



VDOT'S COST ESTIMATION OFFICE

Overview of VDOT's Cost Estimating Manual

 Presented by: Cost Estimation Office

August 2021

Cost Estimating Manual Overview:

Version 1.0 Publishing August 2, 2021

- Much Support From Districts
- DPDEs Support – Crucial to Deliverable
- Estimating Manual Working Group
- Central Office Divisions
- Localities & Industry Partners

- Good Not Perfect
- Compiles Existing Guidance
- Implements Enhancements

VDOT's Cost Estimation Study (EY)

COST ESTIMATING MANUAL

VDOT GOVERNANCE DOCUMENT

VERSION 1.0
July 1, 2021

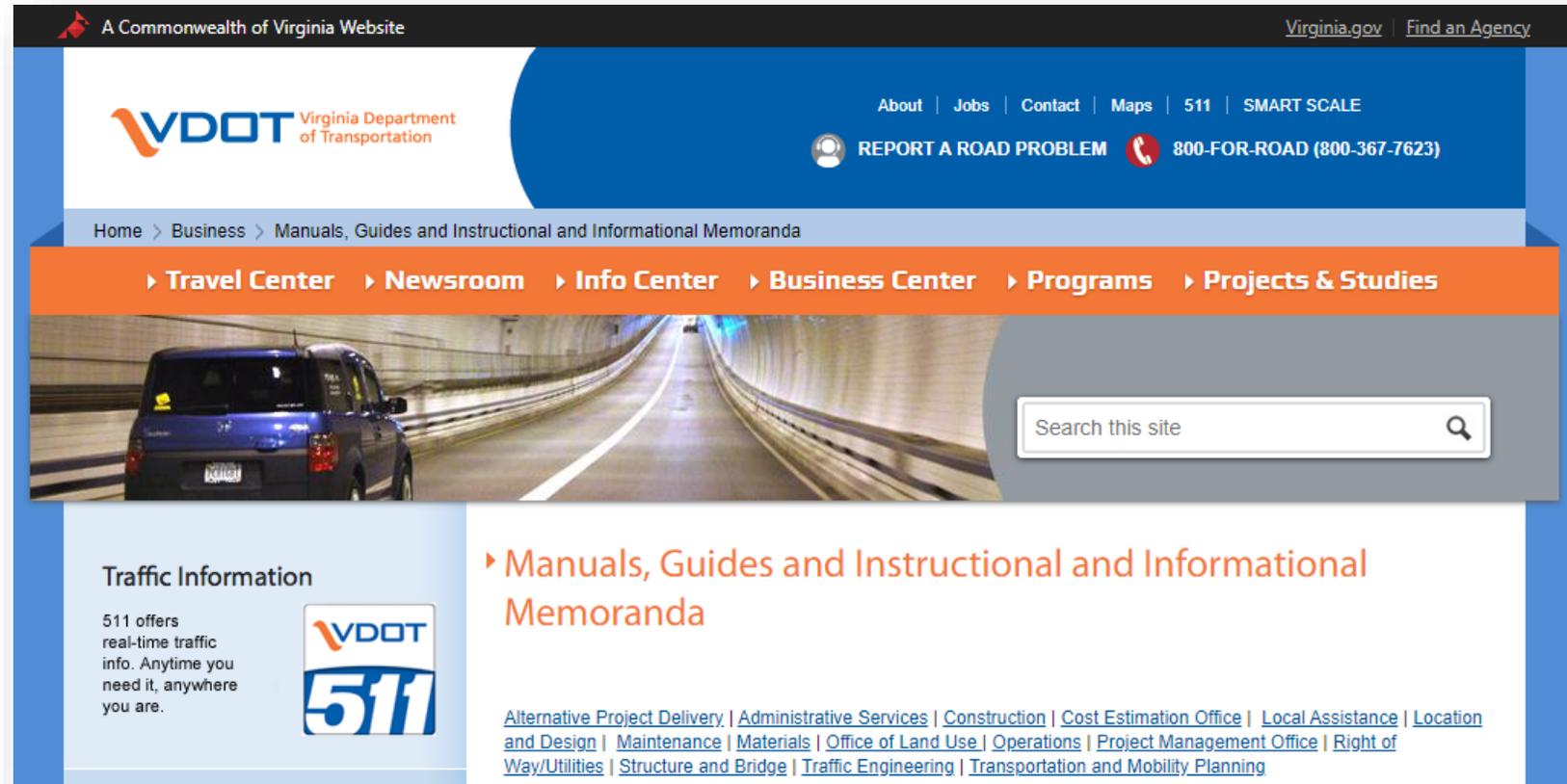
Prepared by:

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Richmond, VA 23219

Cost Estimating Manual Overview:

Where Can I Find VDOT's Cost Estimating Manual?

VDOT's Cost Estimating Manual Version 1.0 is available on VDOT's website at the following location:



<https://www.virginiadot.org/business/manuals-default.asp>

Cost Estimating Manual Overview:

Where Does VDOT's Cost Estimating Manual Apply?



Cost Estimating Manual Usage

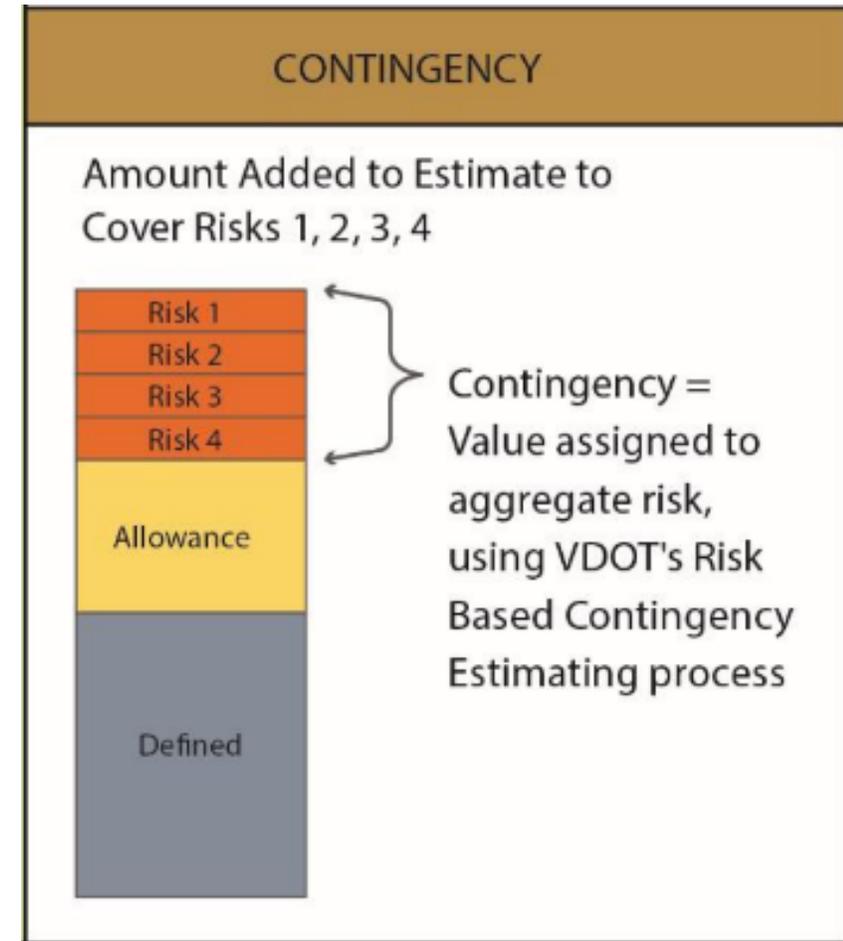
This manual shall be used for all projects with a construction phase (VDOT or locally administered) that are in, or to be entered into, the Six-Year Improvement Program (SYIP) AND that will be reflected on VDOT's Dashboard (see [Dashboard business rules](#)) with the exception of major projects over \$500M which have additional requirements.

