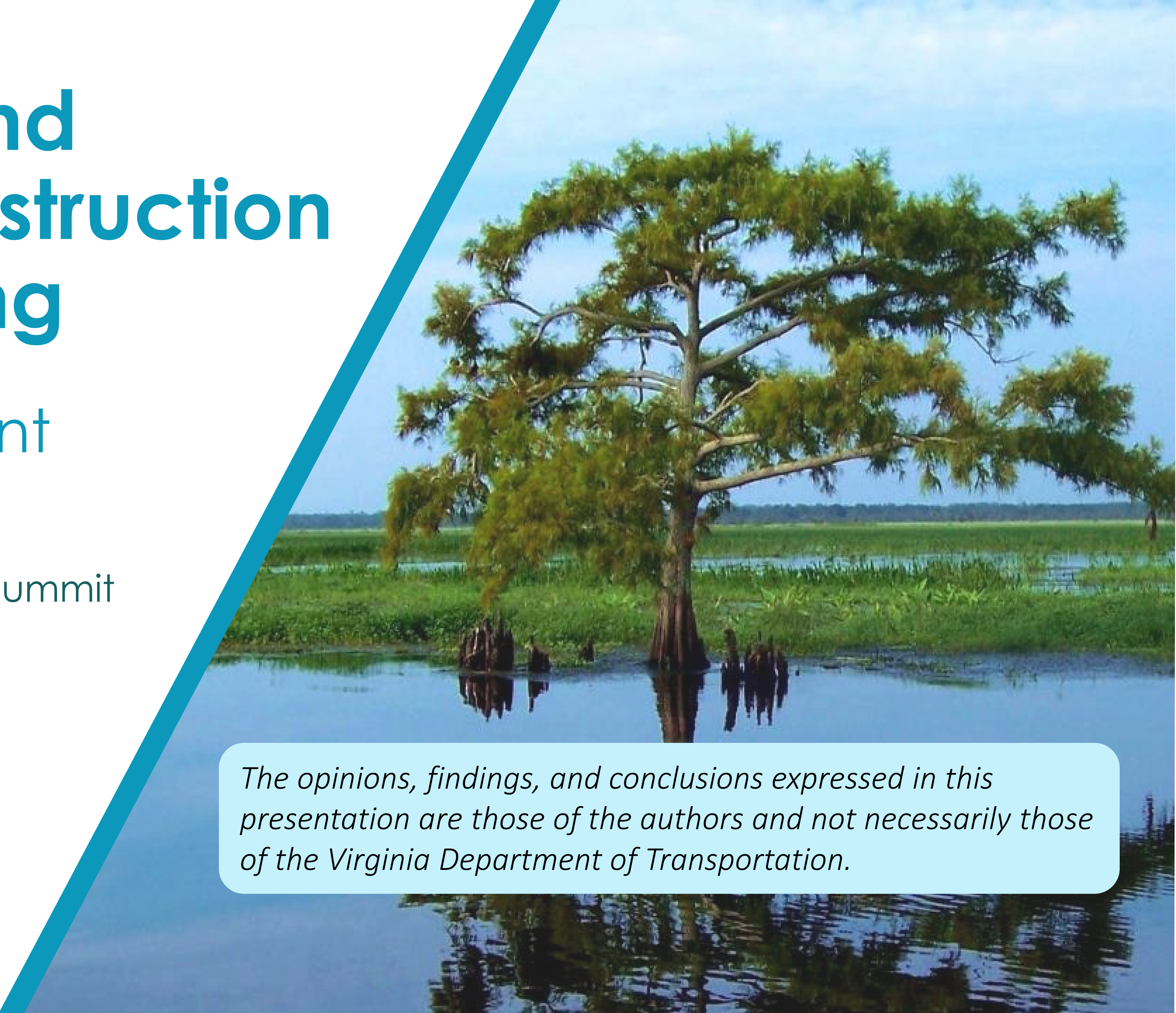
Economics and Highway Construction Cost Estimating

Virginia Department of Transportation

VTCA/VDOT Cost Estimation Summit

March 2025



The opinions, findings, and conclusions expressed in this presentation are those of the authors and not necessarily those of the Virginia Department of Transportation.

the balmoral group

Outline - Normally

- Current Economic Climate & VDOT
- Supply Chains & Resource Constraints
- Construction-related Cost Indices
- Inflation Trends
- Things to Watch in Estimating

Economic Climate Today

Created by Ian Ransley
from the Noun Project

What Economists look at

Economic Climate Today

- National backdrop
- Contractor perceptions
- Geopolitical influences

Big Picture:
What Matters?

Created by Ian Ransley from the Noun Project

Economists' Perspective

Materials Market Conditions

	Raw Materials	Skilled Labor	Competition	Trucking	Global Shipping	Geopolitics
Aggregate	↑	↑	↑	=	=	=
Asphalt	↑	↑	↑	=	=	=
Concrete	↑	↑	↑	↑	=	=
Steel	↓	↑	=	↑	=	↑
Pipe	=	↑	=	↑	=	=
Earthwork	=	↑	=	↑	=	=

Legend

- Exerting negative influence on construction costs
- Exerting positive influence on construction costs
- Neutral or N/A

Material prices are not expected to continue surging by double-digits in FY 2025, but recent uncertainty could impact outlooks next quarter and change several of the signs under the Geopolitics category.

Non-Material Market Conditions

	Raw Materials	Skilled Labor	Competition	Trucking	Global Shipping	Geopolitics
Heavy Equipment	↑	↑	=	↑	=	=
Labor	=	↑	↑	↑	=	=
Industry Capacity	↑	↑	↑	↑	=	=

Legend

- Exerting negative influence on construction costs
- Exerting positive influence on construction costs
- Neutral or N/A

High demand and constrained labor supply continue to drive up VDOT's construction costs. Global and geopolitical upheaval is still on the horizon and could still impact VDOT in FY 2025.

End Goal: Understand Bids

Historically, models have found that for every 10% increase in:	Price of Crude	VA Non-Farm Employment	Price of Crushed Stone	Binder Price
VDOT saw an asphalt bid increase of:	2.7%	8.1%	3.0%	3.7%
	Down 2% Y-o-Y	Up 2% Y-o-Y	Up 7% Y-o-Y	Down 8% Y-o-Y

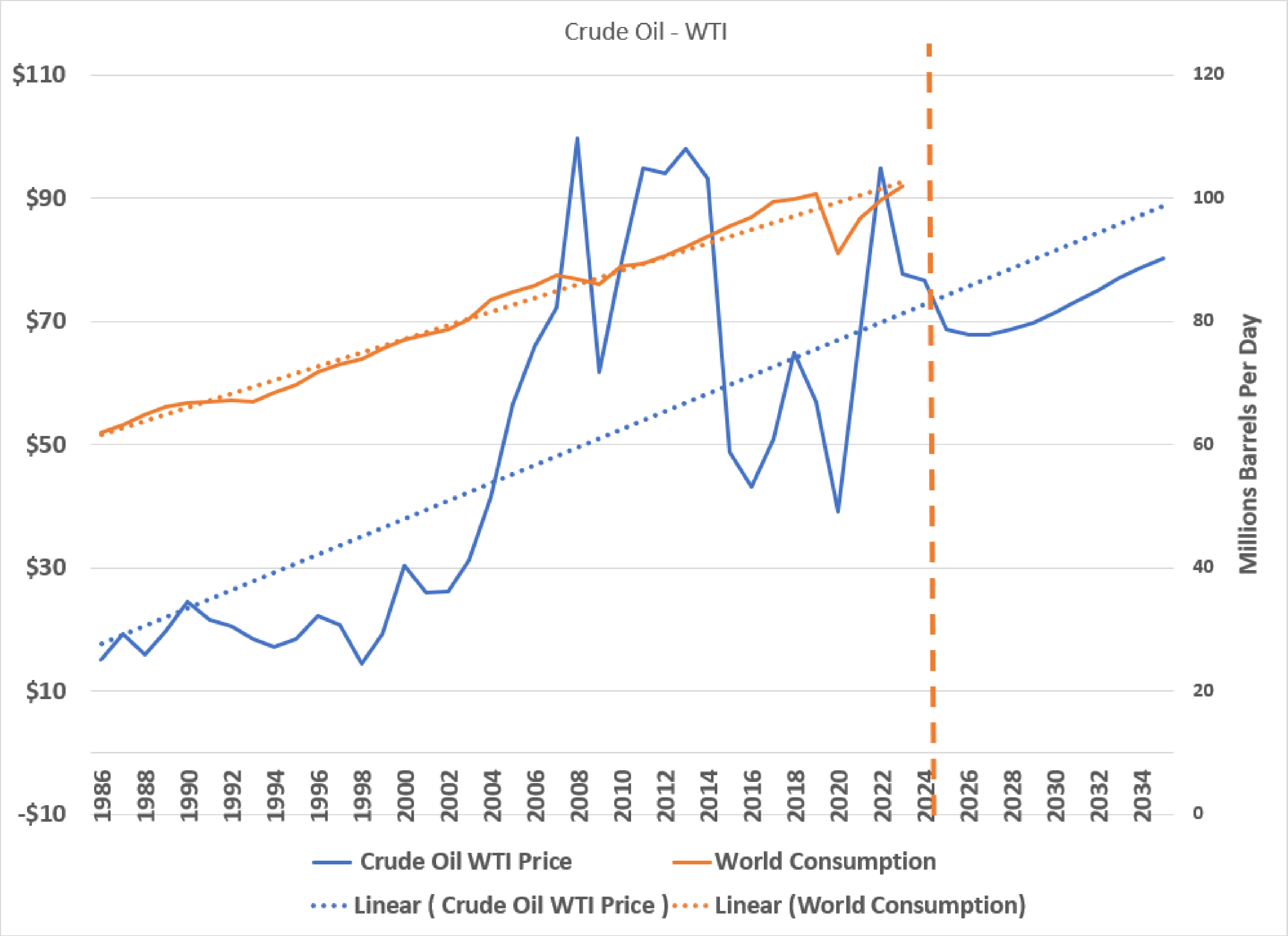
Similar models are prepared across other materials

Oil

Over the last 40 years, global consumption has increased about 1MM bpd annually, or about 1%.

Price increased about 3% annually.

