Project Control From A Public Owner's Perspective

KC Wastewater Treatment Division

Northwest Construction Consumer Council

June 25, 2014

Creating Resources from Wastewater
(WTD mission statement)

* King County is committed to:
  * protecting water quality and preventing pollution
    * not just about treating sewage anymore
  * recovering and reusing the products of the wastewater treatment process (2012)
    * recycle/reclaim water (325 million gallons, BW capacity 20 mgd)
    * recycle solids into nutrient rich biosolids (118k wet tons)
    * generate energy from waste gases (1.3 million kilowatt hrs)
    * methane gas sold (1.83 million therms)

Facts and Figures

* Customers and Service Area
  * serve 415 square miles (3 counties)
  * serve 1.5 million people
  * wholesale provider to 34 local agencies
* System Design Criteria
  * 279 mgd average wet weather flow
  * 232 mgd average dry weather flow
  * 897 mgd instantaneous maximum capacity

Facts and Figures cont.

* Facilities
  * 5 treatment plants
  * 47 pump stations
  * 391 miles of conveyance lines
  * 4 marine outfalls, 38 CSO outfalls
* Overall Financial
  * $20 billion estimated cost to replace entire system
  * $2.8 billion planned capital expenditures thru 2030

Capital Program

* Workload
  * $200 million annual capital budget
  * 200 active projects
    * typical capital facility project size - $14 million
    * largest capital project - $1.89 billion
    * average capital project about 10 years
    * typical asset management project size - $200,000
  * 150 active contracts (design and construction)

*Note – WTD does not make regulations, rather complies with State and Federal requirements

Capital Project Organization

* Project Planning and Delivery (PP&D) Section:
  * delivers capital facilities to operations
  * responsible for implementing and managing both engineering/design and construction
  * organized into 5 major units
    -engineering and technical resources
    -planning and asset management
    -construction management
    -project management
    -project control and contract management

WTD Project Control

* Major Areas of Involvement:
  * cost engineering (projects and program)
  * estimating (small projects, change orders)
  * electronic information management systems
  * contract management
  * scheduling
  * public disclosure

WTD Estimating and Capital Project Budgeting

* Estimating generally thought of as construction take-offs/unit pricing
  * WTD does not have significant estimating resources
  * small projects, amendments, change orders estimated in-house
  * larger construction estimates developed by consultants
* Capital project budgeting encompasses planning through completion
  * total cost of delivering the capital project
  * total capital project budgets are developed in-house
* Project and contract definitions
  * the terms project and contract are not synonymous

PC Chronology, Understanding and Refining WTD Business Processes

* 1999 - Created first comprehensive project database
* 2001 - Created initial budgeting model
* 2004 - Implemented standard project cost format and budget model
* 2004 – WTD's PRISM (Project Information System Management) electronic PM tool goes live

-forecasting	-actuals ($'s, hours, phase)
-modeling	-trending
-cashflow	-contracts
-scheduling	-reporting
-contingency	-new initiatives/modifications

* 2005 – WTD began Project Management Institute (PMI training)

Chronology cont.

* 2008 – BFO study of WTD's historical capital performance
* 2010 – Began developing and implementing changes based upon BFO findings (projects take longer and cost more)
* 2011 – PRISM introduces multilevel cost models (type and size)
* 2014 – PRISM implements revisions to contingency standards
* 2014 – PRISM introduces sustainability requirements
* Historical data set and PRISM updated annually ($4.5 billion)

Public Sector Estimating Challenges

* Public sector budget process initially requires publication of very preliminary information
* Conceptual/planning cost and scope required prior to project approval
* Must budget a specific single point cost for each project
  * cannot budget a range of potential costs
  * too large a budget and project will not go forward
  * too small a budget brings about accusations
* Tendency to be overly optimistic
* Do not follow industry standard estimating practices

WTD Planning Level Capital Estimating Challenges

* Long range plans currently out to 2050
  * based on flow sensors, modeling, census data, growth patterns, etc.
* Comprehensive plans (including costs) published 20+ years in advance
  * identification and need of future projects very accurate
  * scope/assumptions used as basis for planning costs not always representative of actual alternative
* Project cannot officially start until approved by Council
* Complexity, technology, regulations and initiatives are difficult to predict 20+ years in advance
* Lowest cost not always driver (scope, quality, schedule, political, etc.)
* Every project is unique (topo, flow, head, capacity, mostly underground, etc.)

