PROJECT PAINTER 101

TROJANALYTIC

6 OCTOBER, 2025

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Executive Summary

- **Objective**

  Install and certify a fully operational industrial paint booth within a strict three-month period; install with minimal disturbance to other operations

- **Challenge**

  The project faced a **supply chain bottleneck** in acquiring and installing the paint booth and sprinkler system, threatening production schedules and increasing cost uncertainty.

- **Resolution**

  The project **successfully installed the paint booth and Dry Chem System**, completed with a clear scope, updated cost and schedule baselines, and robust risk management measures in place.

Content

Project Objectives & Problem Statement

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Objectives

- **Install and certify a fully operational industrial-grade paint booth** with curing system, fire suppression, and environmental safety compliance.
- **Complete all permitting, site preparation, installation, and inspections** within a strict three-month timeline to ensure readiness before the peak production season and minimize disruption to ongoing operations.

Statement

To resolve production delays in the paint department, **the project will install and certify a new industrial-grade paint booth at the El Segundo facility.** This will eliminate workflow bottlenecks, ensure regulatory compliance, and enable the plant to meet customer demand with minimal operational disruption.

Scope

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> To address severe production delays in the paint department, this project focuses on installing and certifying a new industrial-grade paint booth system at the El Segundo facility. The scope defines what will be delivered, what is excluded, and the key assumptions guiding execution.

In Scope

- Install and certify a new industrial-grade paint booth with curing unit at El Segundo facility.
- Planning, procurement, site preparation (electrical, concrete, ductwork).
- Installation of fire suppression/sprinkler systems.
- Compliance with Cal/OSHA, fire codes, and environmental regulations.
- Final testing, calibration, certification, training, and documentation.

Out of Scope

- Expanding production capacity beyond the new booth.
- Upgrades to unrelated plant equipment or systems.
- Long-term maintenance or post-project staffing.
- Any activities outside permitting, installation, and certification.

Deliverable

- Fully installed & certified paint booth system.
- Approved permits and inspection sign-offs.
- Fire suppression/sprinkler systems tested.
- Final training + documentation package.
- Project report (schedule, cost, risks, communication records).

Key Planning Elements

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> We guide the project through clear milestones, resource coordination, and risk control to ensure the booth is delivered on time and with quality.

Timeline & Milestones

- **Weeks 1–4:** Procurement of booth & equipment.
- **Weeks 7–8:** Permits and inspections completed.
- **Weeks 12–13:** Site preparation (electrical, foundations, ductwork).
- **Weeks 14–15:** Booth installation, fire suppression, and testing.
- **Post-implementation:** Ongoing adjustments and inspections.

Resources & Dependencies

- Vendor coordination for booth, HVAC, electrical teams.
- Regulatory approvals from Fire Marshal, Cal/OSHA, Air Quality Management.
- Funding commitment from corporate.
- Leveraging prior 2021 paint booth expertise.

Risk Mitigation

- Close monitoring of permits/inspection timelines.
- Active supervision of equipment procurement to avoid delays.
- Coordination with plant operations to minimize disruptions.
- Contingency planning for installation complications.

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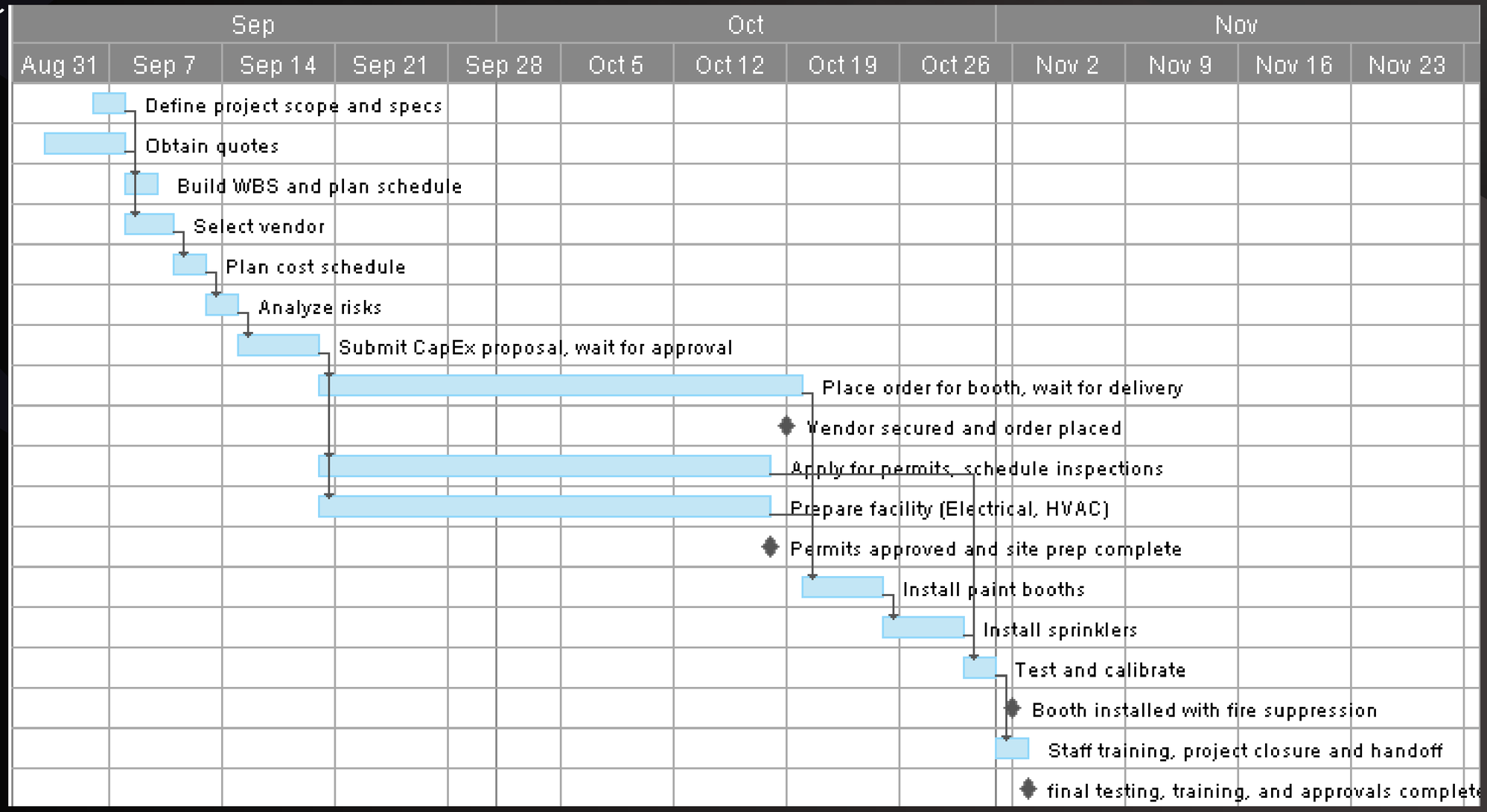
Gantt Chart Overview