Watch the trend line

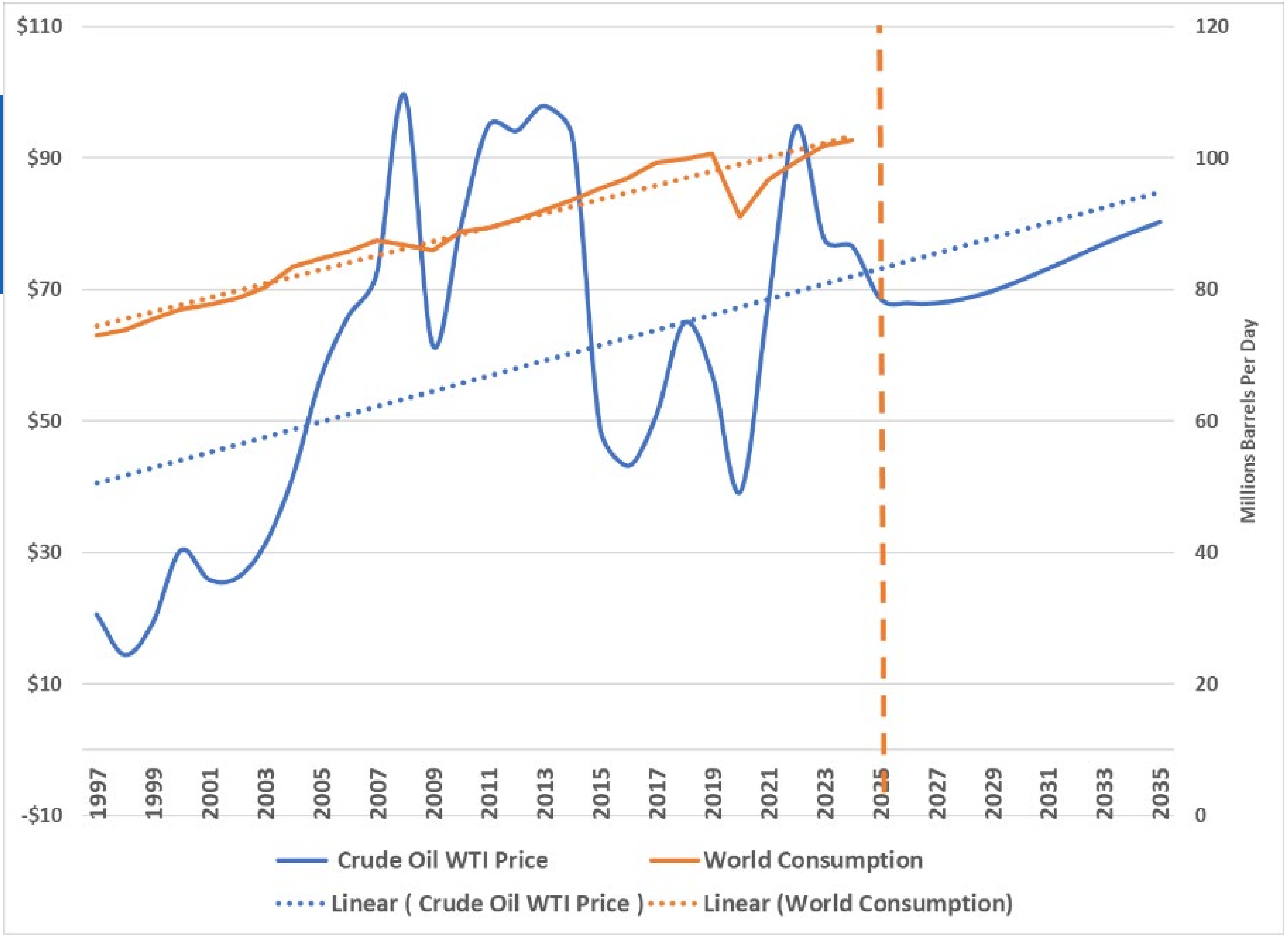


Source: TBG Work Product, EIA.

Oil

Over the last 30 years, global consumption has increased about 1% annually.

Price increased about 2% annually.

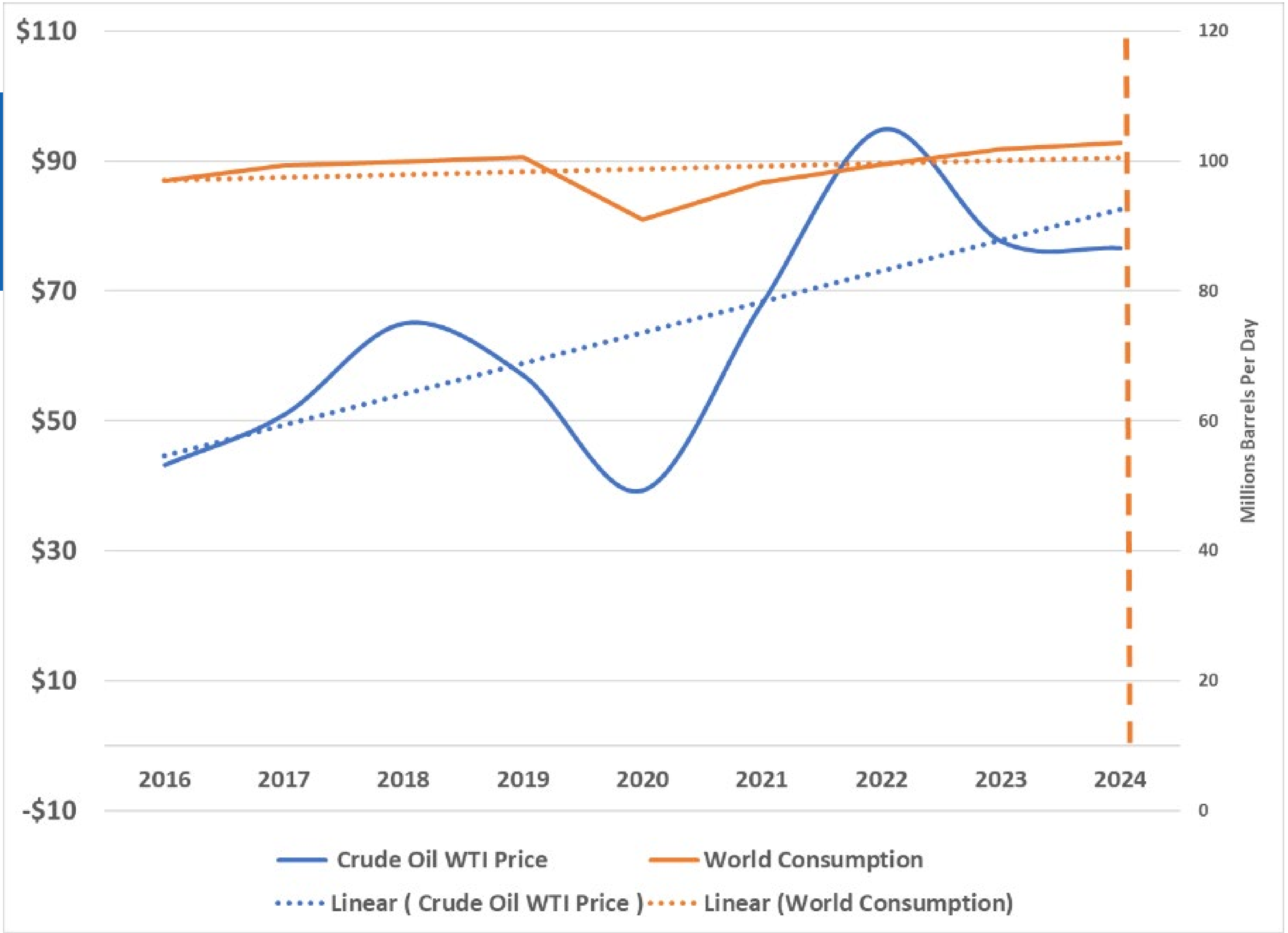


Source: TBG Work Product, EIA.

Oil

Since 2016, global consumption has been basically flat – 0.4% increase annually.

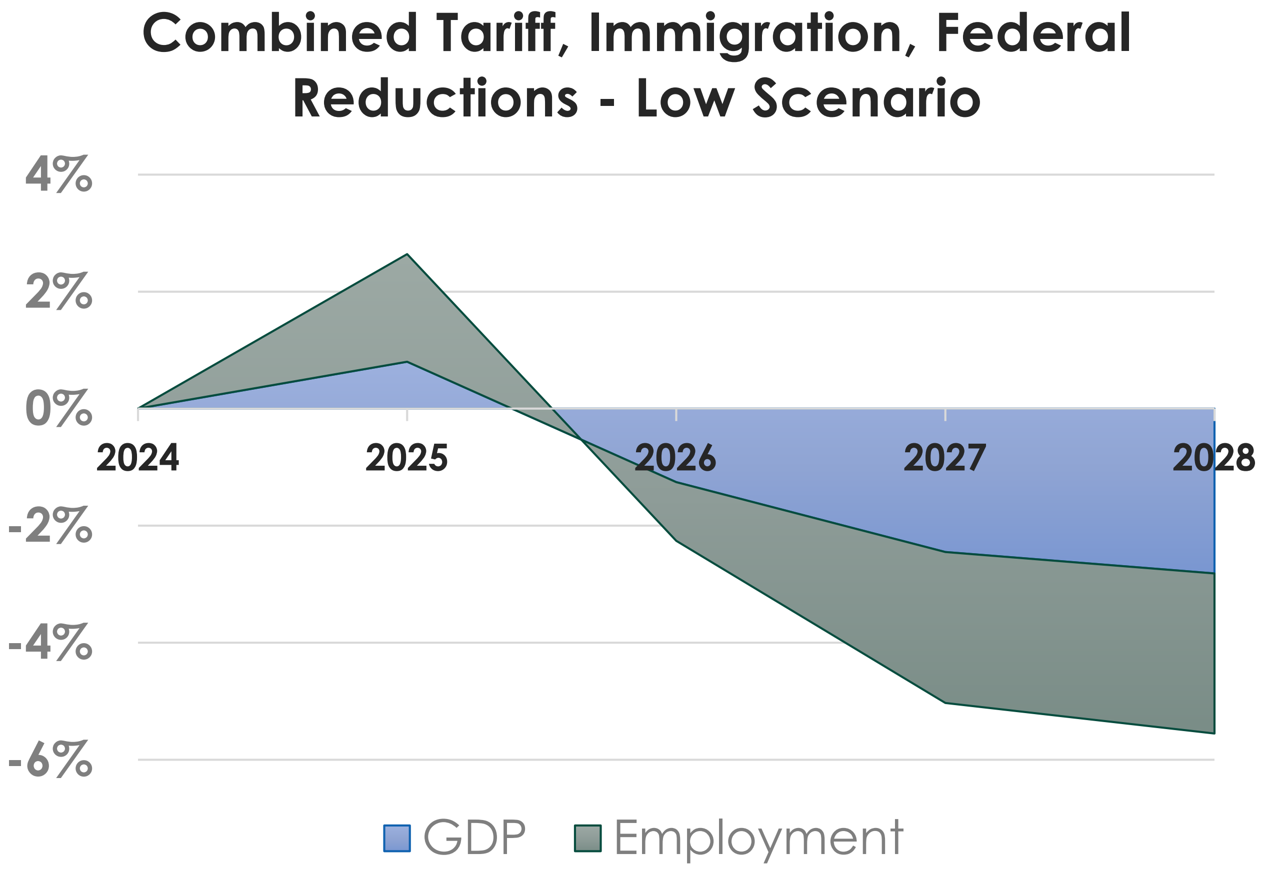
Price has increased 7.5% annually.



Source: TBG Work Product, EIA.