Planning Level Estimating Challenges cont.

* Planning level information basis for Council approval, rate setting (annual budget) and long term policy
  * 0 to 2% project definition
  * preferred alternative not known
  * general assumptions regarding scope, siting, etc.
  * public involvement, mitigation not known
  * must budget finite numbers, not ranges
* Planning cost is the cost always remembered by public

Scope versus Budget

* PC involvement starts when Comprehensive Planning transfers project to Project Planning and Delivery (PP&D) team
* Emphasize link between written scope, budgeted scope and contingency
  * written scope and budgeted scope often conflict
    - written scope state delivery of a completed project
    - budgeted scope can be very literal
  * if it isn't in the estimate, it isn't in the scope
* Accurate project budget is reliant upon realistic Total Cost of Construction
* Allowances and contingencies often misunderstood

Baseline Budgeting

* Baseline is when project team puts its stamp on the project scope, schedule and budget
* Baseline is set after preliminary engineering begins on preferred alternative
* Accuracy of actual costs compared to baseline costs is much more accurate
  * considerable improvement since 2008

Project Cost Categories

* Construction costs
  - -construction
  - -outside utilities
  - -owner furnished equip
  - -sales tax
* Non-construction costs (a.k.a. allied or soft costs)
  - -engr./design
  - -planning services
  - -staff labor/burden
  - -construction mgmt.
  - -permitting
  - -initiatives (art, sustainability)
* Land acquisition/right-of-way
* Project contingency

Total Cost of Construction

* Estimated construction costs should reflect expected construction bid values:
  * known or expected construction or project costs not budgeted, cannot be defaulted to project contingency
    * misleading and underscores total construction/project scale
  * low construction estimate effectively underfunds all other aspects of project budget and contingencies
    * allied costs, sales tax, construction change and other forecasted costs all calculated as a percent of construction budget

Non-Construction Costs

* Employ model to help predict total project costs
  * models are based upon $4.5 billion of completed WTD capital projects
  * allied/soft costs are initially based upon percentages of construction
    * 15 different cost models (seamless to users)
  * land costs, mitigation, etc. are not modeled
  * later estimates/forecasts are combination of built-up costs and modeled costs

Contingency

* Contingency is not a catch-all that covers items not contained within the estimate, does not cover modified or new scope
  * Known-knowns, known-unknowns, unkown-unknowns
* Allowances and contingencies often misunderstood
  * estimator's allowances
  * design allowance
  * construction change order contingency
  * project contingency

