

# Special Project Report 1

**California Air Resources Board**

**Integrated Multi-Pollutant Emissions Inventory 3900-069**



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# 1 Proposed Project Change

## 1.1 Project Background/Summary

Emission inventories provide the foundation for all major programs at the California Air Resources Board (CARB), supporting efforts to assess and minimize the impacts of air pollution in California. These scientific data management systems compile estimates of emissions from all types of sources, including stationary industrial facilities, mobile, and naturally occurring sources. These data systems, when combined with air quality monitoring observations and an effective understanding of emission control technologies, help to inform California's emission reduction strategies and measure their progress. Recent legislative requirements namely AB 617 and AB 197 call for comprehensive and understandable assessments of air pollution impacts and trends at a finer level of geographic detail than previously mandated. CARB's emission inventory and related systems must improve to utilize a modern and effective framework to support enhanced data collection and analysis.

### 1.1.1 Description of Business Program

The Air Quality Planning and Science Division (AQPSD) is responsible for developing official plans and strategies for improving California's air quality and utilizing the best available data and analyses to support these plans. This effort involves developing comprehensive emission inventories covering all pollutant and emission source categories, utilizing numerical models to estimate air emissions and impacts in California, and compiling air quality monitoring data from a vast network of sensors. The resulting datasets and analyses provide a means of quantifying emissions and impacts of emissions by source category and region at a high level of detail, as well as providing estimates of future trends based on historical air quality data. The analysis accounts for the impact of California regulations, improvements in emission control technology, and expected economic growth by sector.

AQPSD also works closely with the local air districts to compile emissions data and trends from stationary sources like industrial facilities to complement CARB's estimates for the remaining source categories such as on- and off-road mobile sources. Together these comprehensive emission inventories, models, and air quality monitoring datasets provide a core foundation for the agency's various programs and inform future regulation and strategy development, while tracking the progress of California's programs for reducing air pollutant emissions and public exposure to pollution.

### 1.1.2 Description of Current Business Process

CARB maintains emission inventories for criteria pollutants, toxic air contaminants, and greenhouse gases (GHG) in separate systems with disparate reporting requirements. Data for the air pollutants and emission sources are provided from a variety of resources such as reporting from local air districts and commercial entities or data from CARB emission models. Emissions assessments and reduction efforts require an understanding of the relationship between air pollutants and how impacts from their emissions can be quantified consistently throughout these separate inventories.

### 1.1.3 Impact of the Proposal on the Business Program / Process

The proposed IMPEI systems are critical to supporting CARB's efforts to protect public health. In order to achieve the primary goal of estimating and assessing emissions data, IMPEI will collect and store detailed process-level activity records related to sources of air emissions. These include fuel throughputs or

processes rates associated with specific devices and industrial processes and their associated emission factors, which together can be used to estimate the emissions of various air pollutants by location.

CARB's air quality and climate plans and strategies require emissions to be assessed across all three-pollutant regimes: criteria, toxic, and GHG pollutants. In recent years, CARB has made many efforts to evaluate the potential criteria pollutant and toxic air contaminant emission reductions associated with GHG regulatory measures. However, the disparate database structures and degrees of granularity of information collected by each program has made this task difficult. In 2016, Assembly Bill 197 (Garcia, 2016; AB 197) further codified the need for co-benefit analysis by requiring the uniform and comprehensive assessment and publication of criteria pollutant, toxic air contaminant, and GHG emissions across all programs and inventories. These systems will collect, manage, and disseminate emissions and air quality data in a manner, which not only utilizes the best available science but promotes transparency and public right-to-know.

The IMPEI systems multi-pollutant emissions inventory framework is essential for the support of an integrated compilation of criteria pollutant, toxic air contaminants, and GHG emissions at a refined spatial and temporal time scale, across all CARB programs.

#### **1.1.4 Customers and Users of the Business Program / Process**

During the business requirement gathering phase of the contract, CARB met with various user groups throughout the state to better understand their needs, and how the new AB 617 systems would be used by each group. The list below identifies each user group, and how they intend to use the system:

- Air Districts – Report emissions and related operational information for industrial facilities and other stationary sources which are under their jurisdiction. This information is compiled along with the remaining sources handled by CARB to form a comprehensive emission inventory covering all pollutants and source types. These comprehensive inventories in turn support air quality planning and federal emissions reporting as required for their district. District users only have access to data for a designated subset of emission source categories, limited to the geographic region they represent.
- CARB – In addition to assisting district users reporting emissions data, CARB users develop and maintain emission estimates for the remaining source categories such as mobile and area-wide. CARB staff then query this comprehensive emission inventory to provide data products for air quality planning, tracking progress of current emission reduction programs, scientific research and analysis, and supporting future regulation development.
- Public– Query information on local, regional, and statewide air emissions from stationary, mobile, and natural sources.