Macroeconomic Uncertainty

- Pre-Tariffs, Pre-DOGE CBO projected ~ 4% unemployment
- VA estimated about 180,000 workers – about 30,000 expected cuts
- NOVA potentially most impacted, some expectations jobs would shift to military areas (Norfolk)
- Smaller regions generally receive income largely generated in NOVA

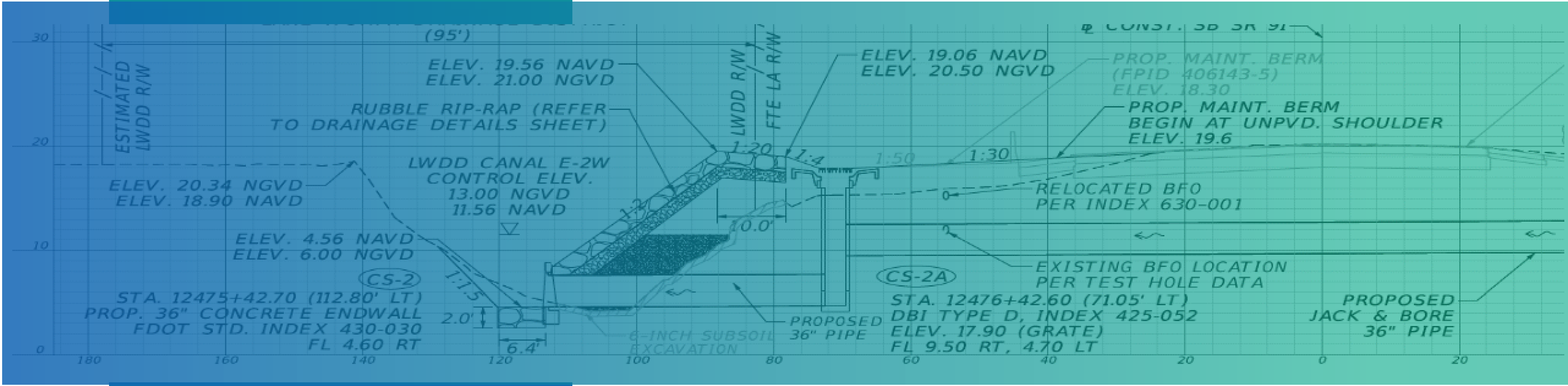


Source: Peterson Institute for International Economics.

What Economists look at

Economic Climate

- National backdrop
- **Contractor perceptions**
- Geopolitical influences

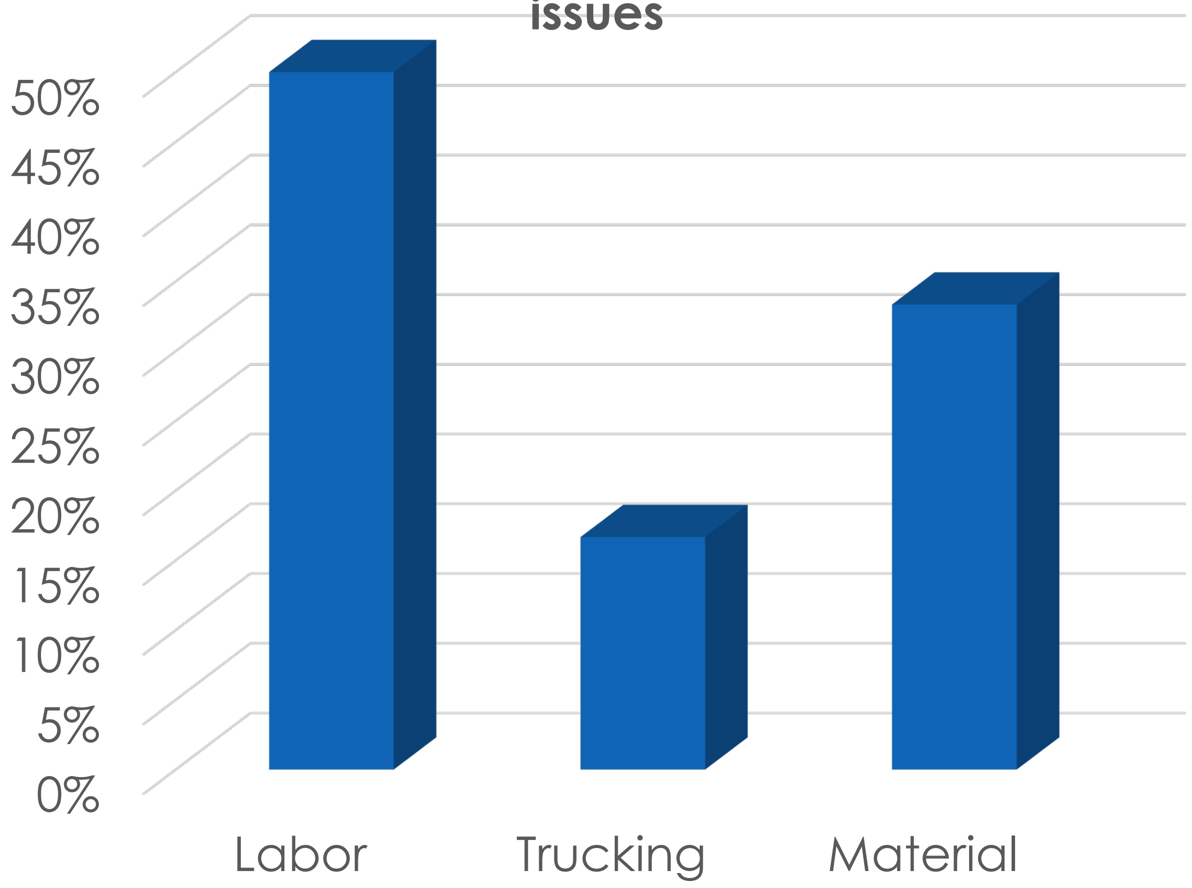


Top Concerns meeting market demand – pre-COVID

60% said **no issue** meeting market demand

40% expected issues

Top concerns for those who expected issues



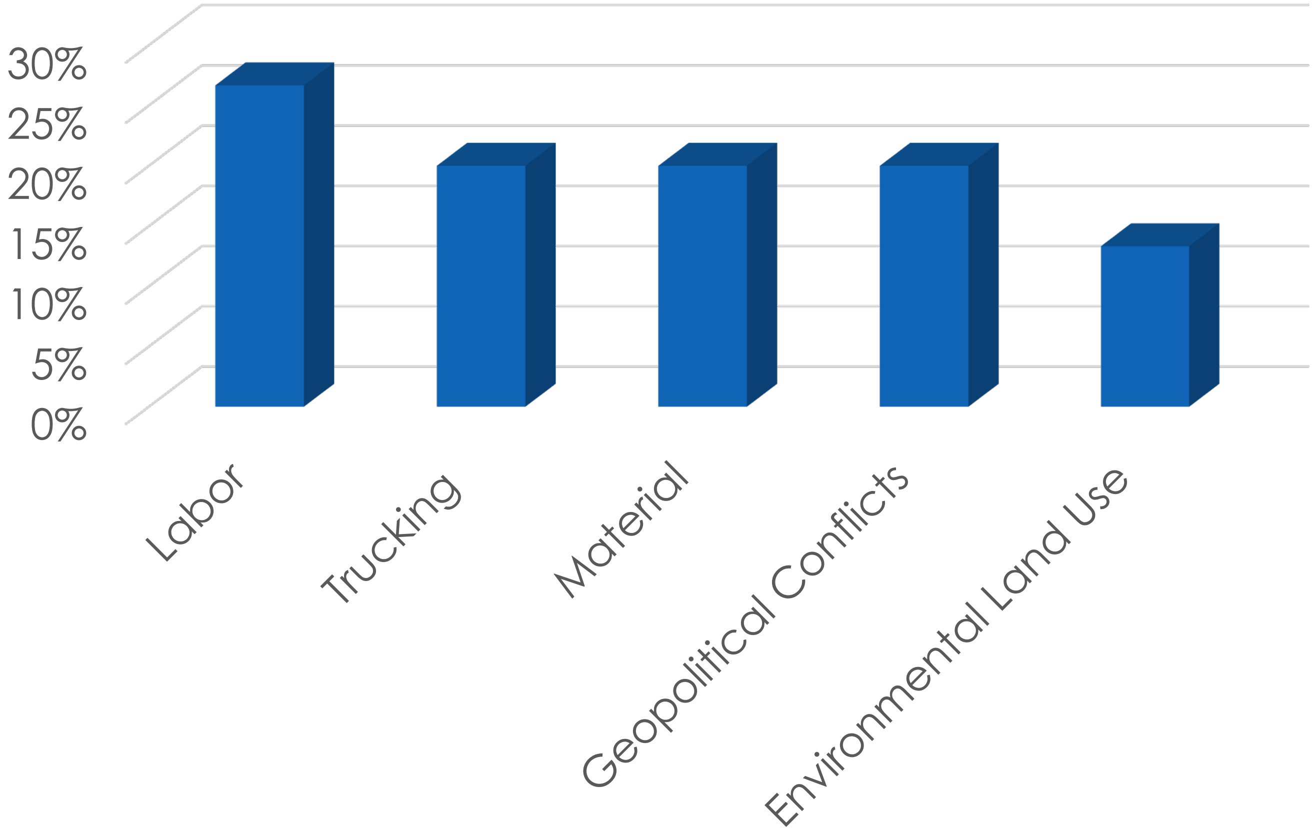
Source: TBG Work Product from Interviews with VDOT Contractors.

Top Concerns meeting market demand – 2025

50% said **no issue** meeting market demand

50% expected issues

Top concerns for those who expected issues



Source: TBG Work Product from Interviews with VDOT Contractors.

