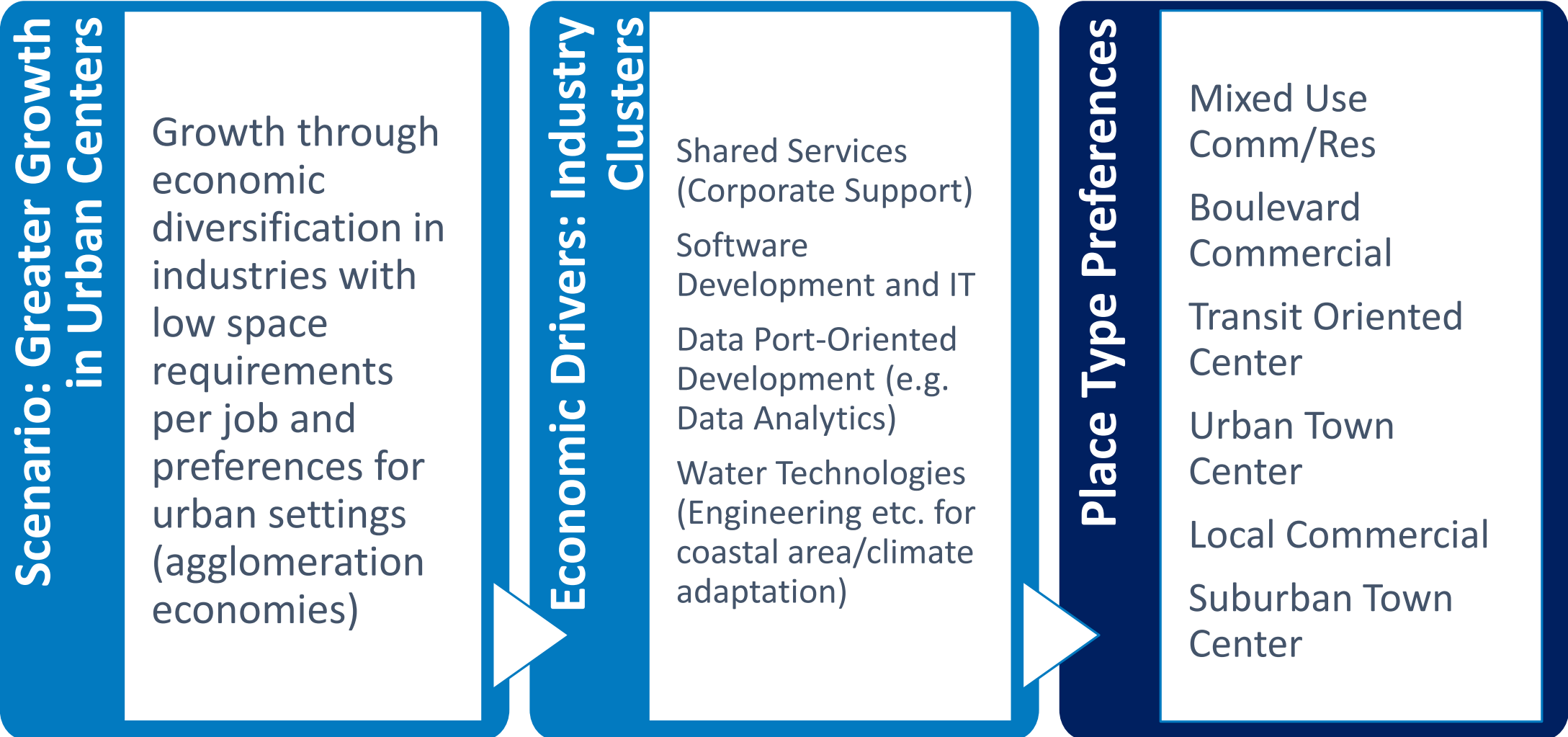
Repulser Examples:

- Storm Surge Areas
- Lack of Public Utilities

Connecting Scenario Drivers to the Location and Type of Growth in the Land Use Model



Example



Example

Scenario: Greater Growth in Urban Centers

Growth through economic diversification in industries with low space requirements per job and preferences for urban settings (agglomeration economies)

Economic Drivers: Industry Clusters

Shared Services
(Corporate Support)
Software
Development and IT
Data Port-Oriented
Development (e.g.
Data Analytics)
Water Technologies
(Engineering etc. for
coastal area/climate
adaptation)

Spatial Attractors

Transit stops
City and Town
Centers
Employment
Centers
Universities

Connecting Scenario Drivers to the Regional Travel Model

Drivers	Regional Model Component
• Sea-Level Rise	Network Processing
• Population/Worker Growth • Port Containerized Volume Growth • AV/CV Adoption	Trip Generation
• AV/CV Adoption	Trip Distribution
• Active Transportation • Transit Propensity • Rail, Barge, and Truck Mode Share • TNC Usage • AV/CV Adoption	Mode Choice
• AV/CV Adoption • Sea-Level Rise	Highway/Transit Assignment

Next Steps

- June 13th WG meeting decision points
 - Scenario Narratives
 - Amount of Greater Growth
 - Draft Goals, Objectives and Performance Measures
- Next steps – develop dashboard, begin running models and focusing on results



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