WTD Contingency Matrix

WTD Estimate Deliverables	AACE Estimate Classes and Characteristics					WTD Construction Contingency			Project Cont.
WTD Phase Estimate	AACE Estimate Class	Degree of Project Definition	Estimate Use *Typical Purpose or Use of Estimate*	AACE Expected Accuracy Range *Typical Variation in Low and High Ranges*	Preparation Effort *Typical Degree of Effort Relative to Least Cost Index of 1*	Construction Pricing Uncertainty Factor	Construction Definition Uncertainty Factor	Construction Change Order Contingency	Project Contingency
Planning Phase (1) Project Identification (a.k.a. Transfer Document/Charter) » CST GATE 1	Class 5	0% to 2%	-Conceptual Screening	L: -20% to -50% H: +30% to +100%	1	Up to 5%	25%	10%	30%
Preliminary Design Phase (2) ◊ Initial Cost Plan ◊ Alternatives Analysis Estimates » CST GATE 2	Class 4	1% to 15%	-Order of Magnitude -Concept Study -Feasibility	L: -15% to -30% H: +20% to +50%	2 to 4	Up to 3%	20%	10%	25%
◊ Develop Preferred Alternative ◊ Baseline Estimate » CST GATE 3	Class 3	10% to 40%	-Budget -Authorization -Control	L: -10% to -20% H: +10% to +30%	3 to 10	Up to 2%	15%	10%	15%
Final Design Phase (3) ◊ 60% Design Estimate	Class 2	30% to 70%	-Control	L: -5% to -15% H: +5% to +20%	4 to 20	Up to 1%	10%	10%	10%
◊ 90% Design Estimate ◊ 100% Bid Document Estimate Implementation Phase (4) ◊ Bid Opening/Engineer's Estimate ◊ Construction Change Order and Work Order Estimates	Class 1	70% to 100%	-Check Estimate -Bid/Tender -Change Order	L: -3% to -10% H: +3% to +15%	5 to 100	0%	0%	10%	5%

PRISM

Project Information System Management Database

* Effort Began in 2003 to Position WTD for Data Management Needs
* Microsoft SQL Database with Servoy User Interface
* Programming Executes and Standardizes Business Processes
* Completed Transition from Multiple Legacy Systems in 2009
* Used to Manage 200 Projects & 150 Contracts Per Year
* Historical Records for 2000 Projects & 1000 Contracts
* Categorizes 20 Years of Historical Financial Data ($4.5B)
* 10 Years of Detailed Project Budget Data
* Automated Daily Project Expenditure Updating

PRISM

Project Information System Management Database

* Consistent Business Practices
  * Budgeting
  * Scheduling
  * Payments, Amendments and Change Orders
  * Reporting
* Comprehensive Coverage
  * Intranet User Accessibility
  * Contains All Capital Projects and Contract
  * Historical Records
* Centralized Data Management
  * Development and Deployment Control
  * Data Integrity and Standardization

PRISM

Project Information System Management Database

* Project Management
  * General Info, Scope, Status, Schedule, Multi-Year Budgets, Cost Reporting, Actuals Reconciliation, Contract Requests, Prioritization/Ranking, Variance Analysis
* Contract Management
  * General Info, Firms, Payments, Task/SOV Tracking, Amendments, Change Orders, RCOs/RCPs, Work-order Management, Authorization Levels
* Reporting
  * Current to Baseline or Multi-Year Budget and Schedule Variances
  * Monthly Expenditure to Budget Variance
  * Quarterly Detailed Project and Contract Status Reports
  * Mandated Reporting
  * Budget Submittal Packages
  * Ad-Hoc Reporting-User Specified Criteria