## 1.2 Project Status

### 1.3 Reason for Proposed Change

The project implementation phase commenced 6/29/2018 with an implementation vendor. The project scoping was completed 1/2/2019. The project involved development of a vendor based custom solution to meet the statutory requirements outlined in AB 617 and AB 197.

The projects scope defined in S1BA did not change. CARB is working based on the original project scope approval. The PAL process was completed for the original project – no additional PAL process approval is being sought.

During implementation, quality and schedule deficiencies of the implementation vendor software design and construction deliverables were noted. As such, the implementation was stopped in May 2019 and now the project seeks to re-start implementation with a new procurement. The total appropriation monies spent and paid to vendors was \$421,037. During this time, with the exception of some preliminary wireframes and mockups, the User Experiences and Workflows for internal and public sites will be re-utilized for completing IMPEI project.

**Schedule.** The project scoping activity to document reporting and business requirements was completed on 1/2/2019. This effort was significantly under-estimated resulting in an overall optimistic and unrealistic schedule that placed considerable pressure on the project and vendor team. The vendor team worked to reach the deadlines with inadequate resources and failed to deliver any tangible deliverables.

**Scope.** The scope of the project remained unchanged from the original proposal outlined during the PAL process and documented in the RFO, however implementation of the business requirements required skills and resources beyond the vendor's original cost estimates. The complexity of this project's scope was underestimated by the vendor, therefore resulting in inaccurate estimates of time and costs.

**Cost.** Implementation of the business requirements required skills and resources that the vendor did not anticipate when providing a project bid in response to the RFO. ~~Shortly after the project commenced the vendor identified that the funding allocated for the project was inadequate based on the project's scope and complexity.~~

This SPR updates the project's baseline for schedule, scope, and cost to ensure sufficient resources and timeline to implement functionality to fully meet CARB's IMPEI business needs. The purpose of these updates is to attract more highly qualified vendors, increased transparency, and to add a stabilization period.

1.4 Proposed Project Change

This SPR updates the project to:

- 1. Extend the project end date and increase the one-time cost for the IMPEI project including the recurring annual maintenance and operations costs.
- 2. In collaboration with the California Department of Technology, Statewide Technology Procurement Division (STPD), issue a new Request for Offer for a systems integration vendor to design and construct a custom system to meet the requirements identified in [Stage 3 for this project](#).

Impact of Proposed Change on the Project

This SPR does not change the original scope for the IMPEI project.

This SPR adds 32 months to project schedule, moving the implementation completion date from 06/30/2019 to 06/30/2022 to reflect the timeframe in which all IMPEI functionality will be procured and implemented including a stabilization period.

These changes will allow CARB to implement the remaining IMPEI functionalities required for the program to fully support its statutory requirements.

This SPR updates the cost for IMPEI based on a Request for Information (RFI) process. The following table compares the approved PAL Stage Gate S4PRA with the SPR 1.0 total One-Time Costs and Future Fiscal Year (FY) Annual Operations. The change column represents the difference between the original cost baseline and the proposed SPR 1.0 cost baseline.

The RFI resulted in three (3) responses for the Integrated Multi-Pollutant Emission Inventory (IMPEI) System. This information was analyzed with the outcomes of type of implementation (COTS, MOTS, Custom), and estimated time and cost to complete the project. This Special Project Report was completed using these vendor provided estimates.

The IMPEI RFI response included two custom solutions:

"Custom A"		"Custom B"	
Labor:	\$ 1,772,780	Labor:	\$ 2,842,400
Licensing:	\$ 137,635	Licensing:	\$ 101,635
Total:	\$ 1,910,415	Total:	\$ 2,943,400

and one modified-of-the-shelf solution:

<b>"MOTS"</b>	
Labor:	\$ 677,124
<u>Licensing:</u>	<u>\$ 48,000</u>
<b>Total:</b>	<b>\$ 725,124</b>

(The MOTS solution is based on an existing commercially available software tool which addresses several major components of the IMPEI scope, but will still require modifications and further enhancements to provide a complete solution for CARB)

In order to better qualify the final estimates and approach, CARB did a review of the vendor responses to the RFIs to determine each vendor level understands of the project scope. This review was not intended to assess a vendor's fit for implementing the system, but rather whether their response covered all given scope components and with sufficient understanding of the requirements to make a reasonable estimate of cost and effort.