VDOT's CEM Excerpt from Page 7 – Purpose & Use

Cost Estimating Manual Overview:

A Resource to All Preparing Cost Estimates for VDOT Projects

- Manual is Packed with Useful Existing Guidance (Directly & Hyperlinked)
- Manual is Not a Text Book on Cost Estimating (See [Chapter 7 for Training Resources](#))
- Manual Provides Consistency (Example: Terms)
- Manual Incorporates Enhancements Identified in EY Study



*Excerpt from Manual
Graphic Illustration of Terms
Figure I-1A (Page 12)*

Cost Estimating Manual Overview:

Estimating Study Major Recommendations (May 2020 EY Report)

- ✓ Establish Consistent Cost Estimating Methodologies
- ✓ Enhanced Project Classification System
- ✓ Develop a Structured Risk Approach
- ✓ Develop a Risk Based Contingencies Approach
- ✓ Establish a Formal Minimum ROW & Utility Process

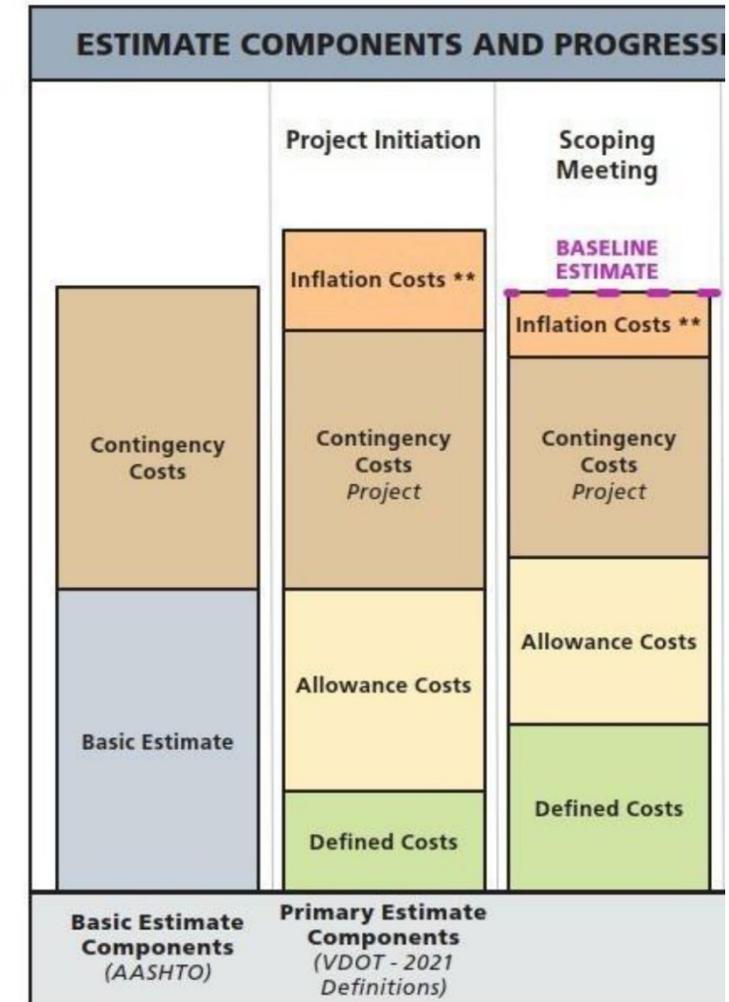
Five of the six recommendations incorporated to a varied extent.

Figure 1-2: Progression of a Cost Estimate

Cost Estimating Manual Overview:

Enhanced “New Requirements” Highlighted

- Consistency in Terminology
- Formal Right of Way Process (Ch. 1)
- Complexity Classifications (Ch. 5)
- Risk Based Contingencies (Ch. 5)
- Estimate Documentation (CEPs) (Ch. 6)



Manual: Consistency in Terminology

VDOT's CEM Figure I-1b

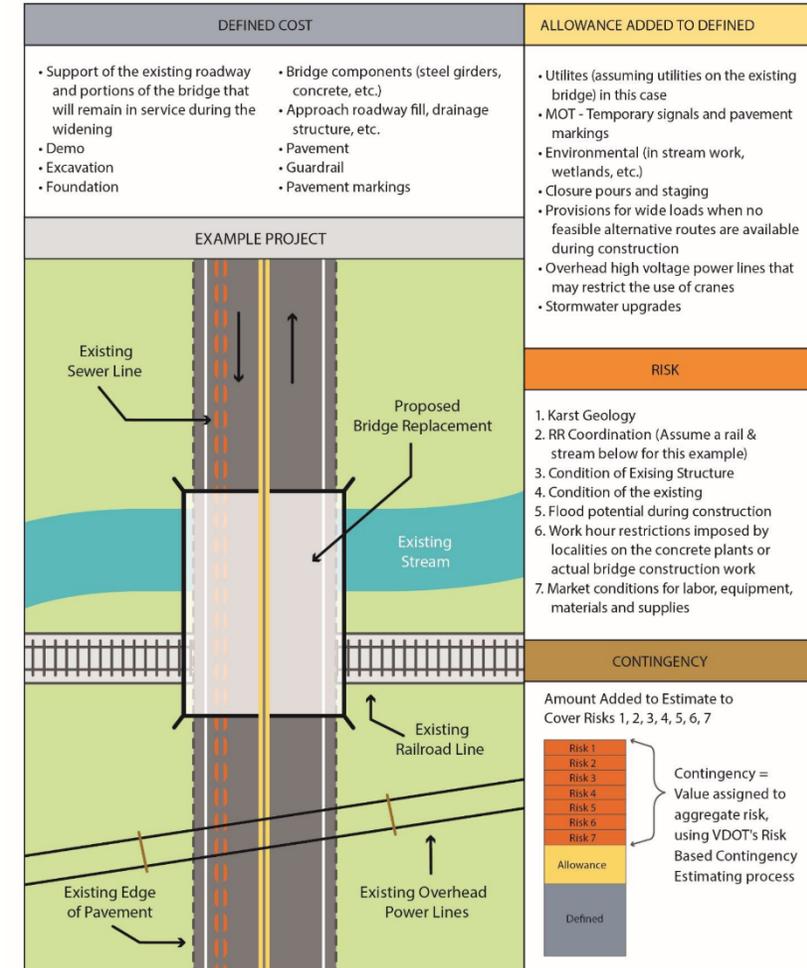
Figure I-1b: Defined Cost, Allowance, Risk & Contingency (Bridge Project)