Top Concerns meeting market demand - 2025

100%

report labor issues

Particularly with skilled labor and an overall lack of interest from workers - deterrent effect of strict drug testing, immigration constraints

- "Too much work" causing bottlenecks; insufficient crews
- Due to labor shortages, some contractors report curtailing their bid efforts
- Some comments regarding project delays due to high interest rates and inflation - Some expect a "lull" in work

Geopolitical risks

56%

expect the global economy to weaken over the next year

94%

expect geoeconomic fragmentation
to accelerate this year, stoking volatility

Source: Chief Economists Outlook January 2025

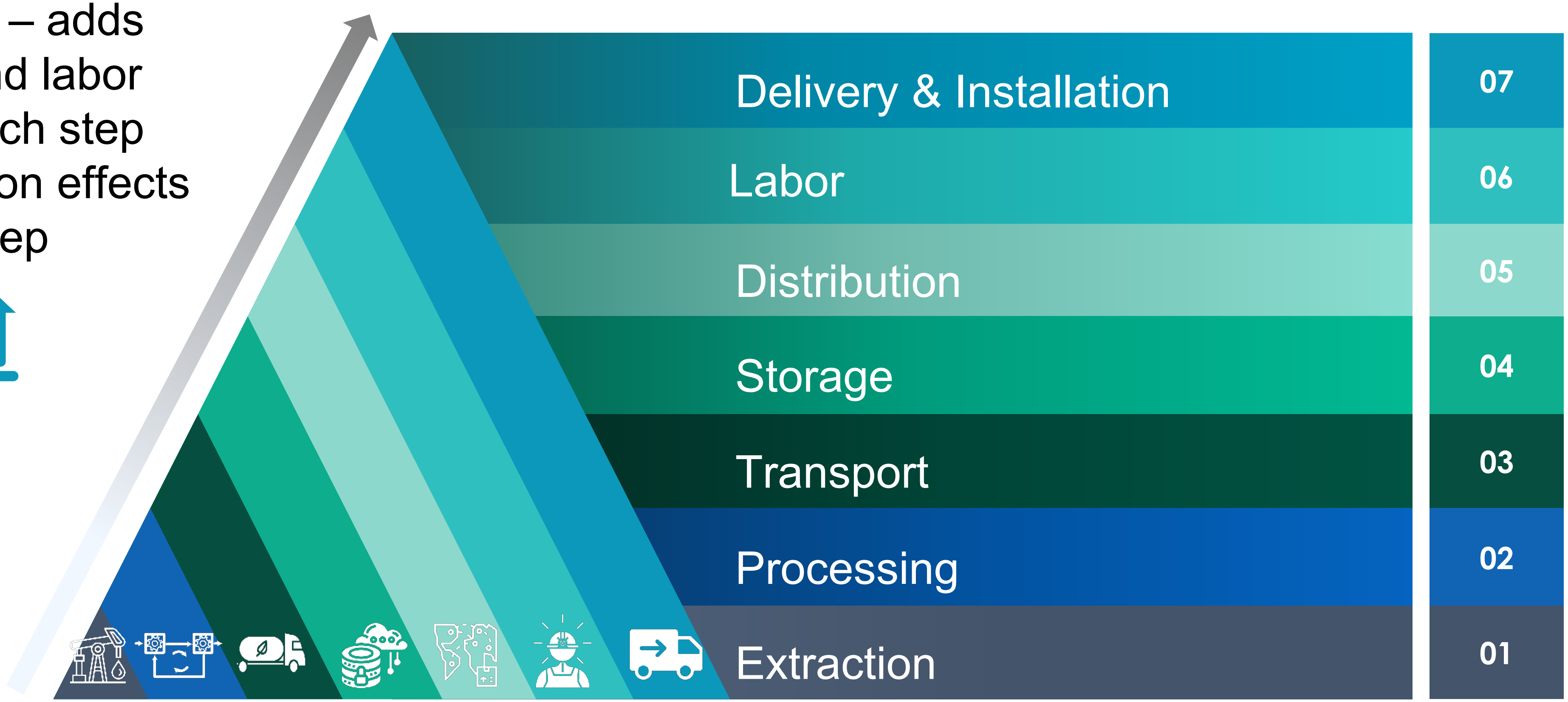
"Geopolitical rivalries and domestic policy choices are viewed as the key drivers …There is consensus that protectionism will cause durable changes to trade patterns over the next three years, with conflict and national security concerns as important drivers."

- Weakest outlook in decades, and global forecasts are being trimmed to reflect the impact of changes to US policy
- Stagnant Chinese economy

Market Impacts, Supply Chains & Resource Constraints

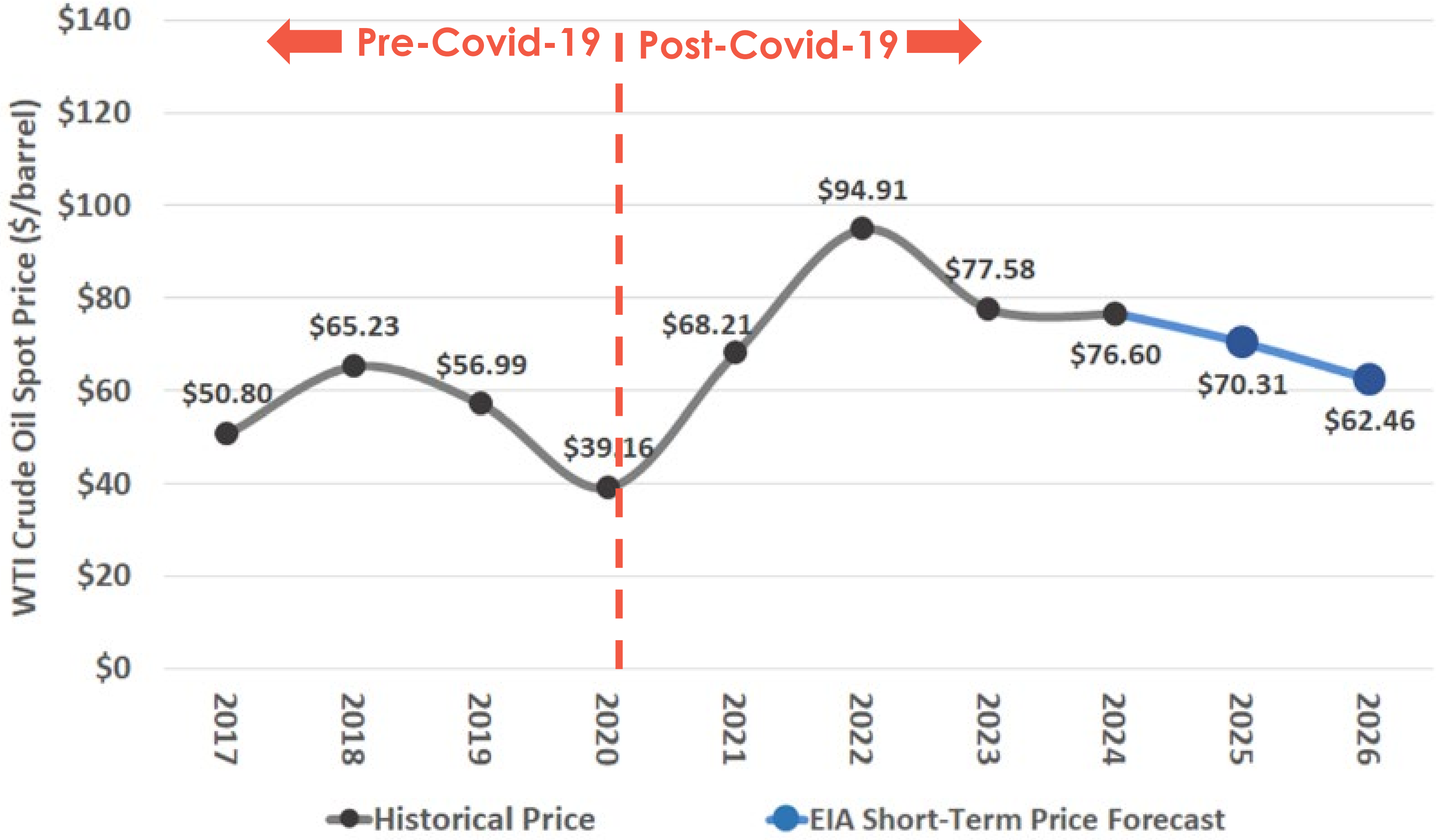
VDOT Supply Chain for highway construction

Transport – adds energy and labor cost at each step
Competition effects at each step



Macroeconomic Conditions: Oil Prices

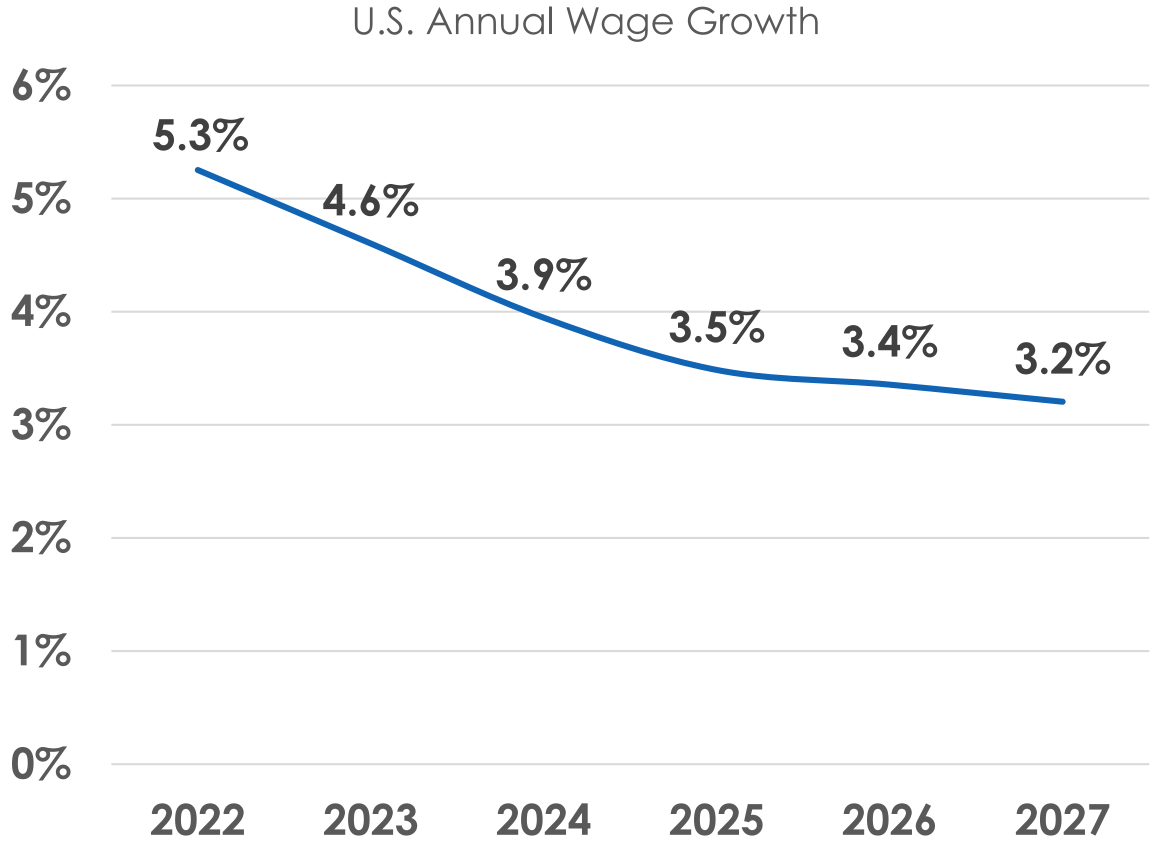
- JPMorgan recently reported that significant oil stocks cannot be tracked and forecasts of supply. demand and pricing may no longer be reliable.
- Oil producers have not been able to keep prices up
- Price forecast is near break-even point for U.S. shale



Source: U.S. Energy Information Administration Annual Energy Outlook and Short-term Forecast. February 2025