Change Cost Table	Stage Gate 4 PAL	SPR 1.0	Change
Total, One-Time Costs	\$4,293,580	\$9,337,773	\$5,044,193
Implementation/Integration Vendor cost	\$989,610	\$2,821,038	\$2,400,000 (BCP-Spring Finance Letter request for FY20/21)
Final FY Annual Maintenance & Operations Costs	\$129,072	\$651,618	\$522,546

Based on lessons learned and RFI response analysis, CARB plans to utilize a modified waterfall approach that incorporates an incremental, iterative approach. This will mitigate project risks related to vendor under-estimate and vendor capability and provide the CARB with benefits of having some components delivered into production earlier.

The project will also contract on a deliverables basis. The completion of deliverables will provide for a more structured process to facilitate their review and acceptance. The Contract Manager and Program staff will work together to collect and analyze metrics which are used to monitor the deliverable process effectiveness and prime contractor performance. In addition, a dedicated project manager and business analyst focusing on project deliverables has been assigned.

#### Accessibility

CARB will address accessibility requirements during system development.

#### Feasibility Alternatives Considered

The original feasibility alternatives considered included: a) developing a vendor based custom-built solution, b) an in-house based solution, and c) a commercial and/or modifiable off-the-shelf solution. The selected alternative to address the business problem was a custom solution developed by a vendor allowing CARB to combine the functionality of two currently disparate systems while retaining their



current functionality. While an in-house developed solution had many of the same advantages as a vendor developed solution, the additional staffing and training requirements would put the development timeframe outside acceptable limits. The MOTS solution would have been less cost effective since no current commercial solution exists to handle the unique needs of a statewide emission inventory system, and developing the needed functionality while omitting extraneous functionality would take more time and effort than the custom solution.

CARB's additional alternative analysis consideration was based on the lessons-learned experiences. The original project efforts were unsuccessful as the allocated time and budgetary monies were insufficient for the project given its complexity. The project vendor also underestimated the required development effort. Due to the shorter project timeframe, scope and quality were impacted as the actual duration and effort were greater than estimated by the vendor. The originally selected alternative was sound and the primary change to the project was the provision of additional project staffing resources and time for development and implementation.

Based on lesson learned, CARB plans to utilize a modified waterfall approach that incorporates an incremental, iterative approach. This will mitigate project risks related to vendor under-estimate and vendor capability and provide the CARB the benefits of having some components delivered into production earlier.

CARB also determined that the time and cost required to implement the selected alternative was the only change required based on lessons learned.

### **Implementation Plan**

The Assembly Bill (AB) 617 established the Community Air Protection and community emissions reduction program for Air Districts Statewide. The IMPEI supports the AB 617 program by ensuring the collection and availability of air emissions data, which will help advance air pollution control efforts throughout the State. The IMPEI project must be completed by the end of 2023 in order for CARB to support the requirements of AB 617.

The steps for the proposed implementation plan described in various PAL Stages (Stage 2, 3 and 4) have not changed.

The time estimates for the business analysis requirement efforts have been adjusted to reflect the project's data handling and integration complexity needs. The project will need to closely monitor risks, review scope and schedule more frequently to address any re-planning and re-estimation concerns.

### **Lessons Learned**

The following are Implementation lessons learned for the IMPEI project:

- a. It is important to ensure that Requests for Offer (RFO) documentation includes all relevant information such as detailed requirements and CARB coding standards to ensure vendors provide appropriate responses for evaluation.
- b. The following was applicable to contract vendors evaluation and selection:
  - Contracts should be deliverable-based.
  - Contracts should include:

- Comprehensive questions that probe the vendor’s experience with similar project implementations, and their understanding of the project scope will be included as part of the evaluation and selection process.
  - Deliverable expectation documents to obtain agreement on the content of deliverables.
  - Identification of minimum experience qualifications.
  - Vendor requirements management
  - The requirement to develop and implement a Quality Management and Software Testing Plan.
- c. The following is/was applicable to the overall application and data migration planning efforts:
- Development and communication of comprehensive user interface, system architecture, software, and database design standards documentation.
  - Documentation of non-function requirements for software design best practices.
  - Inclusion of compliance requirements with CARB technical standards.

## 2 Updated Project Management Plan

The project management processes described during the PAL process continue to be followed. Project Management Plans were prepared during various stages of PAL for the IMPEI project. These documents are available upon request.