Project Start Date: 2025/9/8, **Total Time Duration**: 61days

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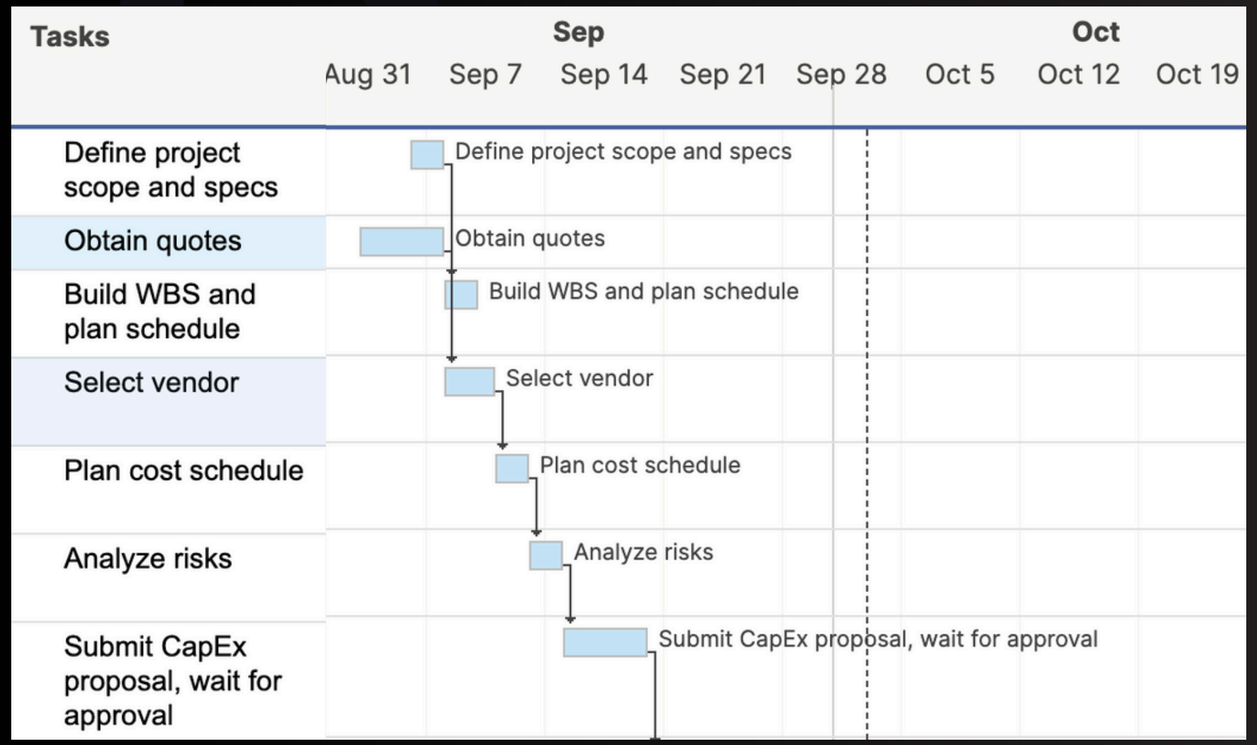
Gantt Chart Walk Through - 1



During Stage 1, our focus is on **laying the groundwork before execution**. This stage involves:

- Defining the **Work Breakdown Structure** (WBS) and scheduling milestones
- Identifying and selecting the most suitable vendor
- Establishing the cost schedule and aligning financial resources
- Evaluating and mitigating potential risks
- Submitting the CapEx proposal for review
- Securing management approval to proceed

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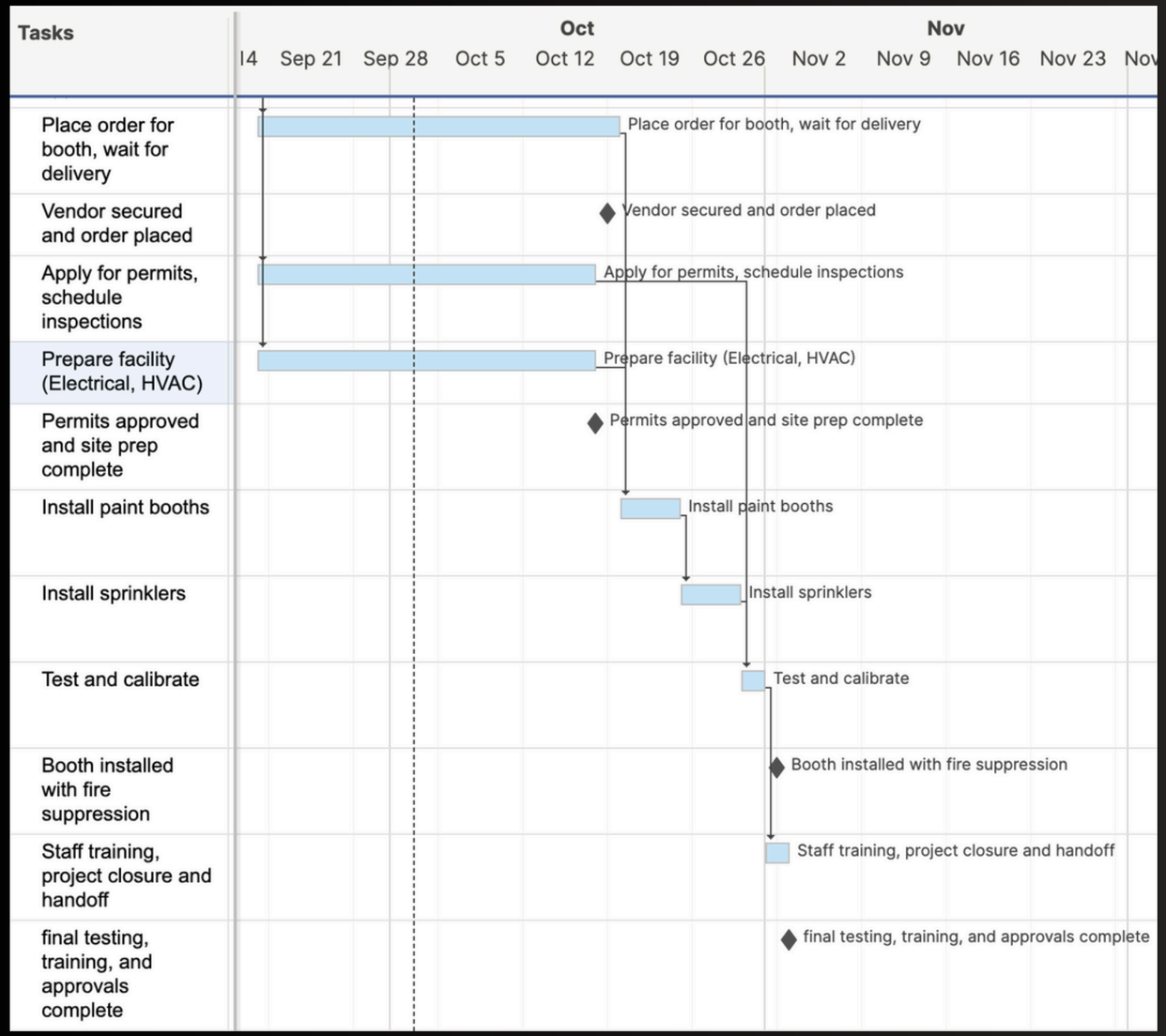
Gantt Chart Walk Through - 2