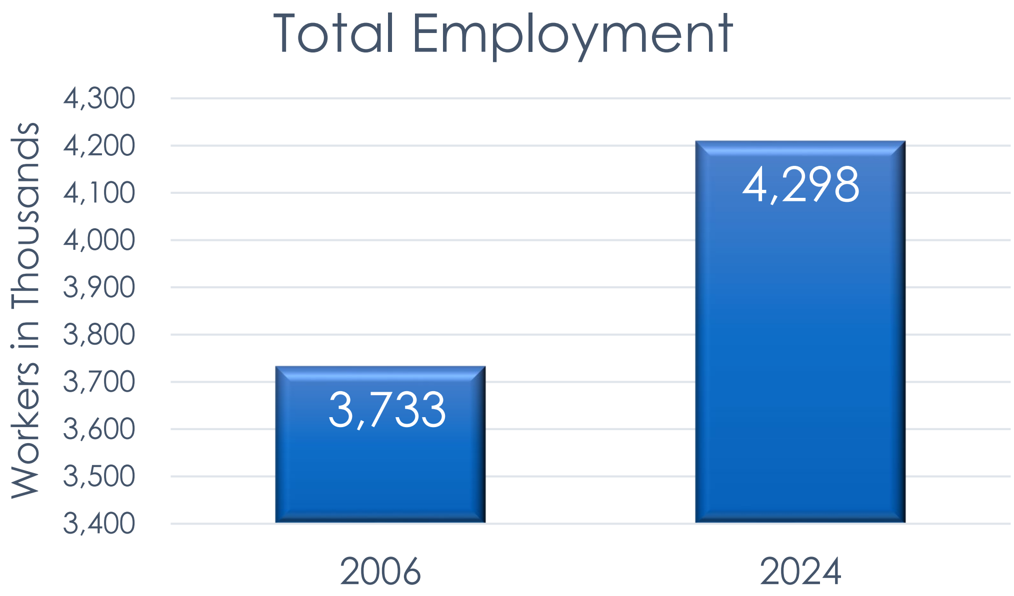
Wage Gains

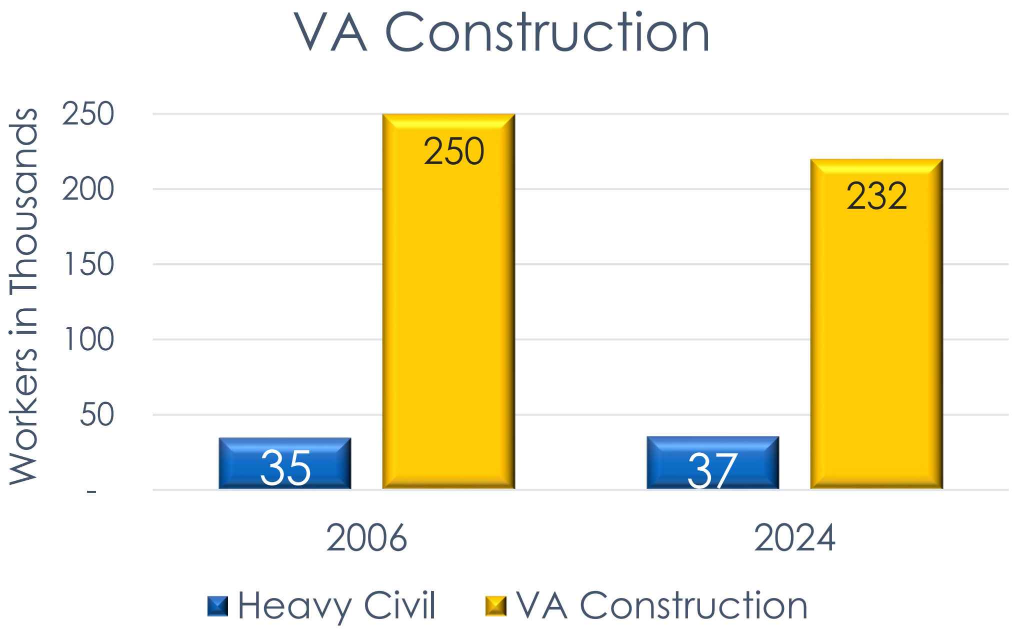
- Pre-COVID, average 3 year rate ~ 4%
- CBO projections show wage gains dropping below recent trends
  - Recent layoffs likely to curb wage growth



Source: Congressional Budget Office, Jan 2025

VA Labor Market – Good & Bad news

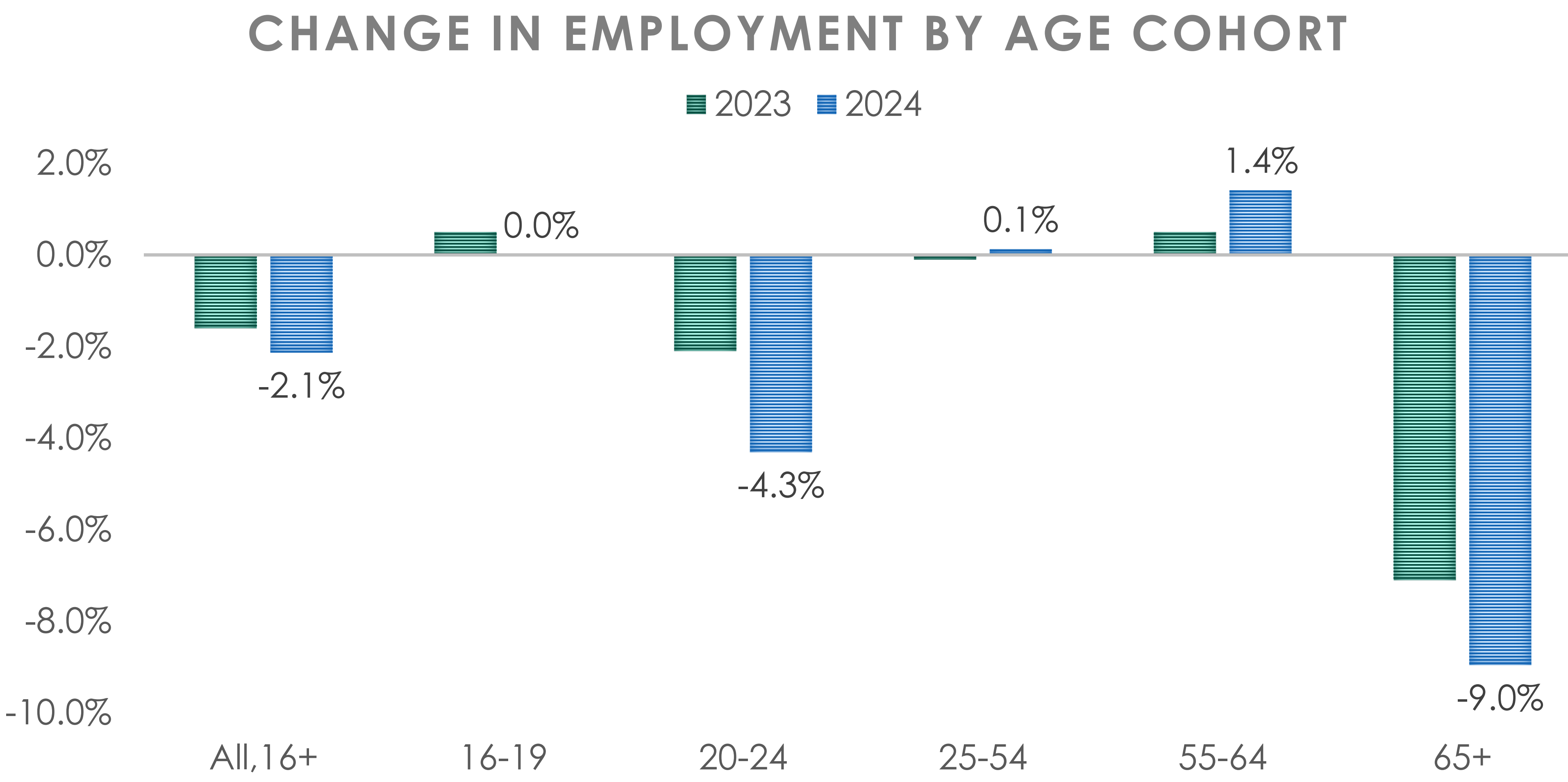




Source: BLS for both charts

- Overall *total* Virginia employment reached 2006 levels in 2013, and has grown by 15%
- Heavy & Civil recovered to 2006 levels last year and grew by 8% year over year, well exceeding projections

Labor Participation



VA ended 2024 slightly higher than pre-COVID: 66.1%

Nationally, ended 2024 62.5% vs. 63.1%: 1.01M workers

Source: Bureau of Labor Statistics

Virginia Workforce – Next Three Years

1.7 % increase in total workforce from 2024 levels

7.4 % increase in VA output

1.3 % increase in Construction employment

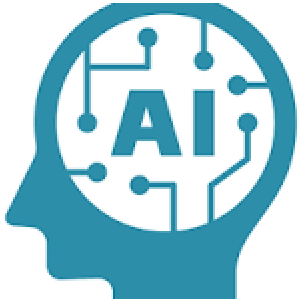
12.3 % increase in Commonwealth Transportation Fund

Construction and Mining employment is expected to grow by 2.9% in Fiscal Year 2025 (highest among all sectors), before declining by 0.2% in 2026

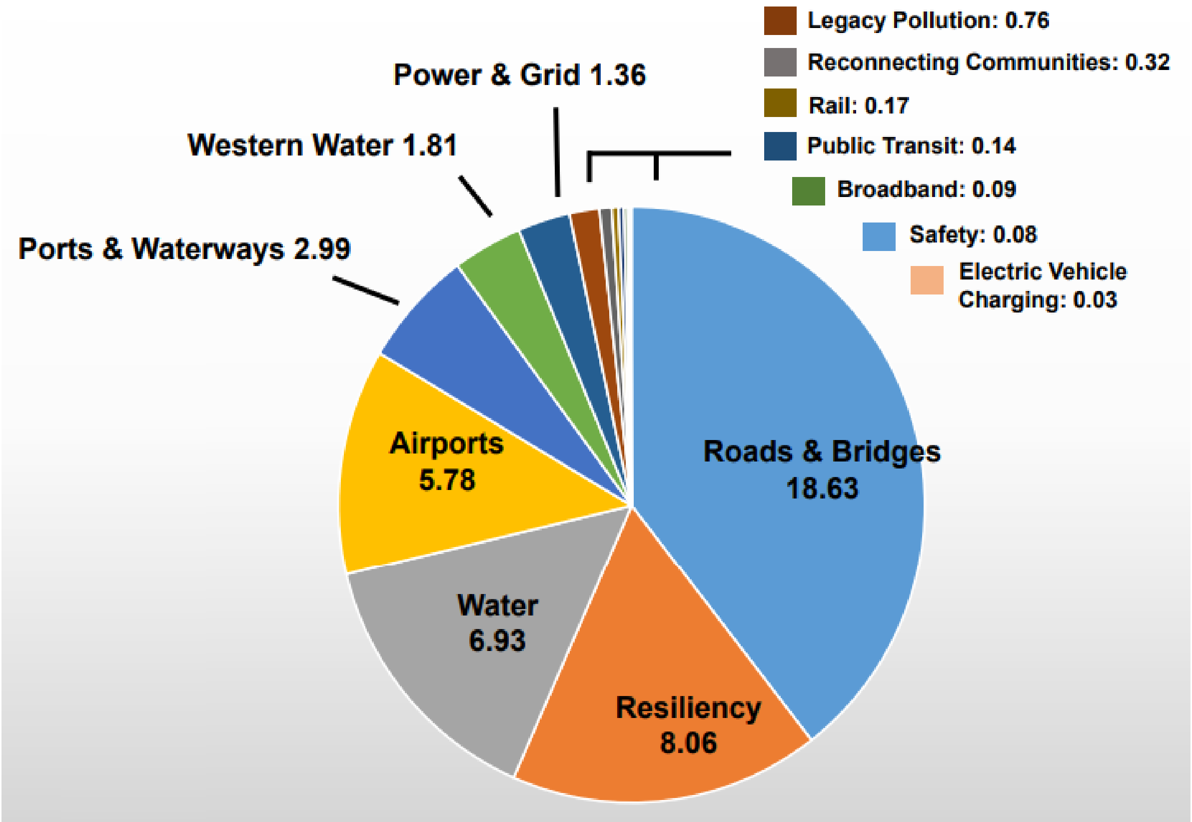
Source: Governor's Advisory Council on Revenue Estimates Dec 2024

VA Workforce – what does this mean?