### 2.1 Project Manager Qualifications

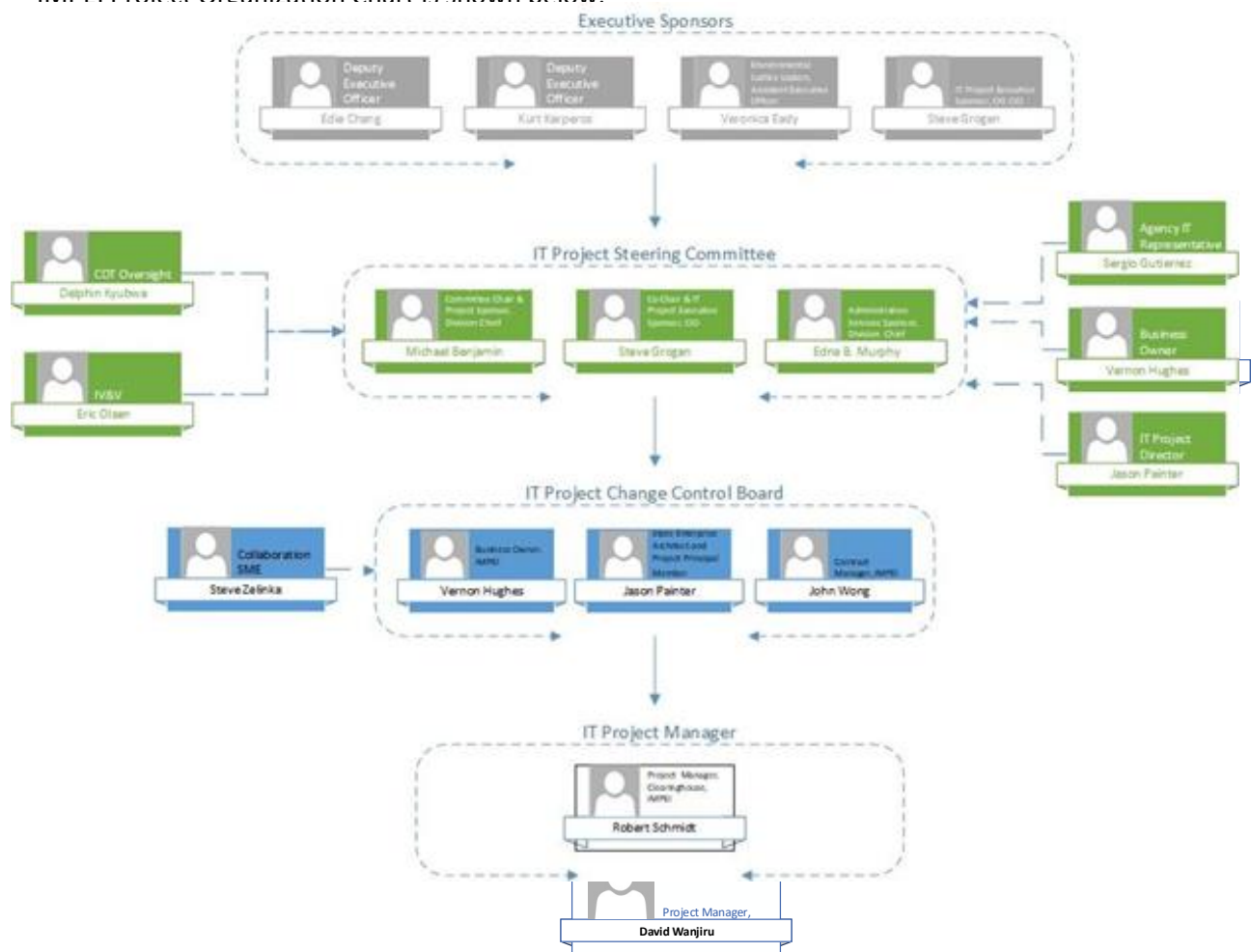
The IMPEI project is managed by a contract Senior Project Manager (PM). The role of the PM is to establish and implement the necessary project management processes, maintain the overall project documentation and project reporting. The PM for the IMPEI project is David Wanjiru. David Wanjiru is within the Project Management Office of CARB’s OIS. He is certified as a Project Management Professional (PMP) by the Project Management Institute (PMI).

### 2.2 Project Management Methodology

CARB follows the California Project Management Framework (CA-PMF). CARB also uses the Project Management Body of Knowledge (PMBOK) from PMI, and the recommended project management and risk management practices of the CDT Information Technology Project Oversight Framework, SIMM section 45, as guiding documents for project management best practices. CARB is using Waterfall Methodology to develop the application.