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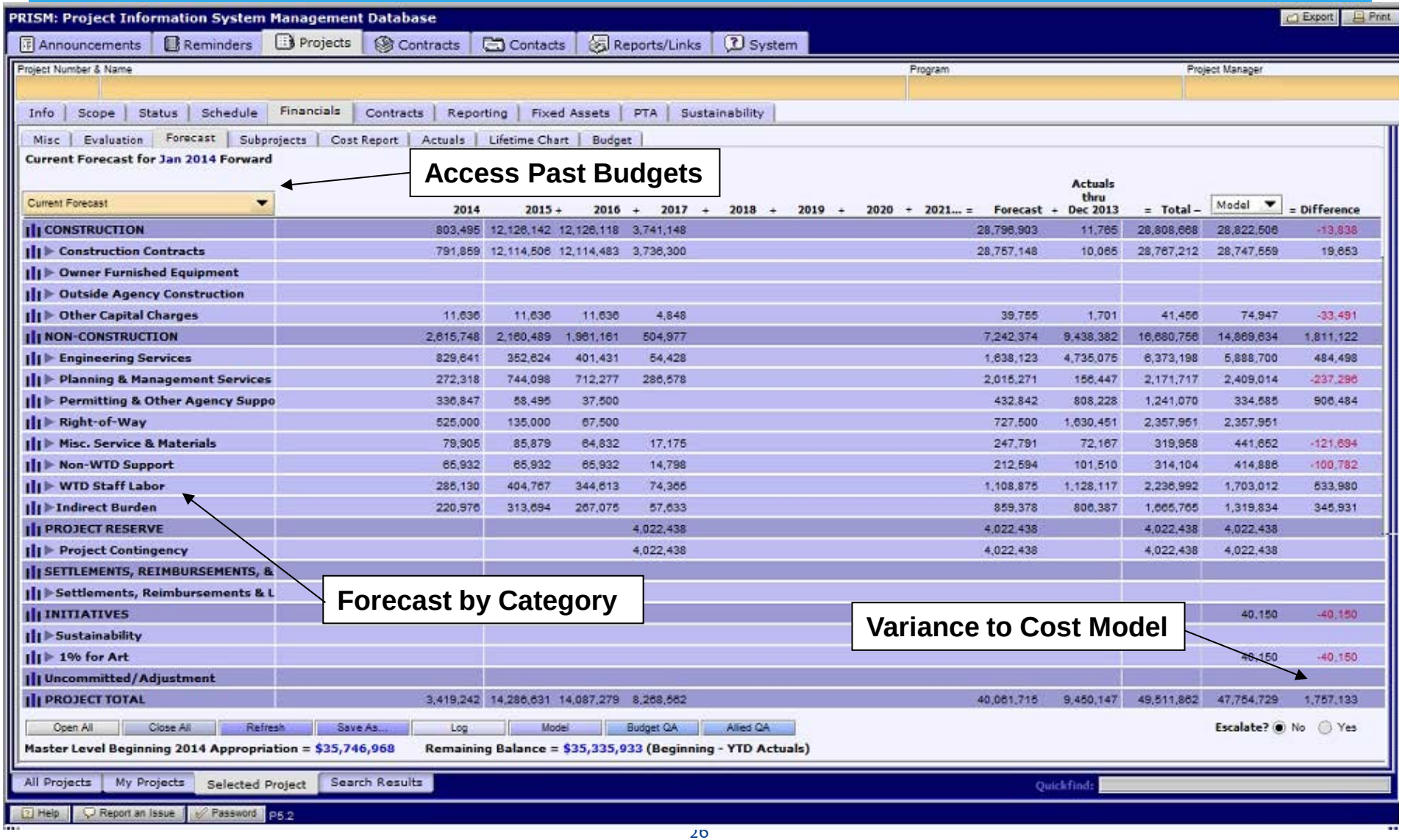
PRISM