Stage 2 represents the **execution** and **implementation phase,** where the project transitions from preparation to operational readiness. Key activities include:

- Procurement and order placement for the booth
- Regulatory compliance through permit applications and inspections
- Facility preparation covering electrical and HVAC requirements
- Sequential installations of paint booths and fire-suppression systems
- System calibration, performance validation, and quality assurance
- Staff training, knowledge transfer, and project closure
- Final verification and approval processes

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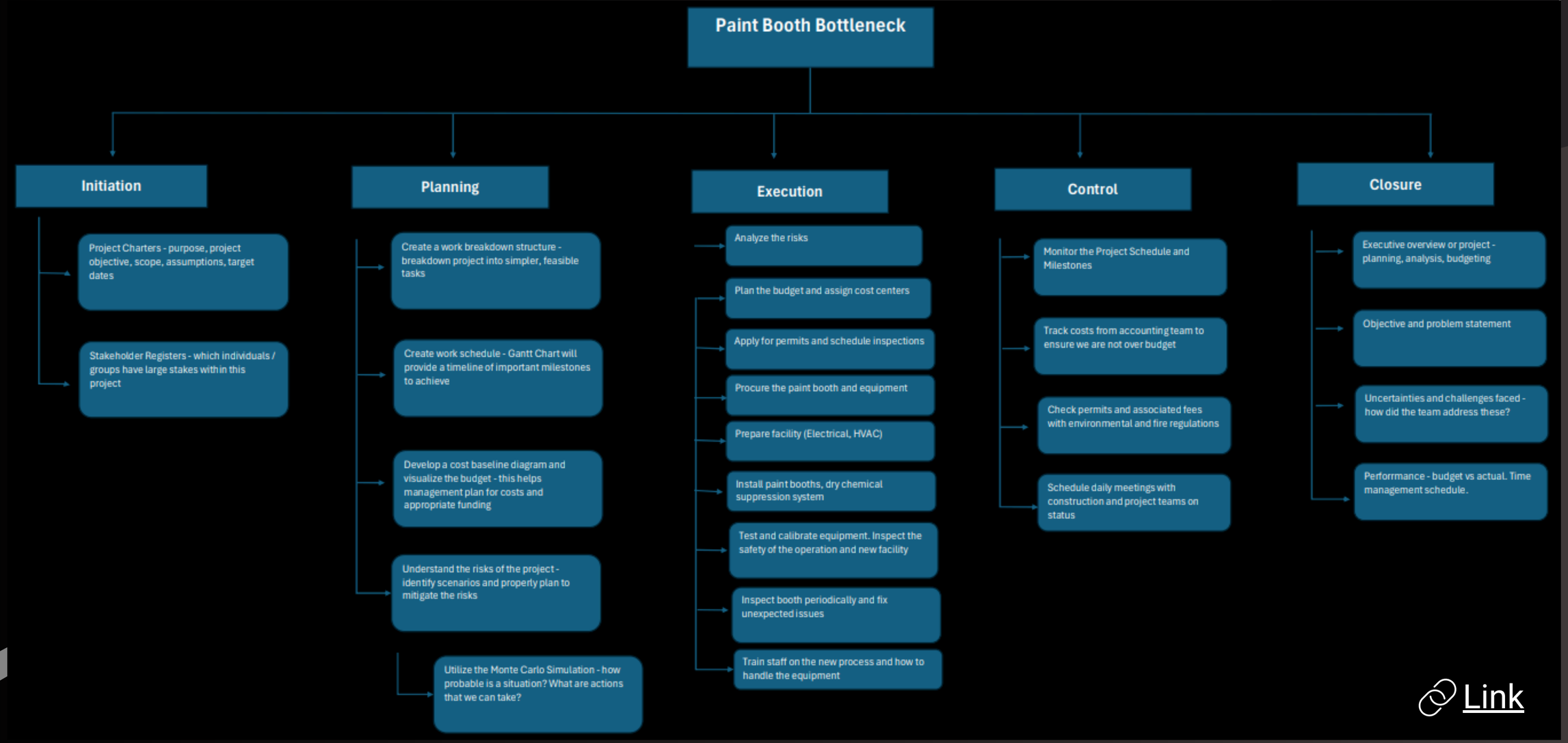
Work Breakdown Structure

A Glance of Work Procedure



Link

Planned Cost Baseline

Costline Assumptions:

1. Final quote for the new booth installation is **$80,000,**
2. Assume that 2025 booth is **144%** larger than the 2021 installation based on the final quote of $80,000,
3. Equipment rentals are expected to cost **33%** more than last time,
4. Spread facility prep cost into 2 weeks,
5. Spread equipment rentals cost into 3 weeks

The project's initial cost baseline:

1. planned cost of **$80,000**,
2. timeline from **9/3/25 to 11/11/25.**

Item Name	Cost Date	Cost	Cummulative
Project Start	*9/3/2025*	$0.00	*$0.00*
PainTech EasyDry Paint Booth (Deposit)	*9/15/2025*	$25,000.00	*$25,000.00*
Facility Inspection Fees	*9/15/2025*	$1,500.00	*$26,500.00*
LADBS Building Permit	*9/15/2025*	$500.00	*$27,000.00*
LADBS Electrical Permit	*9/15/2025*	$150.00	*$27,150.00*
LADBS Mechanical Permit	*9/15/2025*	$150.00	*$27,300.00*
LAFD Sprinkler Permit	*9/15/2025*	$1,000.00	*$28,300.00*
SCAQMD Permit to Construct	*9/15/2025*	$1,400.00	*$29,700.00*
SCAQMD Permit to Operate	*9/15/2025*	$1,200.00	*$30,900.00*
Facility Prep (Electrical, HVAC) Week 1	*9/15/2025*	$2,500.00	*$33,400.00*
Equipment Rentals (Boom life, etc) Week 1	*9/15/2025*	$665.00	*$34,065.00*
Facility Prep (Electrical, HVAC) Week 2	9/22/2025	$2,500.00	*$36,565.00*
Equipment Rentals (Boom life, etc) Week 2	9/22/2025	$665.00	*$37,230.00*
Equipment Rentals (Boom life, etc) Week 3	9/27/2025	$665.00	*$37,895.00*
PainTech EasyDry Paint Booth (Remaining upon delivery	*10/19/2025*	$25,000.00	*$62,895.00*
Paint Booth Installation	*10/20/2025*	$4,887	*$67,782.00*
Sprinkler Installation	*10/25/2025*	$12,218	*$80,000.00*

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Risk Register

Highest Priority Risks:

- **Supply Chain Delays** (Priority Level 16) and **Installation** (Priority Level 15) are the most critical threats to project cost and schedule.

Medium Priority Risks:

- **Facility Prep, Safety Incidents, Quality Control** (each scored 10), **Equipment Rentals** (6), and **Labor Availability** (8) require ongoing monitoring and proactive actions.