- Workforce appears to be gravitating toward Heavy and Civil more than in recent past
- Continued vigilance in innovative recruiting (CTE, high school, apprenticeships really important)
- Recession may free up workers...but reduce need



Emerging Competition for resources



PCA – Portland Cement Association

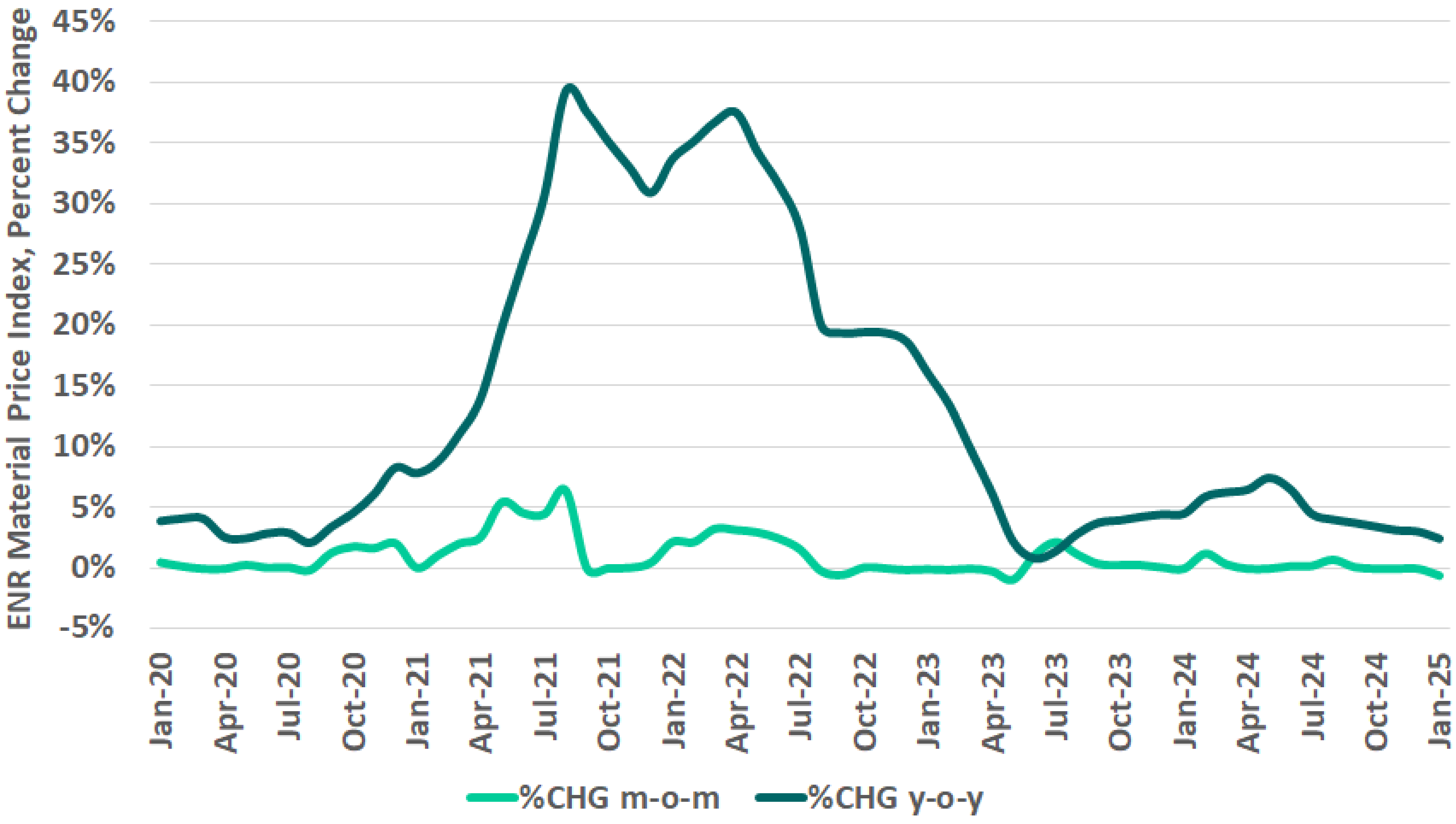
- Data center construction topped $95B in 2024
- Chip manufacturing hits $300B by 2027
- PCA projects resiliency as largest sector behind roads and bridges

Construction Cost Indices

Construction Cost Indices

- CPI - Consumer Price Index: a basket of goods that consumers purchase regularly – Core CPI excludes food and energy costs – most commonly cited inflation index, but least relevant to construction – sneakers and sofas
- ENR Materials Index – construction materials, still includes some non-infrastructure items but relevant
- ENR Construction Index – bundle of construction costs; includes residential construction, less relevant to VDOT
- PPI – Producer Price index –costs facing producers of construction, but reflects costs not delivered product; bids will generally reflect PPI plus operating margin
- NHCCI – built from bid tabs on traditional pay items; most relevant for sector but reflects national trends and lags

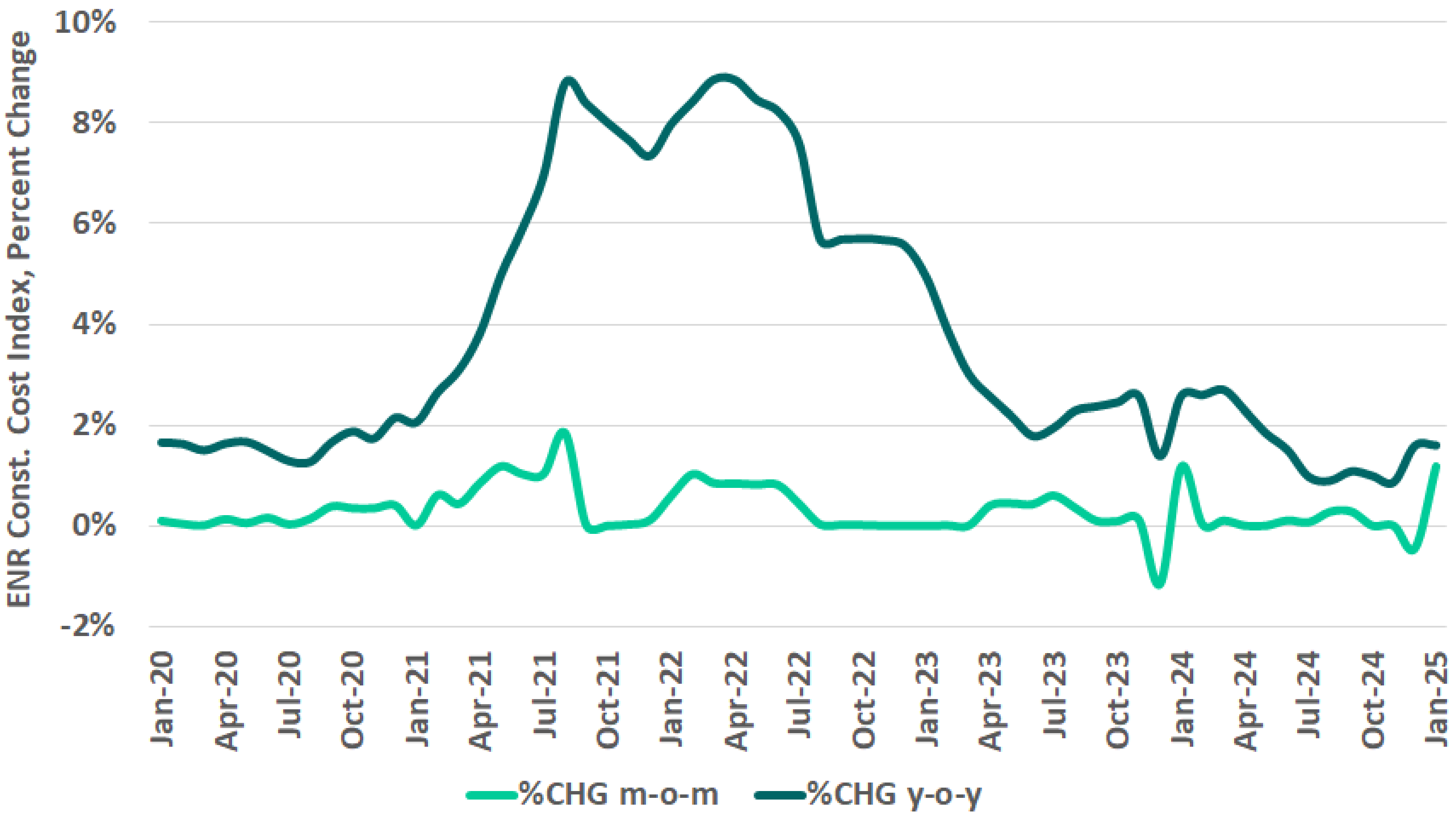
US Cost Indices – ENR Materials Price Index



Source: ENR

- ENR Materials Price Index includes some residential materials like lumber
- Reflects interest rate effects