DEFINED COST, ALLOWANCE, RISK, CONTINGENCY EXAMPLE GRAPHIC:
STAGE CONSTRUCTED BRIDGE REPLACEMENT PROJECT

Introduction	1 General	2 Design-Bid-Build	3 Design-Build	4 Tools	5 Risk	6 Quality	7 Training
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I.5. Key Terms and Definitions

Allowance – An amount included in the Base Estimate to account for costs of known items whose requirements are currently undefined. This cost component covers the “known-unknowns”. An allowance is separate from a contingency. As the design progresses, the “known-unknown” allowances will be converted to the “known-known” costs that are accounted for in the Defined Cost. Examples of allowances in preliminary estimates may be an underground utility extension, the presence of yet unknown quantity of unsuitable soils, E&S measures, Maintenance of Traffic (MOT), Water Quality Credits and Wetland/Stream mitigation costs. *See Figure I-1a and I-1b: Defined Cost, Allowance, Risk & Contingency.*



Very Key Terms: Consistency is Crucial
Defined Cost, Allowance, Risks & Contingency

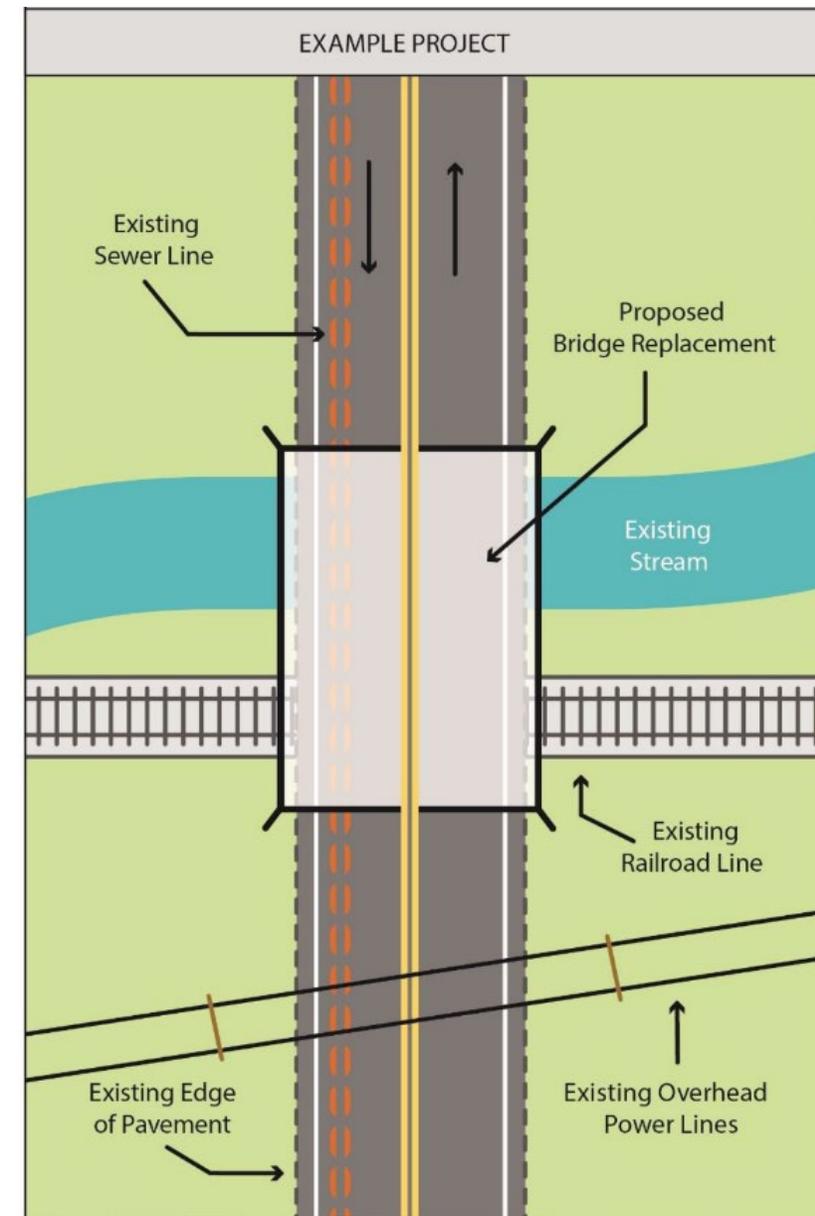
Manual: Consistency in Terminology

VDOT's Cost Estimating Manual has two graphical representation of typical projects depicting cost estimate components:

- Defined Costs
- Allowances
- Risks
- Contingency

Very Key Terms: Consistency is Crucial

Defined Cost, Allowance, Risks & Contingency



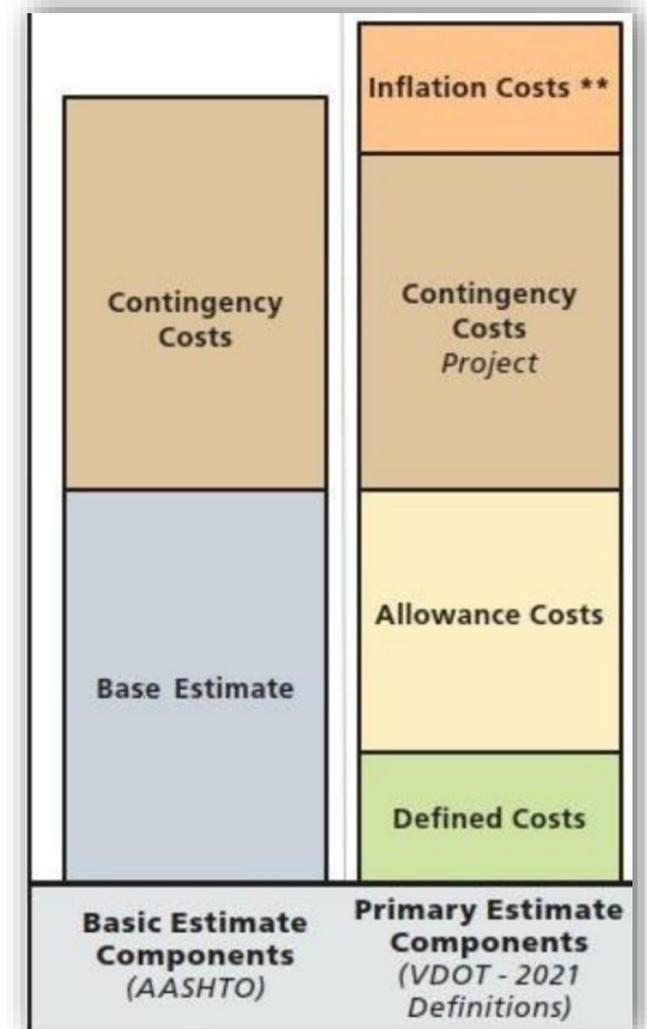
VDOT's CEM Figure I-1B

Manual: Consistency in Terminology – DEFINED COST

Defined Cost – The portion of the Base Estimate where a probable cost of development and construction can be reasonably determined. These are costs of known items whose requirements have been determined and quantified at the current level of project development. These are the “known-*knowns*”.