Lower Priority Risks:

- **Permits** (3) is less severe but still tracked to avoid escalation.

Mitigation & Accountability:

- Each risk has a **clear owner** and **targeted mitigation strategy** to reduce probability or impact.

TractorCo Paint Booth Installation Risk Register						
Risk Description	**Impact Description**	**Probability Level**	**Impact Level**	**Priority Level**	**Mitigation Strategies**	**Owner**
Brief Summary of the risk	Consequences if the risk is not mitigated or eliminated	Rate 1 (low) to 5 (high)	Rate 1 (low) to 5 (high)	(Probability x Impact)	What can be done to lower or eliminate the impact or probability	Who is responsible?
Delays with permits and inspections	Creates bottleneck for implemetation which delays the installation process	3	1	3	Obtain regular updates from Wendy Gale,John Storm	Murphy Yang (PM)
Equipment Rentals	Critical equipment not available on time	3	2	6	Maintain good relationships with vendors	Binbo Xu (Financial Analyst)
Facility Prep	Underestimated HVAC/electrical needs	2	5	10	Plant preperation, maintain relationship with HVAC vendors	Kevin Rey Monje (Project Analyst)
Installation	Unforeseen compliance issues needs additional modifications	5	3	15	Leveraged the plant manager's experience to identify potential installation issues, propose solutions, and reduce both error likelihood and resolution time	Steve Wang (Data Analyst)
Supply chain delays	The ingredients of building the installation weren't on time	4	4	16	Diversify suppliers, keep buffer stock of critical materials, and track deliveries with real-time monitoring systems	Kevin Rey Monje (Project Analyst)
Labor Availability	Hard to find workers or some absenteeism of the workers	4	2	8	Establish agreements with multiple labor agencies, cross-train existing staff, and create an on-call labor pool to mitigate absences	Rona Zhang (Data Analyst)
Safety Incidents	Accidents or hazards during installation leading to injury or delays	2	5	10	Implement strict safety training, perform daily toolbox meetings, enforce PPE compliance, and conduct regular on-site inspections	Steve Wang (Data Analyst)
Quality control	Final output not meeting standards, requiring rework or corrections	2	5	10	Develop a quality assurance checklist, assign dedicated QC inspectors, and schedule interim inspections during installation instead of only post-installation	Rona Zhang (Data Analyst)

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The risk register highlights both the severity of risks and their interconnections. Supply chain delays can amplify installation and labor risks, while safety and quality issues may cause rework and schedule slippages. By mapping risks with scores and ownership, management can prioritize systemic threats while monitoring isolated ones, creating a structured approach that strengthens execution resilience and reduces both disruptions and cost escalation.

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Risk Priority Matrix

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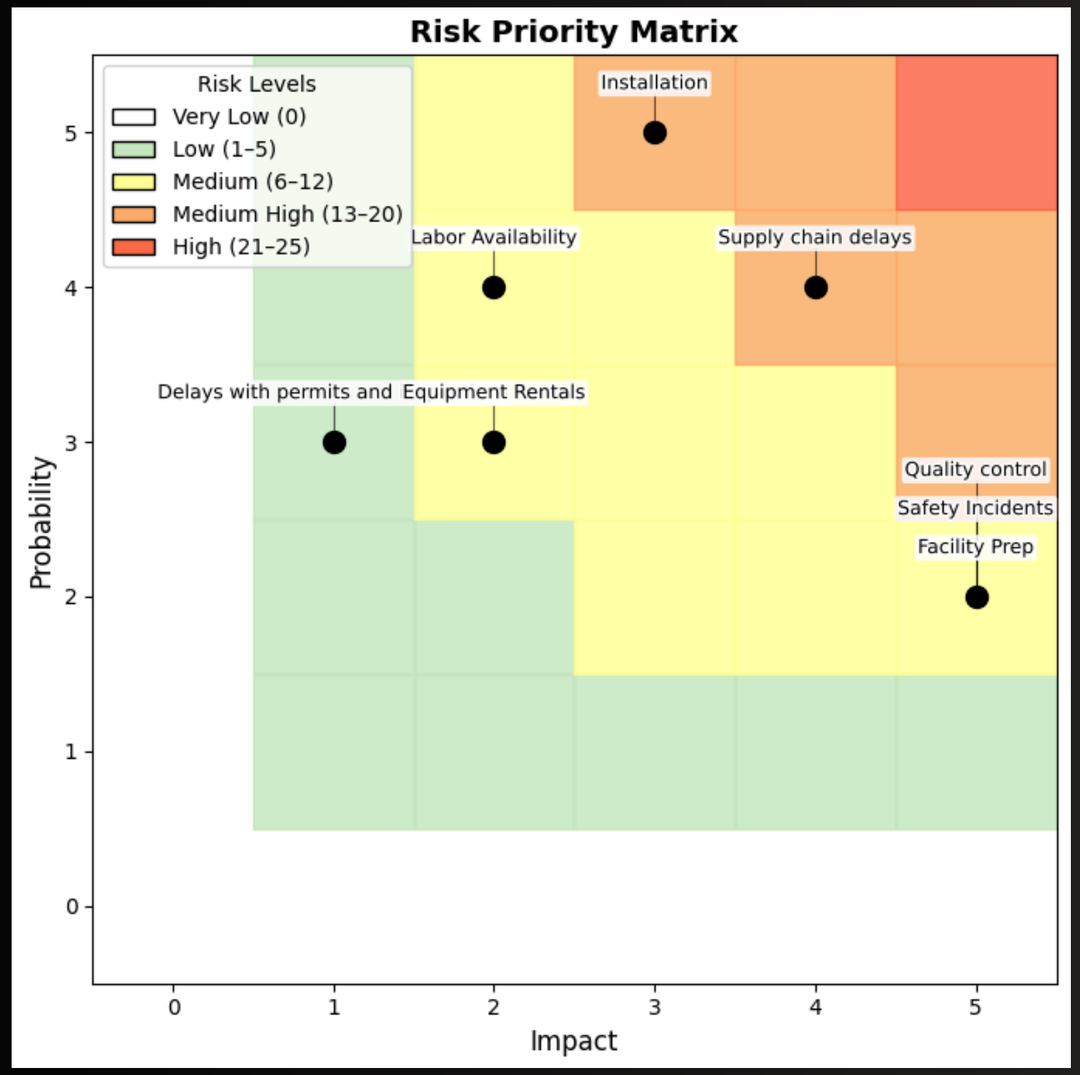

Colab Notebook

- Visualization was developed in Python, translating Risk Register inputs (Probability × Impact) into a **heatmap and scatter plot**.
- Each risk was plotted at its assigned probability and impact, with color zones showing **severity levels**.
- **Supply Chain Delays and Installation risks** fall into the higher-risk zones, making them the **most urgent priorities**.
- Facility Prep, Safety, and Quality Control are in the medium range, requiring **proactive monitoring**.
- Permits, Rentals, and Labor Availability appear in lower-risk areas but **still require tracking**.
- The **customized chart** enables management to **visually prioritize risks** and **align mitigation strategies** with the areas of greatest concern.