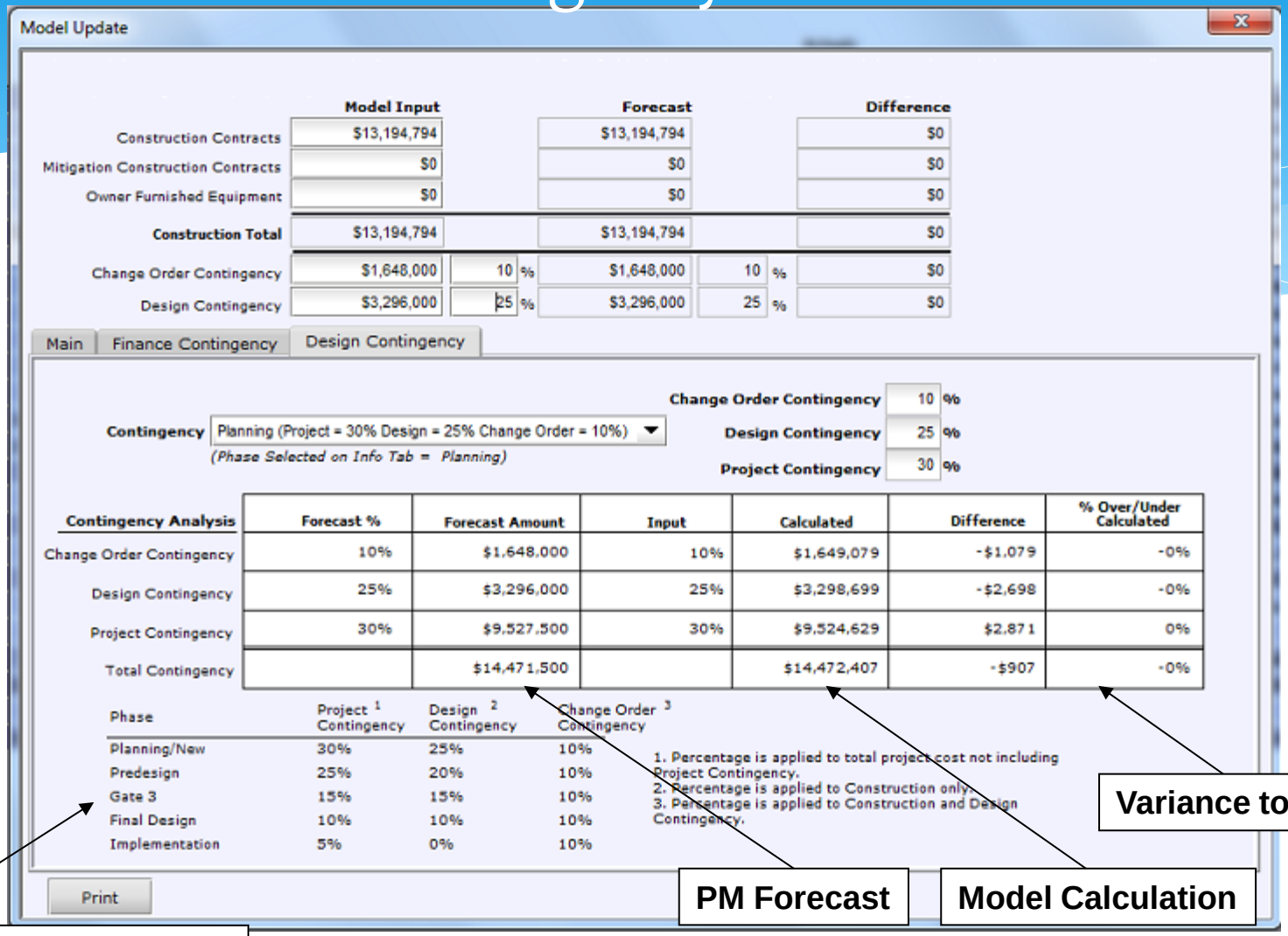
Project Forecasting/Budgeting

* 49 Line Item Capability
* Actuals Mapped to Line Items
* 24 Line Items Modeled Based on Construction Cost
* 3 Line Items Auto-Calculated (Overhead/Sales Tax/Sustainability)
* Access to Past Forecasts/Budgets
* Baseline and What if Scenario Capability
* Nominal and Escalated $
* Contingency Model
* Schedules Also Saved with Budgets