Very Key Terms: Consistency is Crucial

Defined Cost, Allowance, Risks & Contingency



VDOT's CEM Figure 1-2

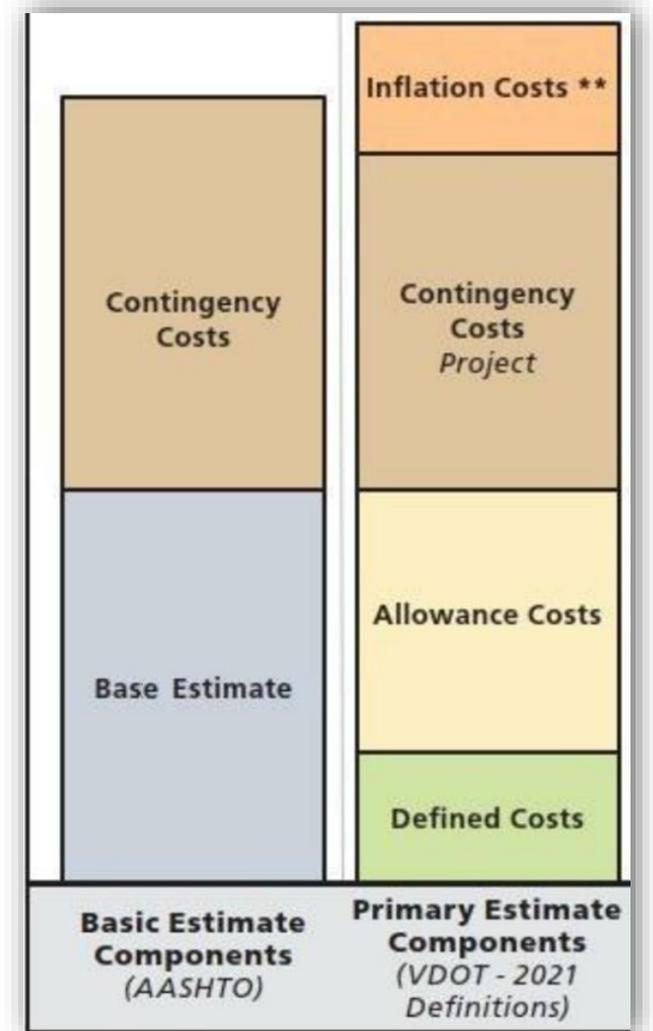
Manual: Consistency in Terminology - ALLOWANCE

Allowance – An amount included in the Base Estimate to account for costs of known items whose requirements are currently undefined. This cost component covers the “known-*unknowns*”.

Examples of allowances in preliminary estimates may be E&S measures, Maintenance of Traffic (MOT) items, Water Quality Credits and Wetland/Stream mitigation costs.