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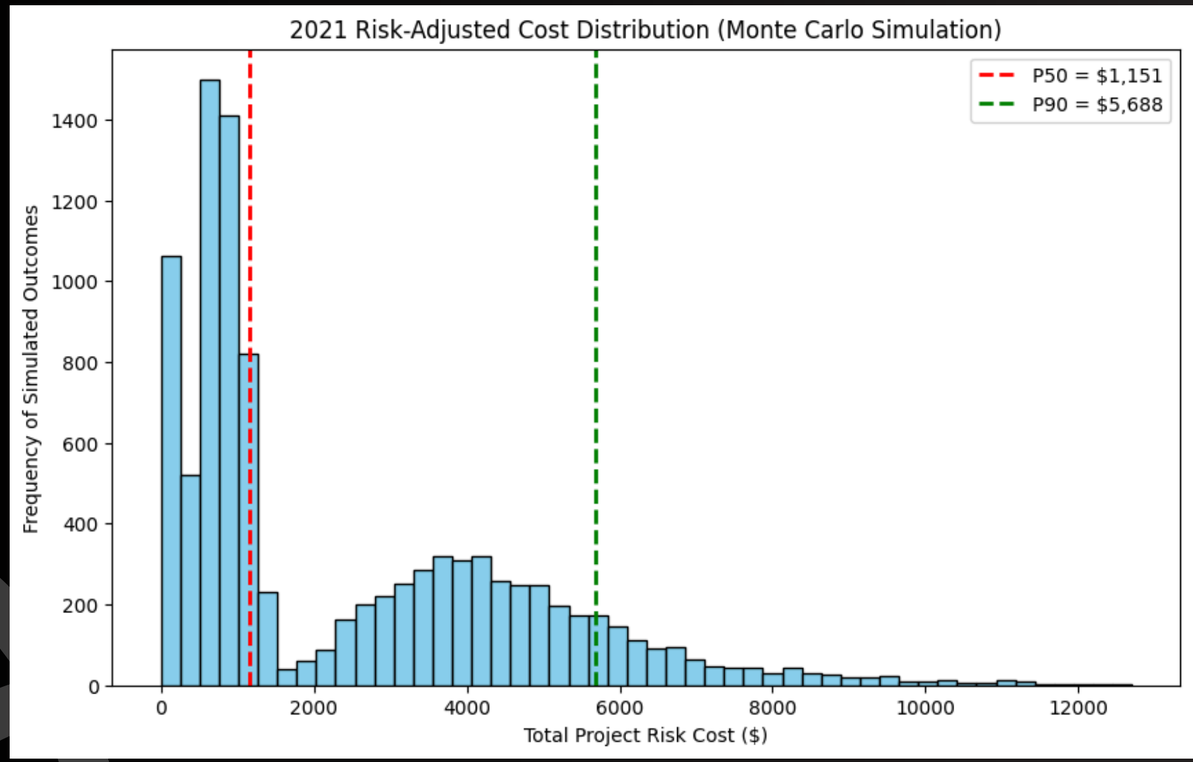
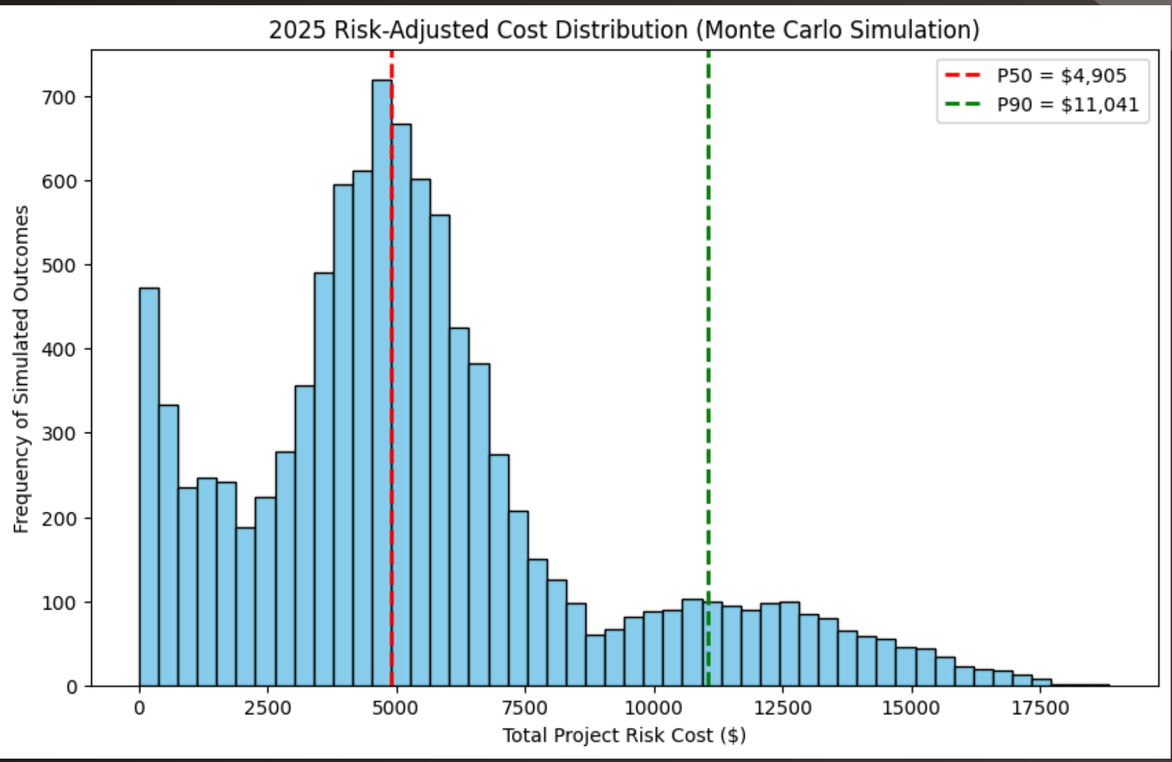
Uncertainty Analysis - Monte Carlo Simulation

	Risk	Min	Most Likely	Max	Likelihood
0	Facility Prep	1000	3000	7000	0.2
1	Equipment Rentals	250	700	1500	0.8
2	Installation	800	3000	6000	0.3

2021 VS 2025

	Risk	Min	Most Likely	Max	Likelihood
0	Permits	150	575	1000	0.5
1	Facility Prep	2000	7000	12000	0.2
2	Equipment Rentals	250	1125	2000	0.5
3	Installation	1000	4000	7000	0.8