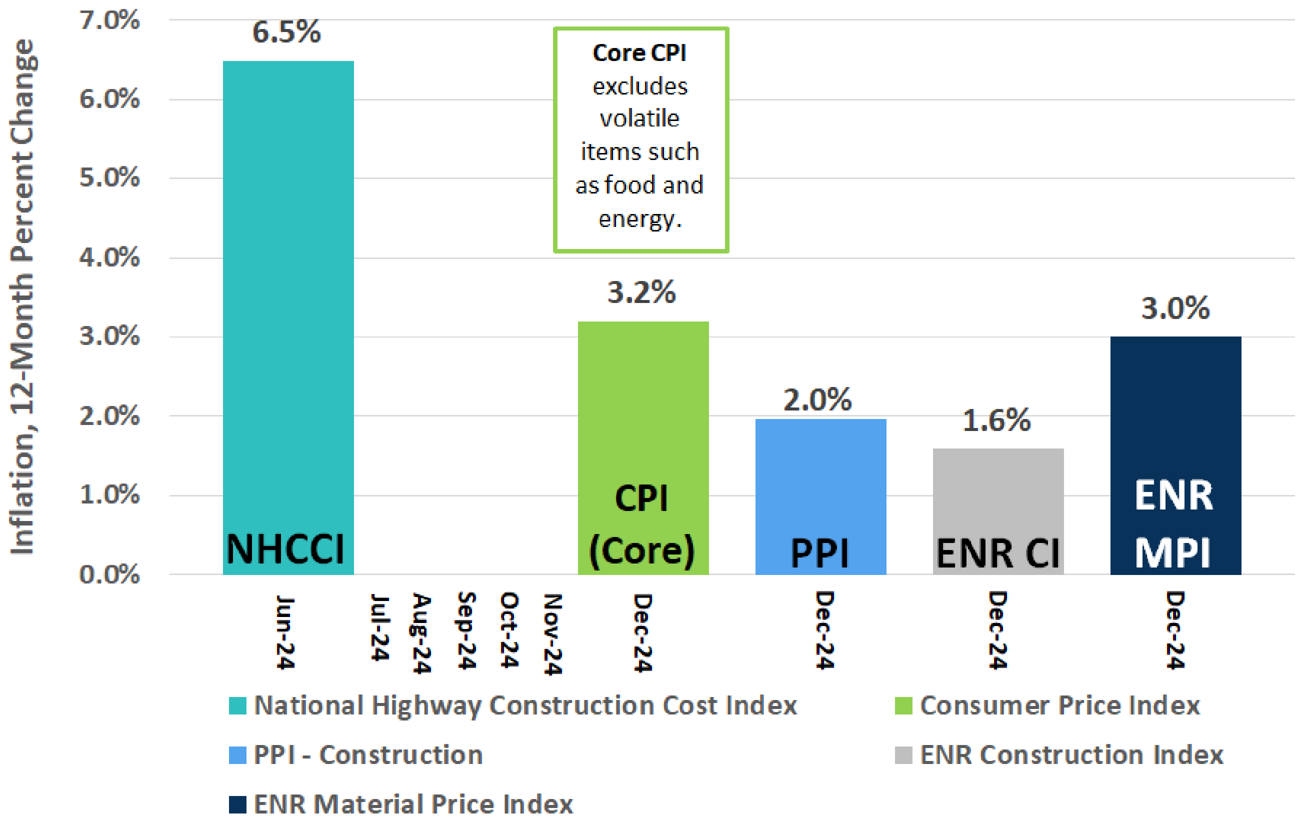
ENR Construction Index



Source: ENR

- ENR Construction Cost Index includes residential construction
- Mirrors interest rate effects on housing

Construction Cost Indices



Source: TBG Work Product, BLS, ENR, Federal Highway Administration (FHWA).

- General inflation (excluding energy/food costs) was stable at 3.2% in Dec. 2024.
- The ENR Construction Index was up by 1.6%, year-over-year.
- The ENR Material Price was up 3.0%, year-over-year.
- The FHWA National Highway Construction Costs Index fell to 6.5% through June 2024 (latest available data).

Outlook


Existing LA R/W Line
Starry St
Ramp Toll
Dallas Blvd
Potential Pond Area
Potential Pond Area
Starry St
N
Ramp Toll
Existing LA R/W Line
High-Speed Rail
Dallas Blvd
Potential Pond Area
Starry St
Dallas Blvd
Dallas Blvd
Potential Pond Area
Existing LA R/W Line

Inflation

- Overall, the lower bound modeled estimates would result in SYIP costs about 3 - 5% lower than current programmed SYIP for FY 2025 & 2026
- The Best Estimates model would result in SYIP costs about 2% higher than current programmed SYIP in FY 2025 & 2026
- The upper bound/worst case model is estimated to result in costs 8 - 9% higher than currently programmed SYIP expenditures in FY 2025 & 2026
- The models are weighted:
  - 15% lower bound
  - 60% best estimate
  - 25% upper bound

Overall VDOT Inflation forecast is about 7%

pre-Tariffs

On a probability weighted basis, current models predict that the inflation already factored into SYIP projects is fairly close to updated models.

Prior Inflation Memoranda, the introduction of BMD specs, and 2024 actual inflation of about 6% account for most of the inflation anticipated for VDOT in the current SYIP – barring a jump to the upper bound/worst case scenario

Tariffs

- Asphalt could increase 3-10% over current estimates in 2026, 2-4% (2027)
  - Wildcard: VA binder comes from Spain/Europe mostly, but Northern states sourcing from CA could shift to VA sources, constraining supply
- Concrete could increase by double digits in first two years
- Aggregate and Earthwork could decline due to economic reductions in VA, lower demand
- Steel
  - Potential contraction of employment/GSP in VA overshadows other factors
  - Upper bound would be in double digits

Preliminary modeling (3/3/2025)

Material	2025	2026	2027
	Margin above current estimates:		
Asphalt	4% - 10%	3% - 10%	2% - 4%
Concrete	9% - 25%	24% - 25%	0% - 9%
Aggregate	-1% - 6%	-3% - 10%	-3% - 10%
Earthwork	-4% - 7%	-12% - 9%	-12% - 14%

Things to Watch in Estimating Costs

How do I use this information?

Outlier Quantities:

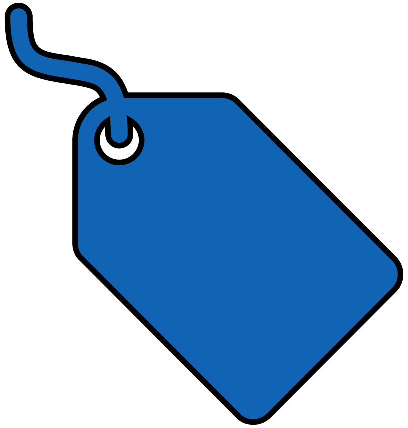
Median quantity asphalt in a VDOT DBB project, last 12 months: ~3,100 Tons

Median price, ~$138/Ton

Quantities below 1,000 Tons saw substantially higher unit prices

Same is true for other materials

- Historical bids provide guardrails around current estimates
- When should estimates go outside the guardrails?

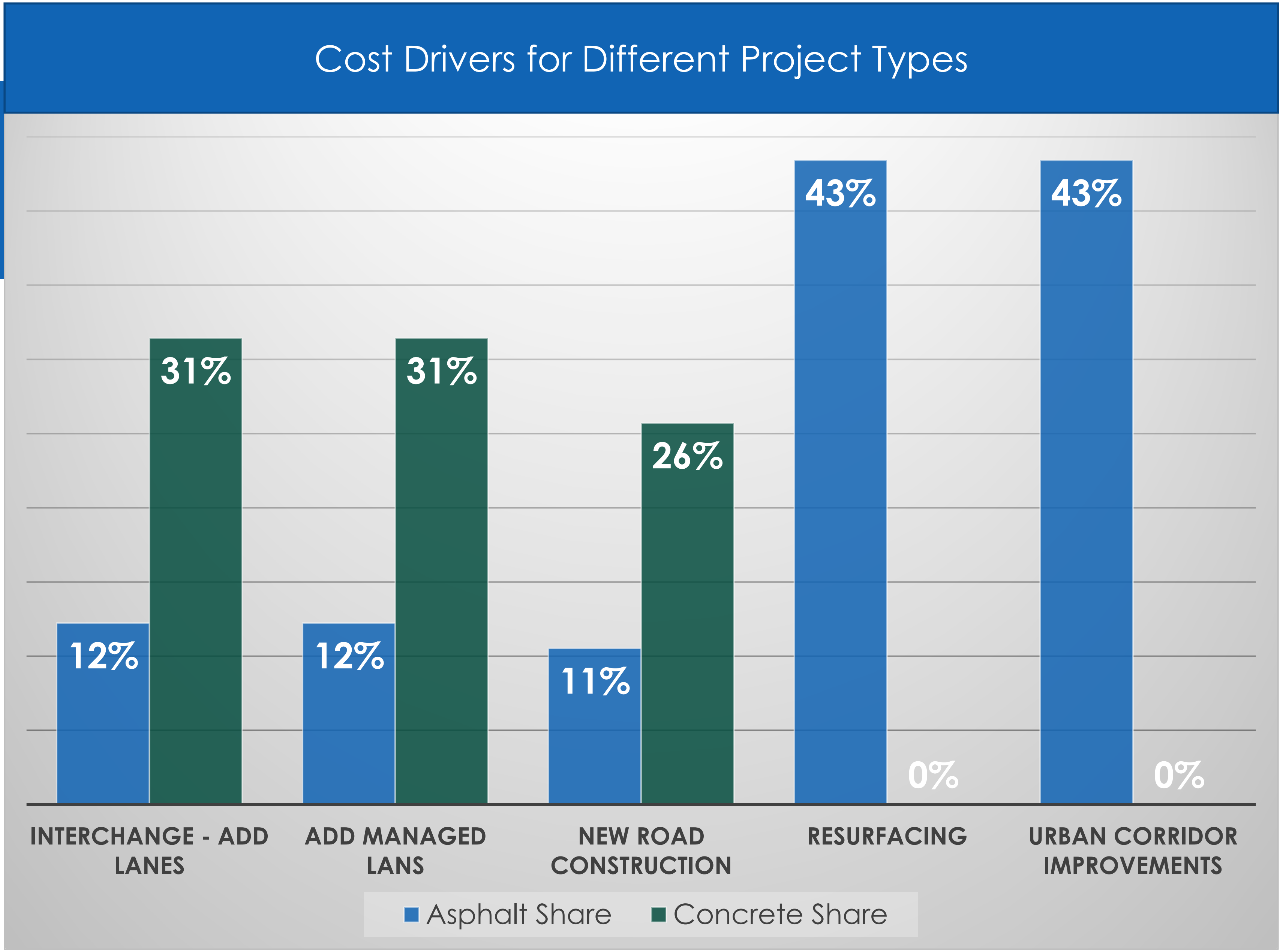


How do I use this information?