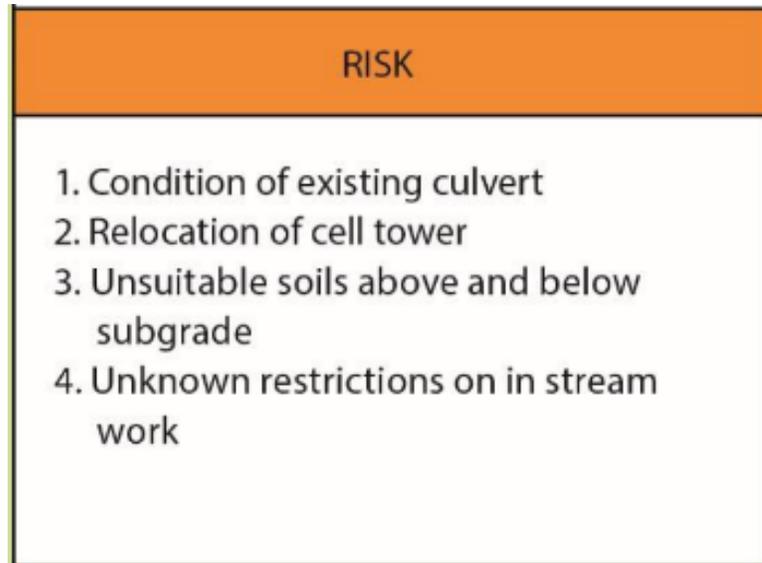
Very Key Terms: Consistency is Crucial

Defined Cost, Allowance, Risks & Contingency



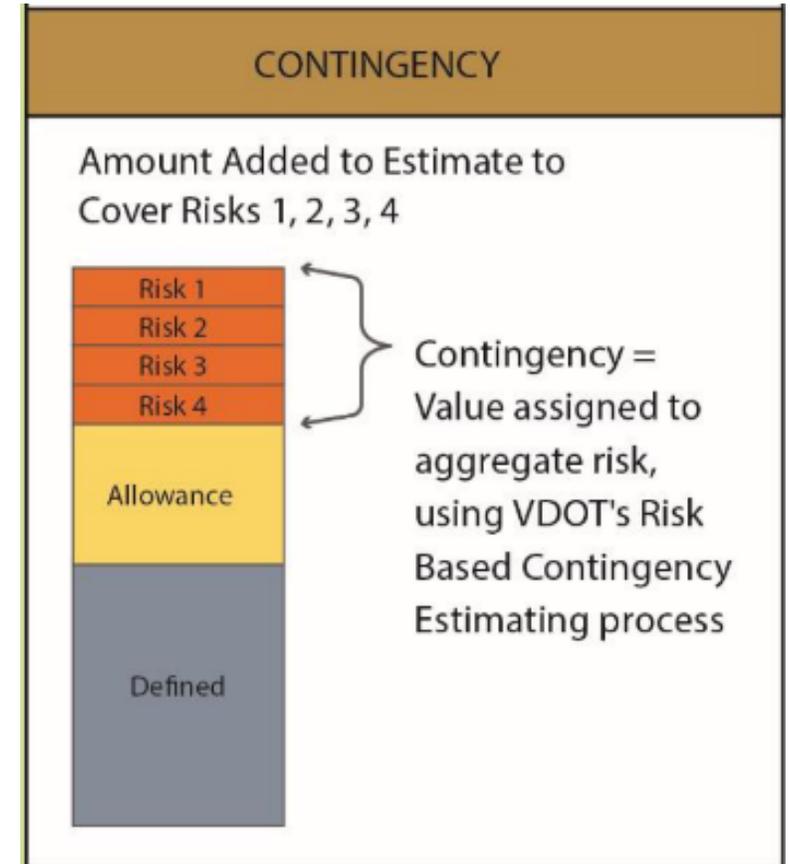
VDOT's CEM Figure 1-2

Manual: Consistency in Terminology – RISK & CONTINGENCY



VDOT's CEM Figure I-1b

Risk Analysis
→
Drives Contingency



VDOT's CEM Figure I-1b

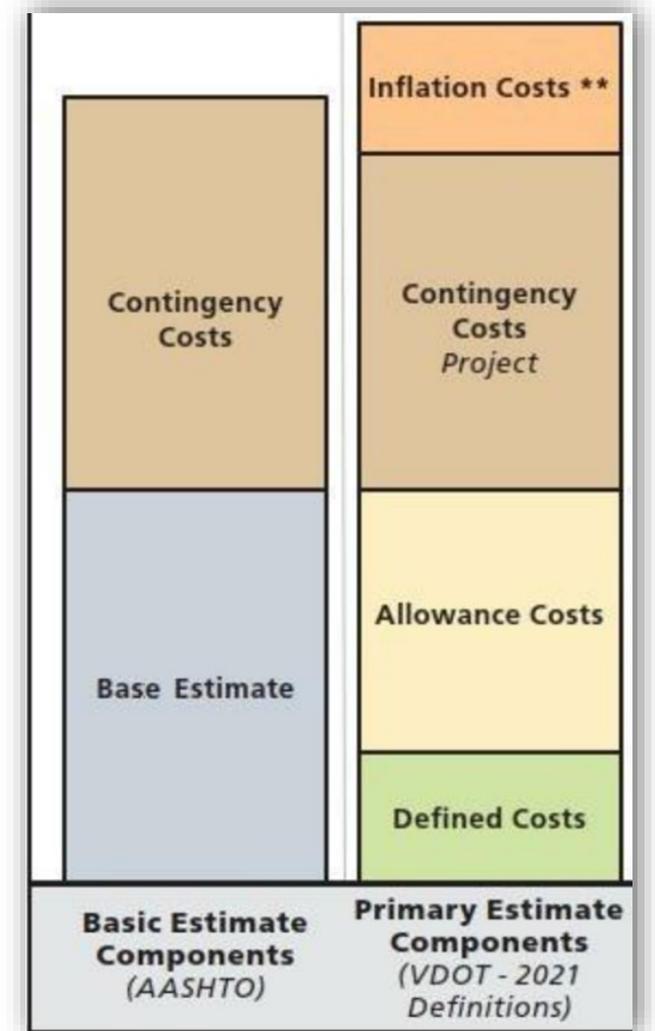
Very Key Terms: Consistency is Crucial
Defined Cost, Allowance, Risks & Contingency

Manual: Consistency in Terminology

VDOT Estimate Cost Components VS AASHTO Estimate Cost Components

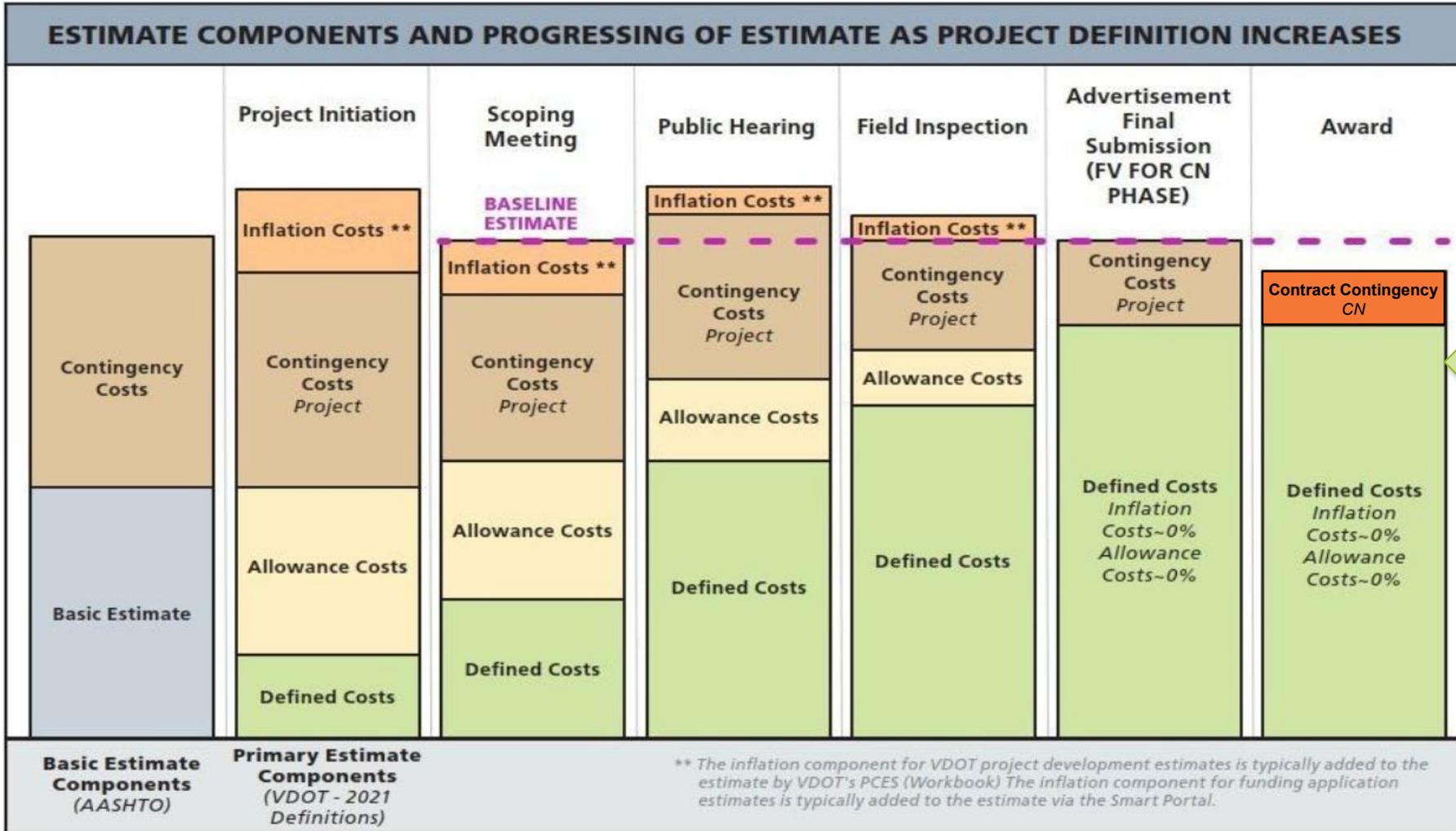
Consistency in how we understand estimate cost components, combined with consistency in how we communicate estimates will yield great dividends.

Very Key Terms: Consistency is Crucial
Defined Cost, Allowance, Risks & Contingency



VDOT's CEM Figure 1-2

Manual: Progression of Estimate Through Project Dev.