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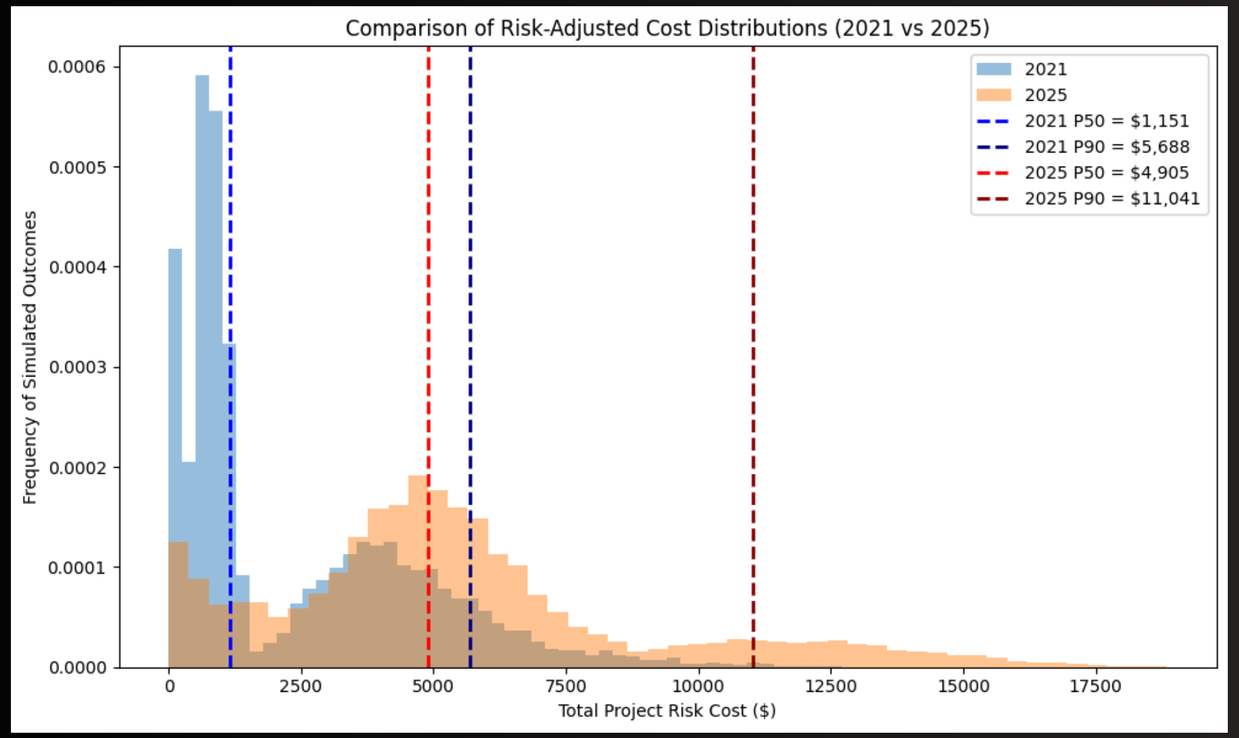
Uncertainty Analysis - Monte Carlo Simulation



- **P50** represents the **median outcome**: half of all simulated scenarios fall below this cost, but budgeting at P50 means a **50% chance of overruns**.
- **P90** is the **more conservative** benchmark: 90% of simulated outcomes fall below this cost, providing **greater confidence** in staying within budget. (**Approved by General Manager**)
- The comparison of distributions shows a **substantial upward shift** in risk-adjusted costs **from 2021 to 2025**.
- By **2021**, the **P50** was about **$1.1K** and the **P90** was **$5.7K**, with most outcomes **clustered at the lower end**.
- By **2025**, the **P50** rises sharply to nearly **$4.9K** and the **P90** nearly doubles to over **$11K**, reflecting both higher typical costs and **more severe** worst-case outcomes.

Possible reasons of why the 2025 risk-adjusted cost nearly doubled compared to 2021:

- **Inflation in construction materials and labor**: Prices for steel, electrical equipment, and skilled labor rose sharply after 2020 due to **supply chain disruptions** and **labor shortages**, especially because of the cumulative effects of **COVID pandemic** period. This pushed the baseline cost of facility preparation and installation much higher in 2025.
- **New regulatory and permitting requirements**: Unlike 2021, the 2025 cost structure includes **permits** (building, sprinkler, SCAQMD, etc.), which add both **direct costs** and **additional risk of delay**. These new items reflect stricter compliance and higher fees.
- **Expanded scope and higher likelihood of risks**: The 2025 plan spreads costs across **more weeks of rentals** and **larger facility prep ranges**, with higher probabilities assigned to installation risks.

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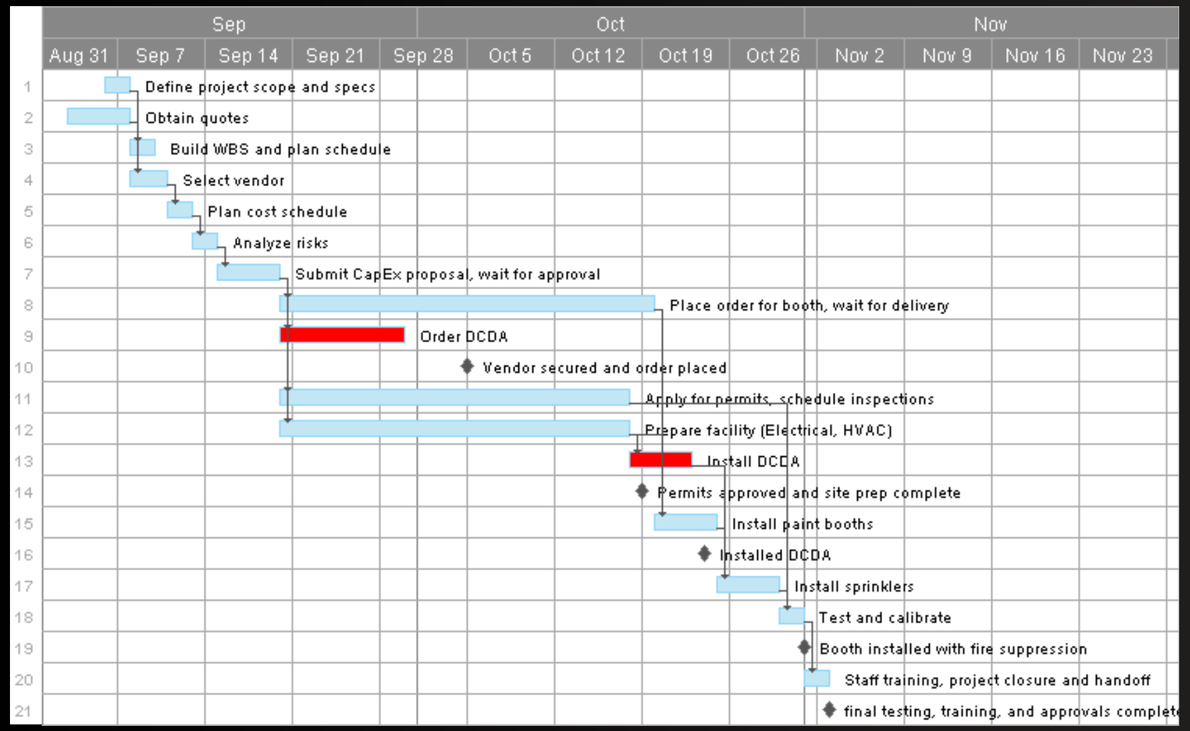
Change Management Record