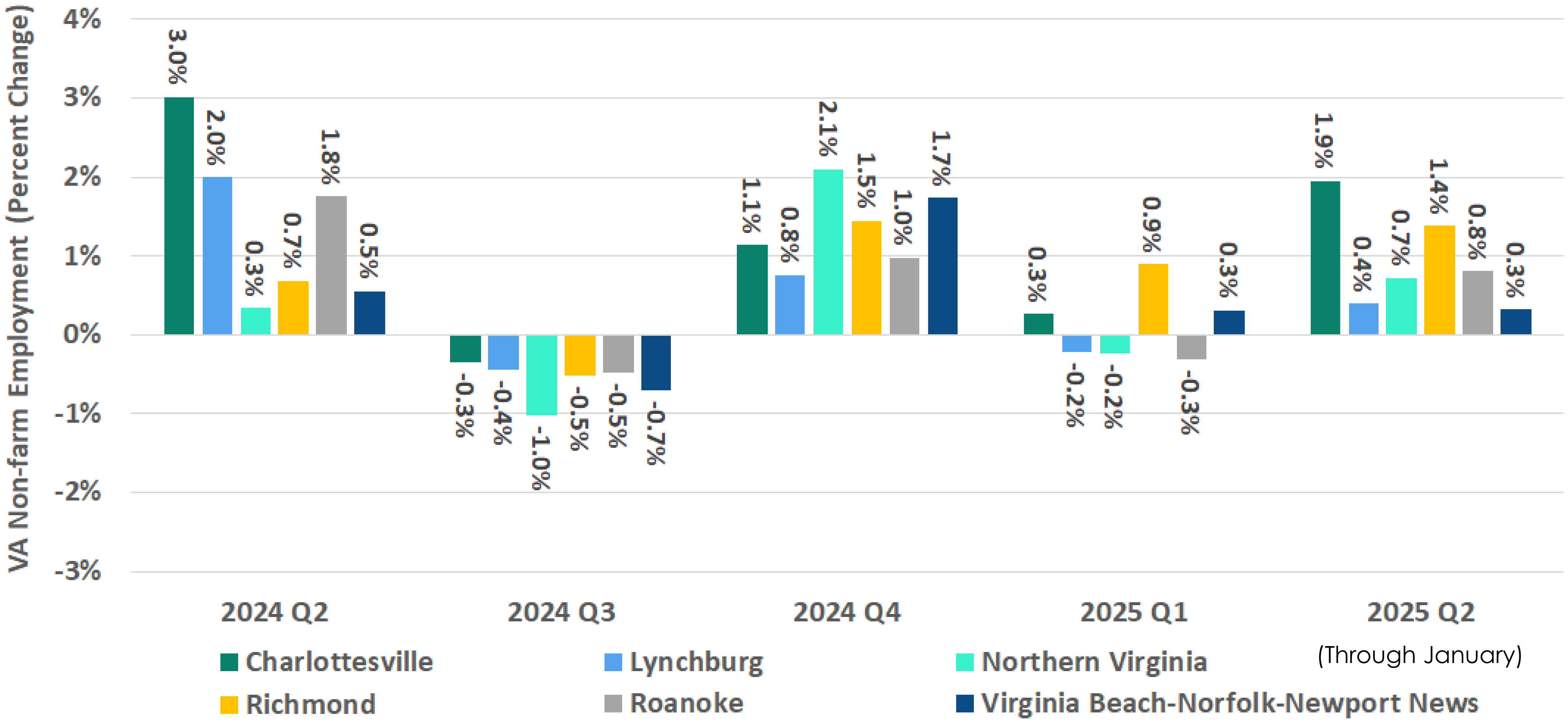
Type of work:

Different project types have different cost drivers

Recognize which pay items are likely to be more sensitive to the type of project you are reviewing

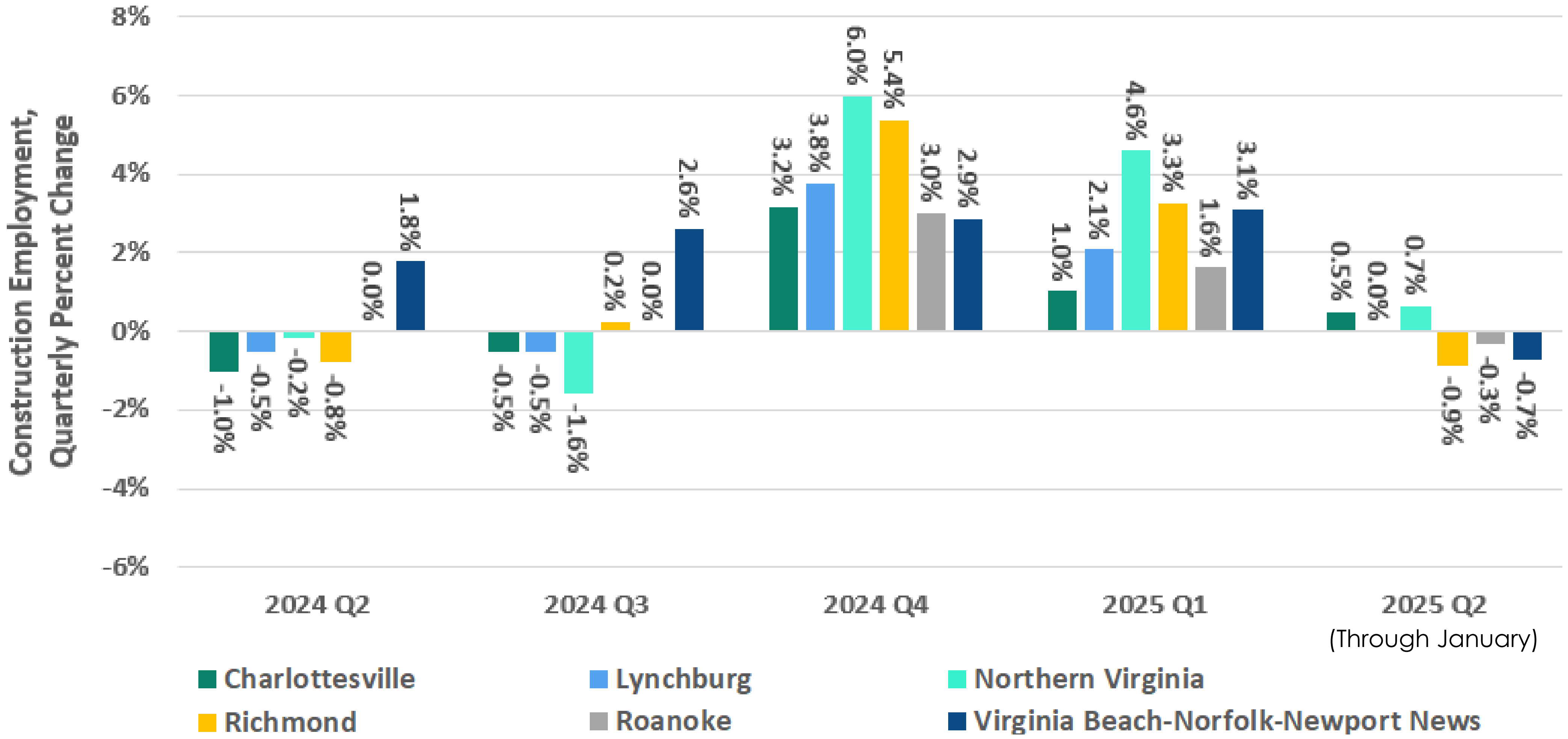


Understanding Local Conditions



Source: TBG Work Product, BLS.

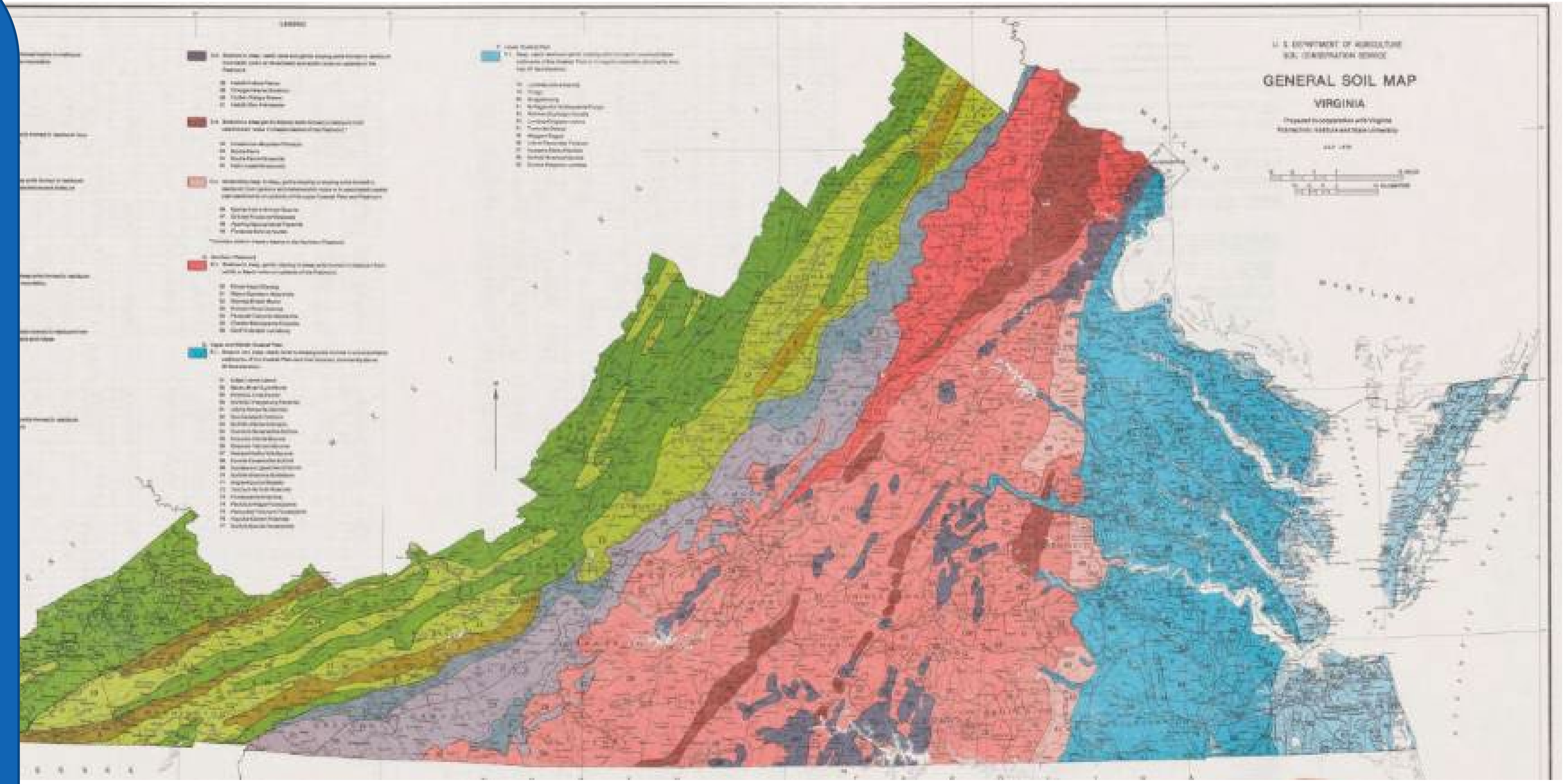
Understanding Local Conditions



Source: TBG Work Product, BLS.

Local conditions

- Market conditions also reflect physical conditions
- Where is your project? Is it working in a high-density, urban area with lots of conflicts?
- Is it in an area of sandy soils or rock? Or clay? Cost factors are very different



Managing Estimates

Labor

- Be aware of local labor markets, unemployment, increases and decreases
- Are your friends getting laid off? Or getting raises?

Materials Costs

- Markets that rely heavily on imports – even if VDOT does not use imports – will be volatile
- Energy costs affect most materials – check WTI or Brent Crude prices

Competition for resources

- Situational awareness of projects competing for resources in regional markets – data centers
- War or expanded conflicts can create competition for some resources

Schedule

- Is your schedule realistic and logical?
- Will it deter good market participation?
- Humans are bad at estimating low probability events

Questions? Thank you!

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