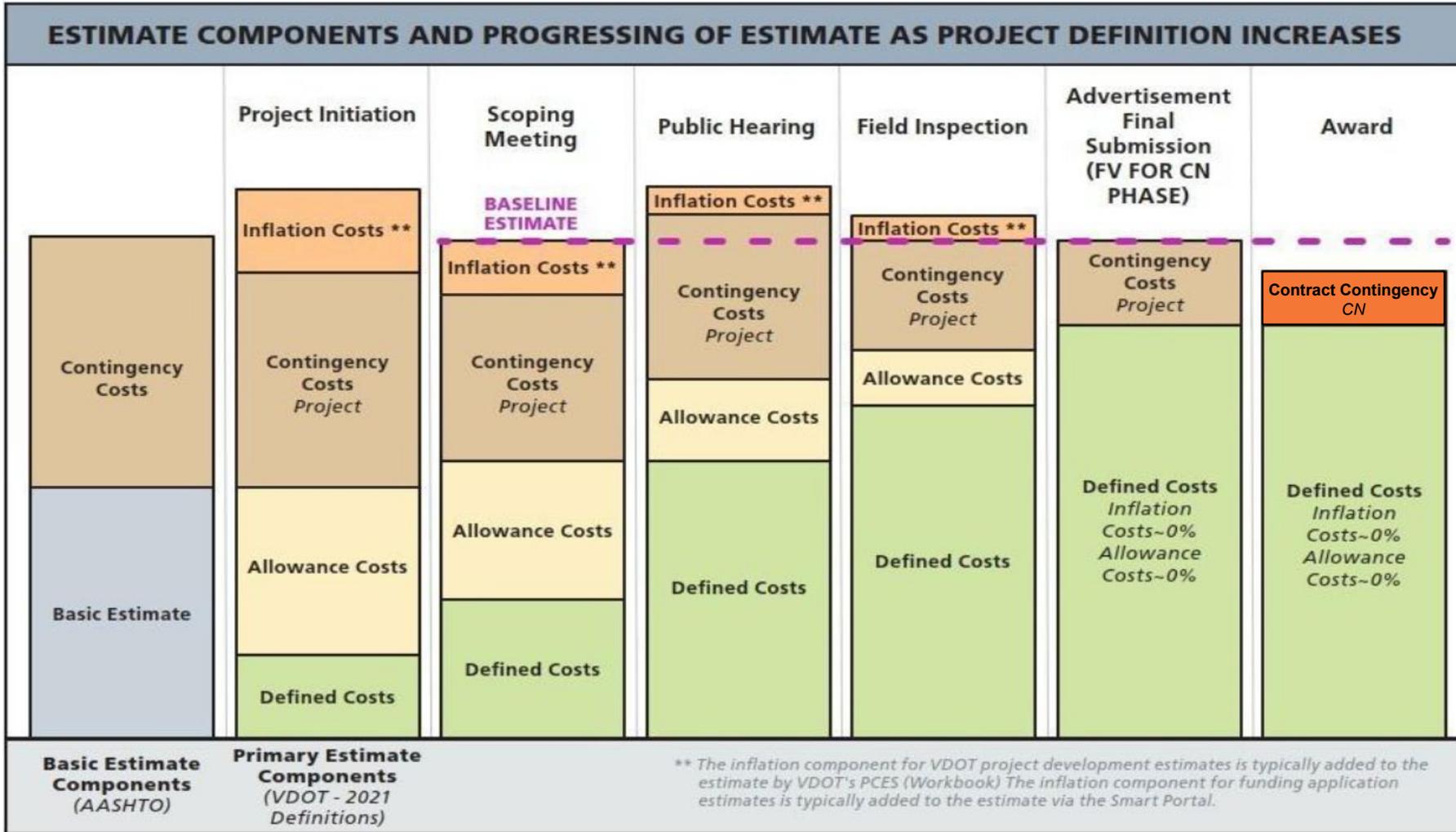


Defined Cost will increase and become the largest cost component of the estimate as the level of definition increases

VDOT's CEM Figure 1-2

Manual:

Project vs CN Contract Contingency

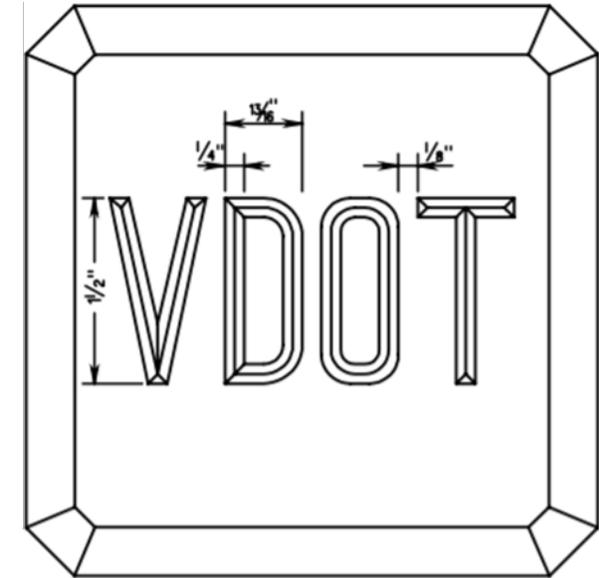


Construction Contract Contingency is a separate amount specifically to address changes during Construction Contract Administration

VDOT's CEM Figure 1-2

Manual: Formal Minimum ROW Process (Ch. 1)

- ROW & Utilities – Specialty
- On VDOT Projects
Provided by ROW Division
- Chapter 1 of CEM – Minimum Requirements
- ROW Division Detailed Guidance June 2021



VDOT Right of Way Monument

Section 1.11 VDOT ROW Cost Estimate Guide

Manual: Project Complexity Classifications (Ch. 5)

- Most Complex
- Moderately Complex
- Non-Complex

5.3.1. Project Complexity

Project complexity is a primary input to risk-based estimating. Project complexity drives the level of effort and choice of tools for a risk-based estimate (Molenaar et al. 2010 and Anderson et al. 2008). Project complexity is described in a number of ways. Some descriptions rely on project attributes to convey the project complexity. For example, attributes related to roadways, traffic control approaches, structures, ROW, utilities, environmental requirements, and stakeholder involvement are often used to distinguish different levels of project complexity.

VDOT has prepared the Project Complexity Classification for the Cost Estimating Process in *Table 5-1* based on existing processes and business needs.



Table 5-1: VDOT Project Complexity Classification for the Cost Estimating Process

Most Complex	Moderately Complex	Non-Complex
Most VDOT Tier 2 Projects (See IIM-LD-249)	Higher Risk VDOT Tier 1 Projects Such As:	Most VDOT Tier 1 Projects (See IIM-LD-249)
Medium to high complexity & schedule risks	T1 Projects under \$10M with higher risks	Very low to medium complexity schedule risks
Special provisions for special time related conditions	T1 projects with multiple and potentially challenging ROW needs	Short straightforward operations, typically single season & schedule type work

Manual: Risk Based Contingencies (Ch. 5)

- Based on AASHTO
- Step by Step Guidance
- Risk Assessment Key
- Sliding Scales Sets Suggested Limits



Setting Contingency

Establishing a reasonable contingency requires considerable human and engineering judgment. The sliding scales provided herein are not to be used as the sole source of setting a contingency.