Updated Gantt chart

Option 1

Order Double Check Detector Assembly (DCDA)

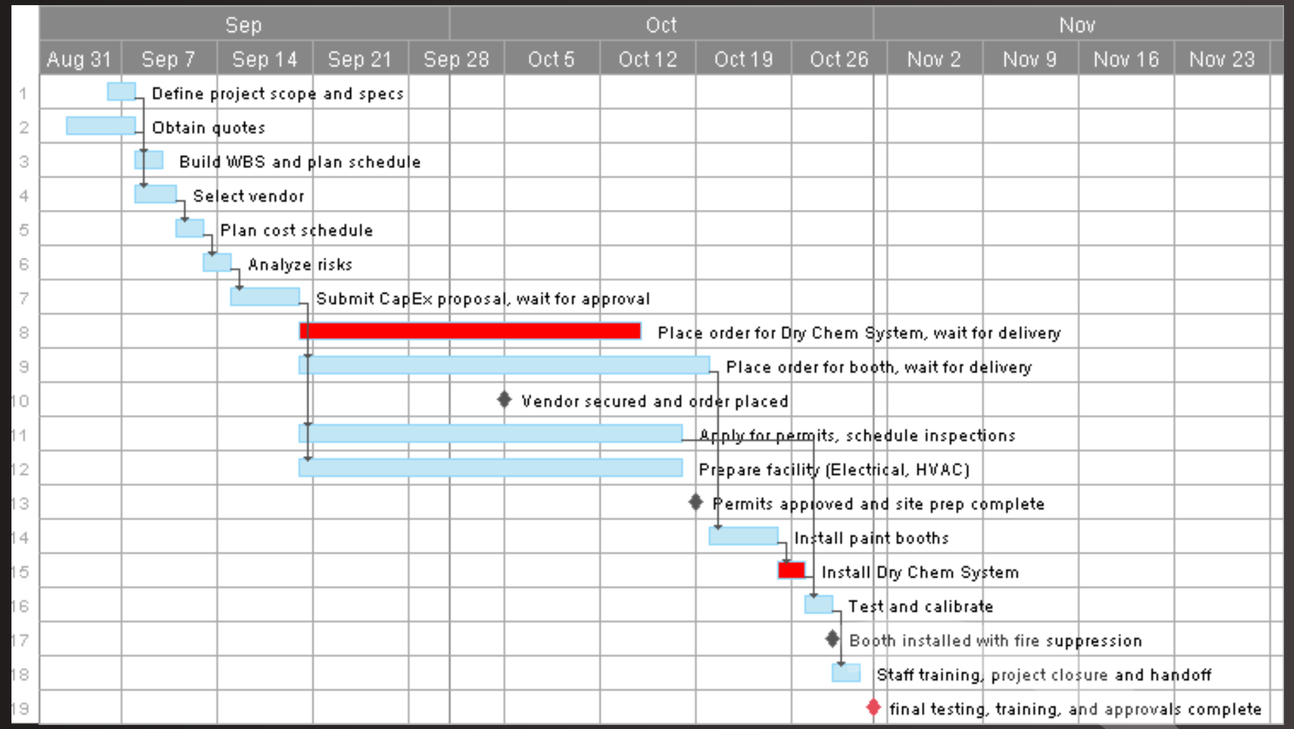


project duration 61 days(+0 Days)

Total Cost: + $10K

Option 2

Order Order Dry Chem System + Install Dry Chem System

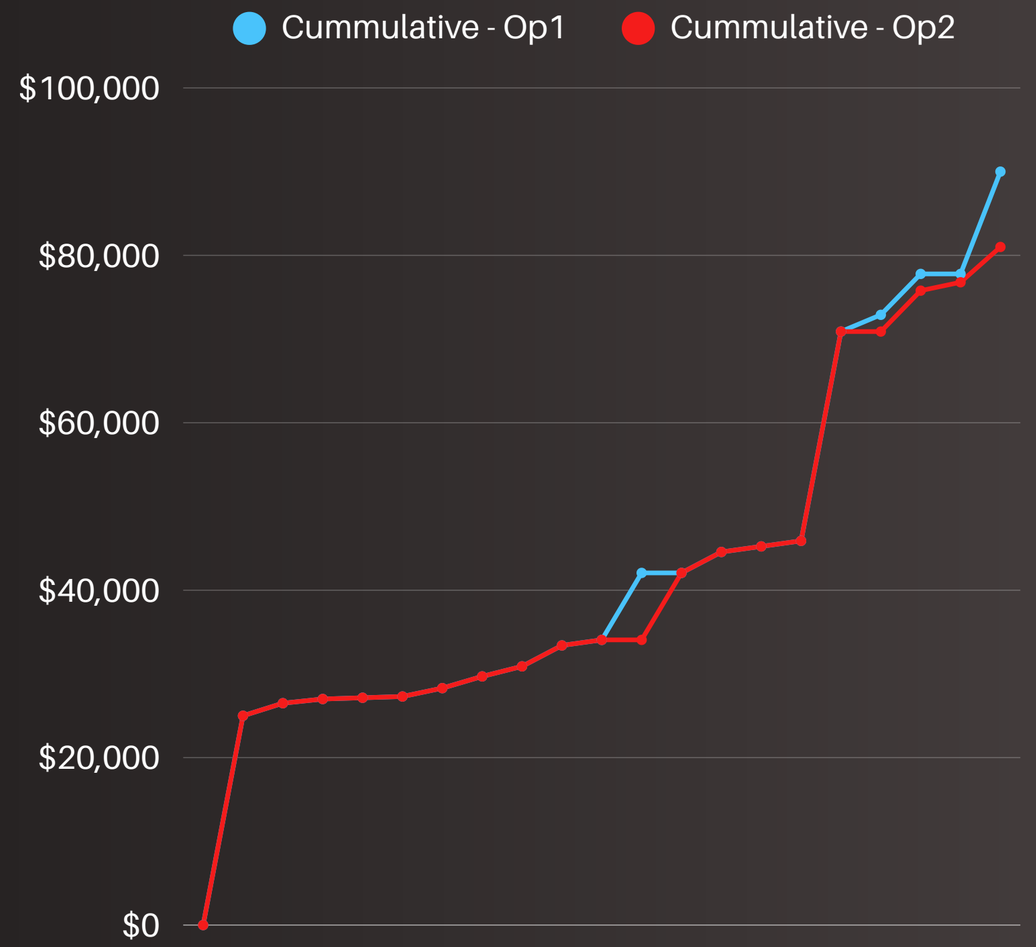


project duration 58 days(-3 Days)