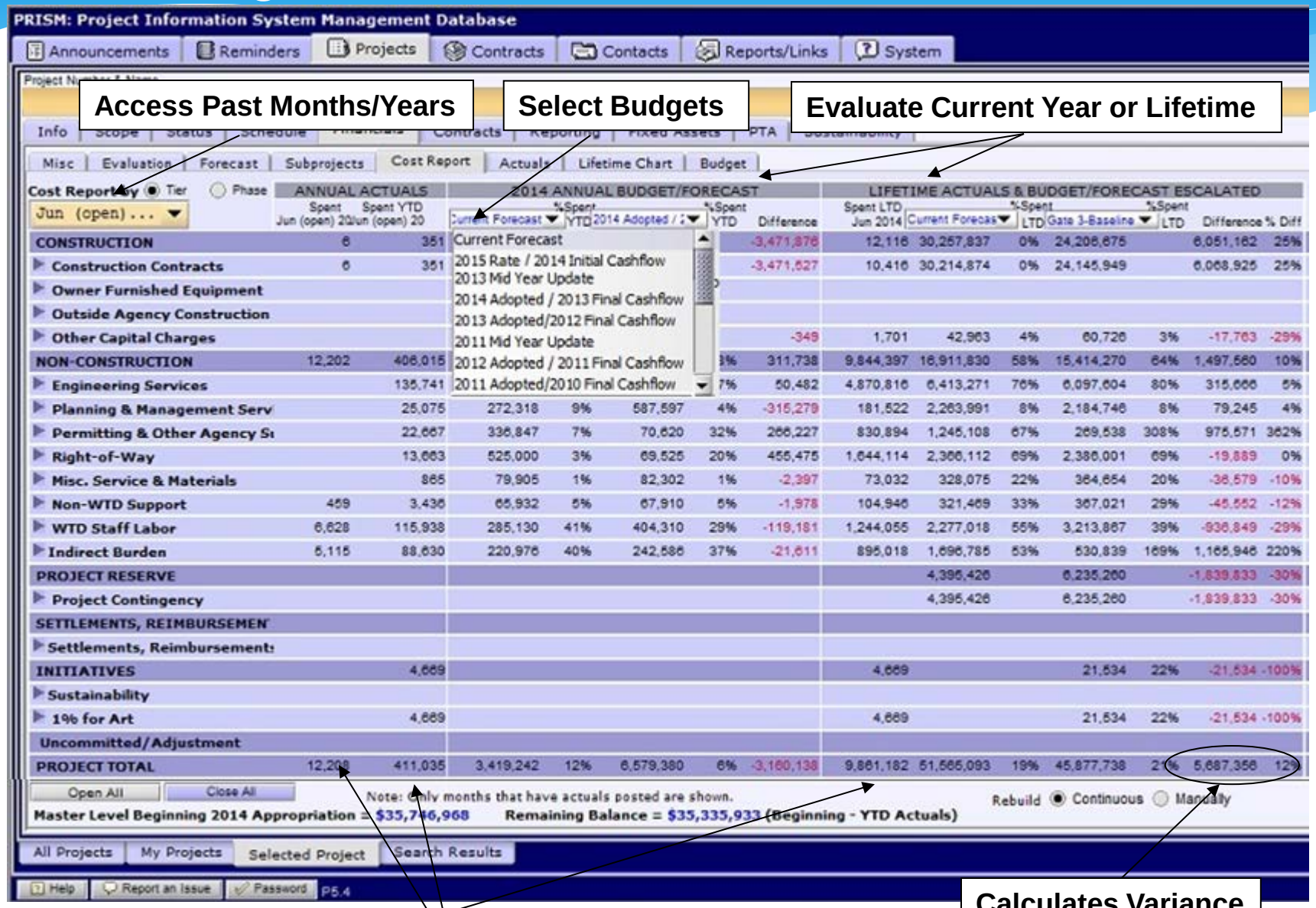
Project Forecasting/Budgeting



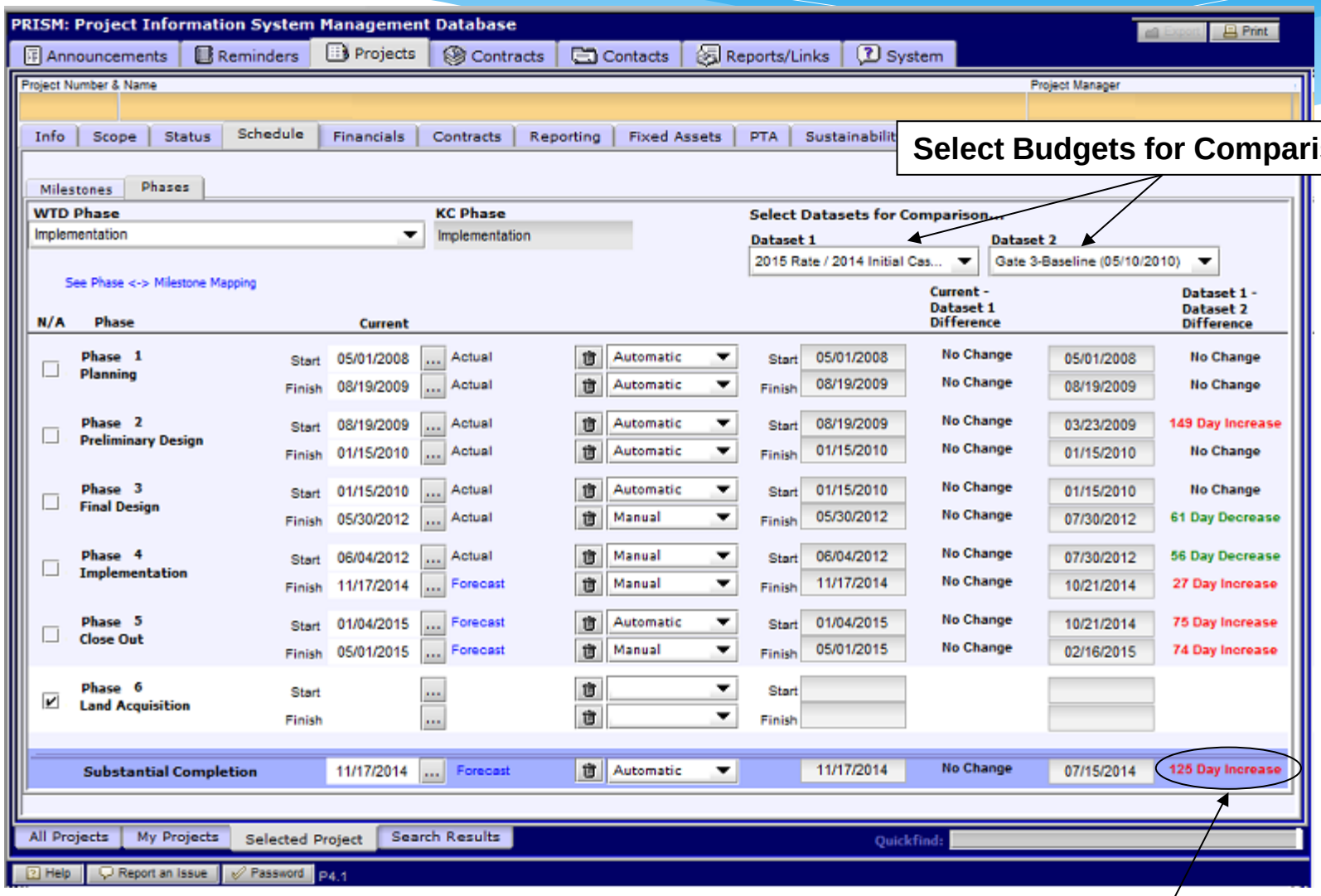
Contingency Model



Budget Variance-Current to Baseline



Schedule Variance-Current to Baseline



Select Budgets for Comparison

Calculates Variance

Conclusion

* Project Control delivers on management's commitment and investment toward improving project estimating and budgeting.
* We are a neutral party providing information, analysis and reporting for decision makers.
* We provide tools and reports for senior management resulting in consistent policies and performance measurement.
* We provide accessible tools and information for Project Managers to improve estimating accuracy and improved project delivery.
* Change is inevitable. We must be flexible and adaptable to changing requirements.

Questions / Contact Info.

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http://www.kingcounty.gov/environment/wtd.aspx

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