Excerpt from Manual – Call Out Box (Page 82)

Manual: Risk Based Contingencies (Ch. 5)

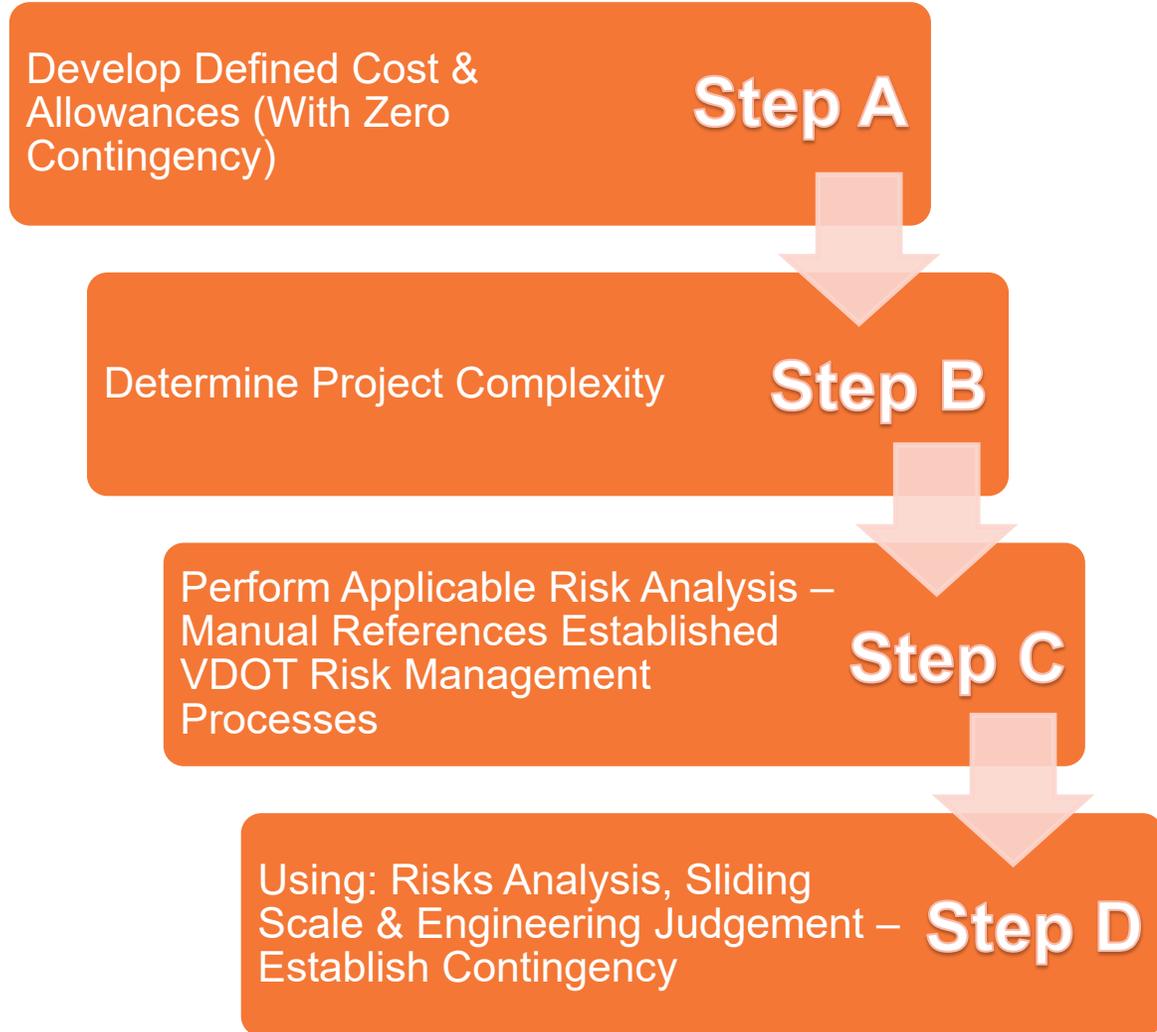
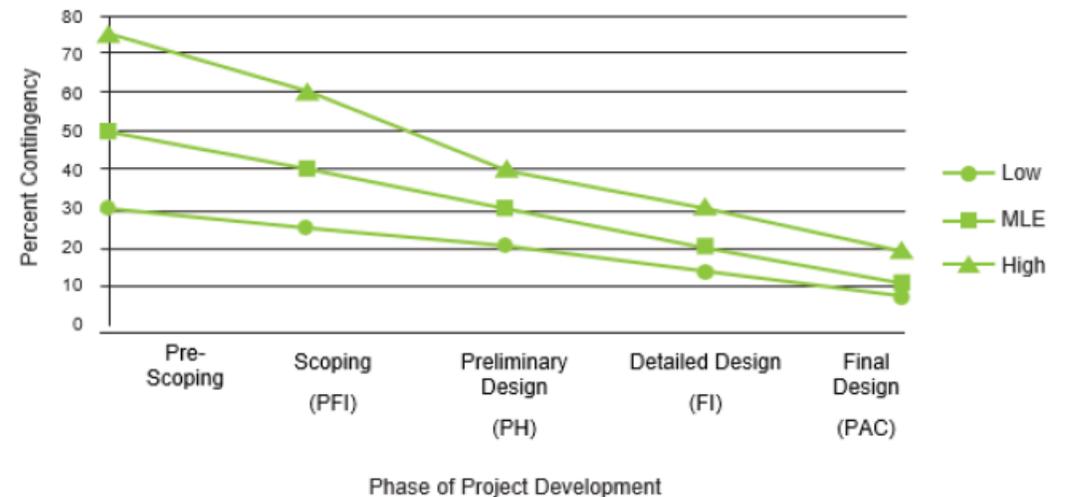


Table 5-4: Simplified Deterministic Risk-Based Analysis Example

From AASHTO's Practical Guide to Cost Estimating (2013 First Edition – Chapter 5)

Project Cost Element	Estimated Impact	Probability of Occurrence	Cost Contingency
Initial Purchase of ROW	\$1,200,000	20%	\$240,000
Known Hazardous Substance	\$125,000	10%	\$12,500
Coordination with Railroad Agencies	\$50,000	10%	\$5,000
Treatment of Water Discharged from Site	\$400,000	3%	\$12,000
TOTAL			\$269,000

Figure 5-4b: Risk and Contingency Process and Sliding Scale – Moderately Complex



Manual: Risk Based Contingencies (Ch. 5)