Total Cost: + $1K

Updated Actual Cost Baseline

Item Name	Cost - Option1	Cummulative - Op1	Cost-Option2	Cummulative - Op2
Project Start	$0.00	$0.00	$0.00	$0.00
PainTech EasyDry	$25,000.00	$25,000.00	$25,000.00	$25,000.00
Facility	$1,500.00	$26,500.00	$1,500.00	$26,500.00
LADBS Building	$500.00	$27,000.00	$500.00	$27,000.00
LADBS Electrical	$150.00	$27,150.00	$150.00	$27,150.00
LADBS	$150.00	$27,300.00	$150.00	$27,300.00
LAFD Sprinkler	$1,000.00	$28,300.00	$1,000.00	$28,300.00
SCAQMD Permit	$1,400.00	$29,700.00	$1,400.00	$29,700.00
SCAQMD Permit	$1,200.00	$30,900.00	$1,200.00	$30,900.00
Facility Prep	$2,500.00	$33,400.00	$2,500.00	$33,400.00
Equipment	$665.00	$34,065.00	$665.00	$34,065.00
DCDA,	$8,000.00	$42,065.00	$0.00	$34,065.00
Order Dry Chem	$0.00	$42,065.00	$8,000.00	$42,065.00
Facility Prep	$2,500.00	$44,565.00	$2,500.00	$44,565.00
Equipment	$665.00	$45,230.00	$665.00	$45,230.00
Equipment	$665.00	$45,895.00	$665.00	$45,895.00
PainTech EasyDry	$25,000.00	$70,895.00	$25,000.00	$70,895.00
DCDA Installation	$2,000.00	$72,895.00	$0.00	$70,895.00
Paint Booth	$4,887	$77,782.00	$4,887	$75,782.00
Dry Chem System	$0	$77,782.00	$1,000	$76,782.00
Budgeted	$12,218	$90,000.00	$4,218	$81,000.00



→ **Select Option 2:** 3 days shorter duration and $9K lower cost compared to Option 1

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Budget to Actual Analysis

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Item Name	Cost Date	Planned Cost	Acutal Cost	Variance
Project Start	9/3/2025	$0	$0	$0
PaintTech EasyDry Paint Booth (Deposit)	9/15/2025	$25,000	$25,000	$0
Facility Inspection Fees	9/15/2025	$1,500	$1,500	$0
LADBS Building Permit	9/15/2025	$500	$500	$0
LADBS Electrical Permit	9/15/2025	$150	$150	$0
LADBS Mechanical Permit	9/15/2025	$150	$150	$0
LAFD Sprinkler Permit	9/15/2025	$1,000	$1,000	$0
SCAQMD Permit to Construct	9/15/2025	$1,400	$1,400	$0
SCAQMD Permit to Operate	9/15/2025	$1,200	$1,200	$0
Facility Prep (Electrical, HVAC) Week 1	9/15/2025	$2,500	$2,500	$0
Equipment Rentals (Boom lift, etc.) Week 1	9/15/2025	$665	$665	$0
Facility Prep (Electrical, HVAC) Week 2	9/22/2025	$2,500	$2,500	$0
Equipment Rentals (Boom lift, etc.) Week 2	9/22/2025	$665	$665	$0
Equipment Rentals (Boom lift, etc.) Week 3	9/27/2025	$665	$665	$0
Dry Chemical Suppression System	9/27/2025	$0	$8,000	-$8,000
DCSS Installation Cost	10/7/2025	$0	$1,000	-$1,000
PaintTech EasyDry Paint Booth (Remaining upon delivery)	10/19/2025	$25,000	$25,000	$0
Paint Booth installation	10/20/2025	$4,887	$4,887	$0
Sprinkler installation	10/25/2025	$12,218	$4,218	$8,000

All items remained within budget with the exception of the dry chemical suppression system. This item was not within scope but was added on after analysis of option 1 and option 2.

Overall, we added $1000 to the inital budget.

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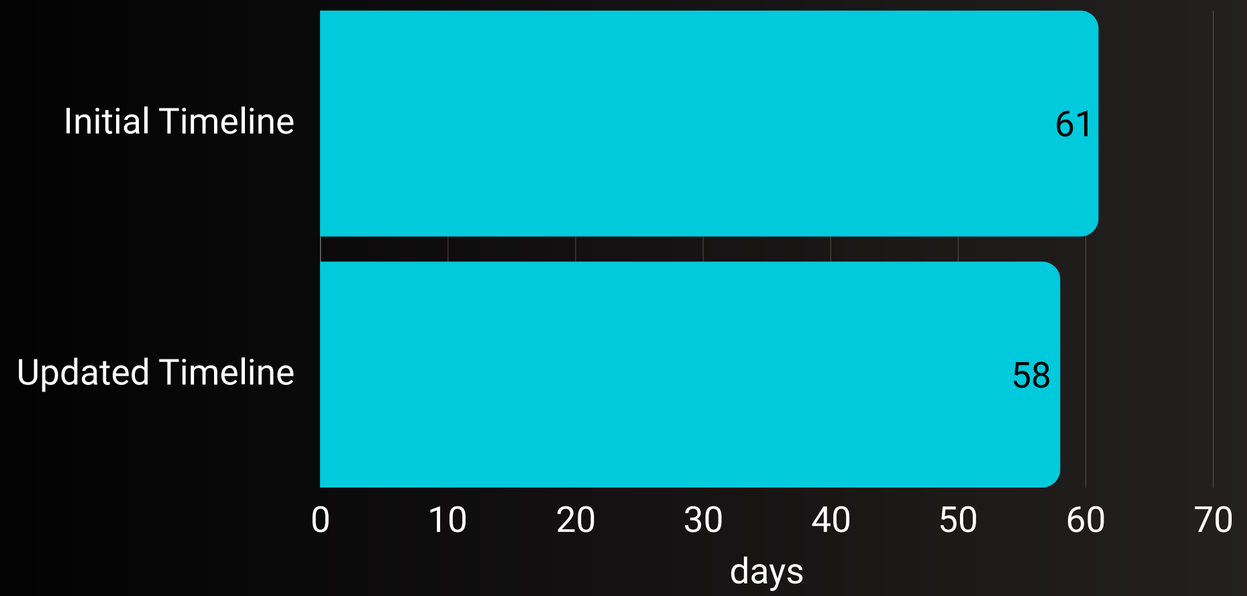
Final Performance Results



Our results indicate that our Initial Earned Value, assuming that we achieved 100% completion of the project, is $80,000. And our planned value, including our risk matrix, is valued at $91,041. Based on our Cost Performance Index, **we are slightly under budget**, and our Scheduled Performance Index is **ahead of schedule,** which is also under 1. This is also supported by the timeline above, where we are ahead of schedule **from 61 days to 58 days**.

Cost Performance Index (CPI)

0.99

Schedule Perfromance Index

0.88

Earned Value

$80,000

Planned Value

$91,041

Lessons Learned Log

What Worked Well

- Clear charter and scope aligned objectives
- WBS improved ownership and accountability
- Risks prioritized with quantitative scoring
- Baseline updates showed cost and schedule impacts
- Scenario analysis supported data-driven choices

What Didn’t Work

- Baseline lacked quantitative validation
- Schedule buffers too limited
- Risk interdependencies captured late
- Technical results hard to communicate

Recommendations for Next Time

- Add larger quantitative contingencies for time and cost
- Validate risks earlier with historical benchmarks
- Keep a living baseline with regular updates
- Simplify visuals for stakeholder clarity
- Stress-test top risks for full outcome range

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THANK YOU

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