Table 5-4: Simplified Deterministic Risk-Based Analysis Example

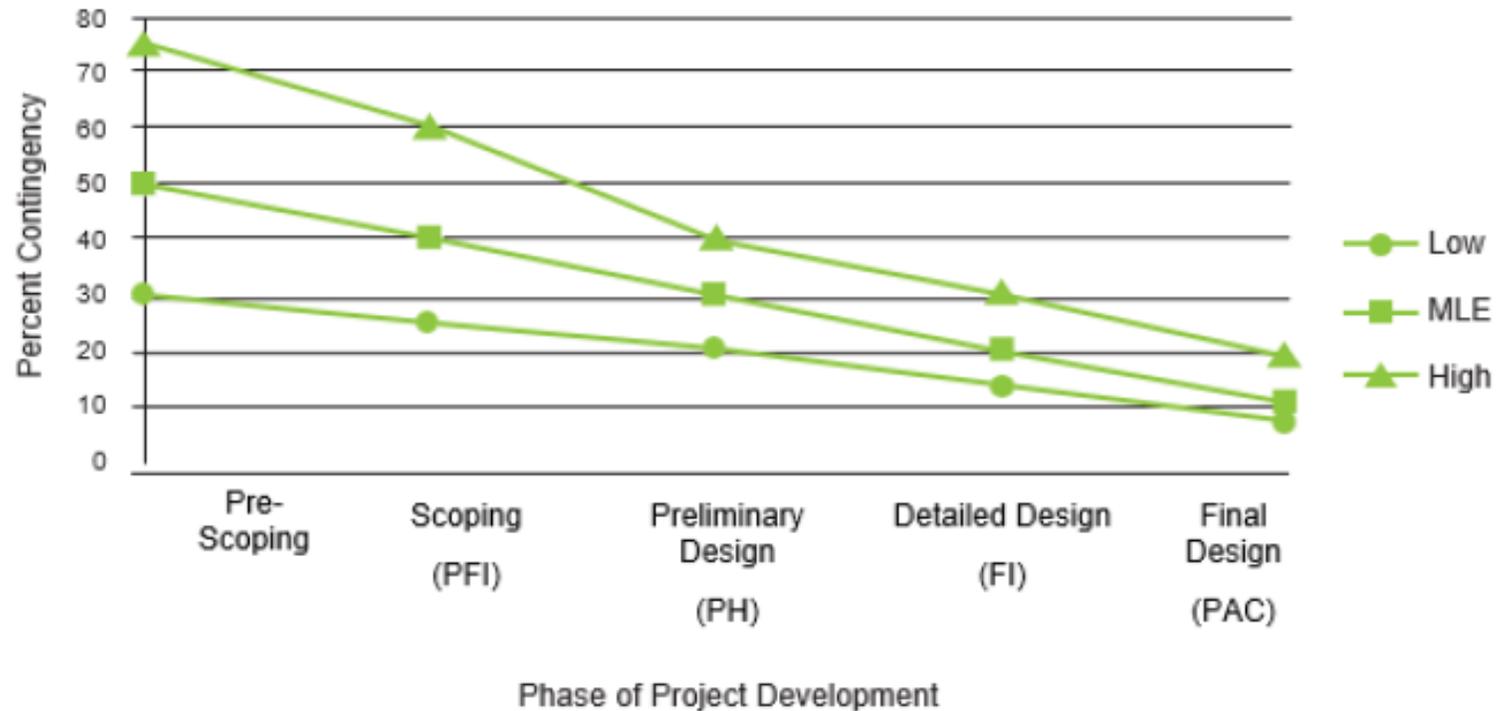
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TOTAL			\$269,000

Risk Identification & Risk Evaluation is a Key Step

Manual: Risk Based Contingencies (Ch. 5)

Figure 5-4b: Risk and Contingency Process and Sliding Scale – Moderately Complex



Sliding Scales – Used to Cross Check & Compare to Risk Analysis

Manual: Risk Based Contingencies (Ch. 5)

- VDOT Has Authority Over Very High and Very Low Contingencies

Step 6B: Contingency above or below LOW and HIGH on the applicable sliding scale:

If the estimator(s) determines that the MLE derived in Step 5 is not acceptable AND also determines the amount between LOW percentage and the HIGH percentages is not acceptable, the estimator(s) shall determine a justifiable contingency and present recommended contingency to the District L&D Engineer, S&B Engineer or equivalent VDOT management level, for review and consideration. The estimator(s) shall reach concurrence on an acceptable contingency with the appropriate VDOT manager. In the CEP and/or the Cost Estimate Workbook, the Estimator(s) shall document the justification for deviating from the MLE and adjusting the contingency above or below the LOW and HIGH percentages. The documentation shall include the concurrence of the applicable VDOT manager. Proceed to Step 7.

Excerpt from Manual – Chapter 5 (Page 87)

Manual: Cost Estimate Packages (CEPs) (Ch. 6)

Establishes Standard for Estimate Documentation by Complexity Type



6.4.2. Moderately Complex Project CEP Requirements:

CEPs for all Moderately Complex projects should be stored in ProjectWise in a folder labeled “Estimate”. It will be the responsibility of the VDOT Project Manager to request access, through VDOT’s CADD Support, to the “Estimate” folder(s) for the appropriate individuals.

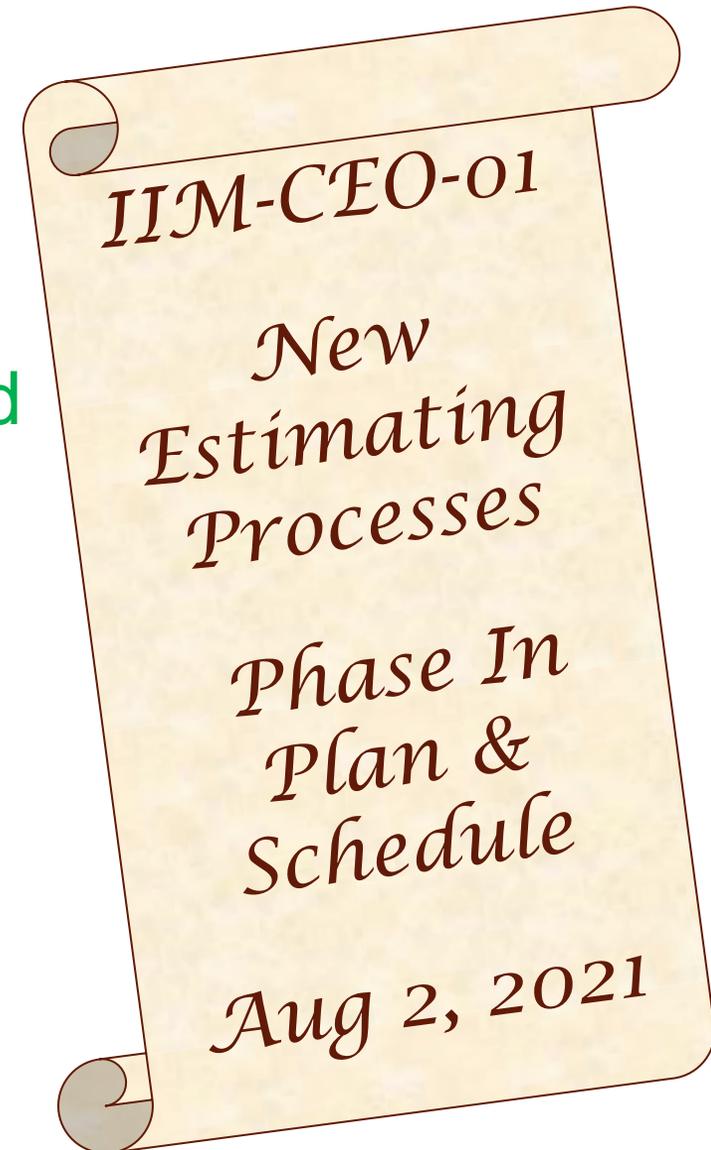
- Cost Estimate Workbook
- Estimator(s), reviewer(s), and project team
- Basis of Estimate
 - For information used, and not included in CEP, provide detailed description and links (including PM-100 scoping report if applicable)
- Estimate type (analogous, parametric, quantity/bid based, cost based, etc.)

*Excerpt from Manual – CEP Requirement for Moderately Complex Project
(Page 100)*

Implementation of the Manual – Plan & Schedule: IIM-CEO-01

Manual Implementation Being Implemented in Controlled Fashion

- **Active Projects:** With next regularly scheduled estimate update.
 - *(NLT July 1, 2022)*
- **Ongoing Funding Applications: RS & TAP**
 - *(NLT April 1, 2022)*
- **Future Funding Applications: Effective immediately.**
 - *(Aug. 2, 2021)*



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