2.3 Project Organization

IMPEI Project Organization Chart is shown below.



## 2.4 Project Priorities

Project priorities specified in Table 1 remain the same for this SPR. Project stakeholders for the IMPEI Project agreed on the relative importance of each of these four factors before the beginning of the project, as future project management decisions will be guided by these priorities.

Project trade-off matrix is given below that shows the relative importance of each factor using a priority of 1 (highest) to 4 (lowest) for each of these factors.

### Project trade-off matrix

Schedule	Scope	Resources	Quality
3	1	4	2

The project trade-off matrix represents CARB project constraints prioritization approach. It is utilized for managing any project related changes in the event activities/tasks situations require more than can be achieved within the estimated time, cost, quality and/or resource constraints to meet the project's goals.

## 2.5 Project Plan

### 2.5.1 Project Scope

Project scope as documented in PAL Stage 3 and remains the same.

### 2.5.2 Project Assumptions

Major project assumptions listed in section 2.7 of PAL Stage 2 remain the same.

### 2.5.3 Project Phasing

Project phases documented in section 2.11.5 of PAL Stage 2 remain the same.

### 2.5.4 Project Roles and Responsibilities

Project roles and responsibilities documented in section 2.12.9 of PAL Stage 2 remain the same.

### 2.5.5 Project Schedule

The project schedule is re-baselined with an implementation completion date of 06/30/2022.

Major Milestones, Deliverables, Operations	Original Estimated Completion Date	Estimated Completion Date
Implementation RFO Ready to Release	01/31/2018	09/01/2020
Implementation Contract Procurement	06/30/2018	04/30/2021
(Re-) Start Implementation	07/01/2018	07/01/21
Implementation	06/30/19*	06/30/2022

Stabilization	04/30/2020*	12/30/2022
Post Implementation Evaluation	04/30/2021*	12/29/2023
Project Closure	05/31/2021*	1/30/2024

**Note:** \* indicates milestones or deliverables that were not completed by vendor prior to stopping contract implementation.

## 2.6 Project Monitoring and Oversight

Project monitoring and oversight will continue for the project duration.

## 2.7 Project Quality

The IMPEI Project team is executing the quality management plan as specified in section 3.18 of PAL Stage 3 and updated based on lessons learned.

## 2.8 Change Management

The IMPEI Change Management plan specified in section 3.18 of PAL Stage 3 remains the same.

## 2.9 Authorization Required

Not applicable.

## 2.10 Issues

The following are potential project issues are:

- Project milestones late delivery
- Quality Reduction
- Limited CARB State staff Resource Availability

## 2.11 Risks

The IMPEI project will maintain a Risk Register that is available upon request. The register incorporates the following major project risks:

- Delivery Commitment
- Scope or Quality Reduction
- Requirements Stability
- Requirements Completeness and Clarity
- Design Difficulty

## 2.12 Security

There are no security issues for IMPEI project.

### **3 Updated Economics Analysis Worksheet**

Updated FAWs are included as separate attachments with this document.

**Project Cost Change – SUMMARY**  
**One-Time and Final FY Annual Maintenance & Operations**

One-Time and Final FY Annual Maintenance & Operations	Stage Gate 4 PAL	SPR 1.0	Change	Reason for Change
Total, One-Time Costs	\$4,422,651	\$9,490,151	\$5,067,500	See one-time Cost Table Below.
Final FY Annual Maintenance & Operations	\$129,072	\$651,618	\$522,546	Includes M&O Professional Services.

**S4PRA PAL FAWs to SPR FAWs – COMPARISON**  
**ONE-TIME COSTS**

One-Time and Final FY Annual Maintenance & Operations	Stage Gate 4 PAL	SPR 1.0	Change	Reason for Change
Personal Services	\$2,414,368	\$4,551,916	\$2,137,548	<p>SPR adds approximately 32 months to project schedule resulting in increased one-time PS costs. Project End date was April 30, 2021, re-baselined to December 31, 2022.</p> <p>FY 18/19 – PAL approved twelve months one-time. No change.</p> <p>FY 19/20 – No change during re-planning.</p> <p>FY 20/21, FY21/22- Adds approximately 2</p>

				<p>years implementation time.</p> <p>SPR re-baselines to twelve months of future operations. This SPR extends the future operations into FY 22/23.</p> <p>Adjustments for actual and projected time on project.</p>
Operating Expenses & Equipment (OE&E)	\$1,777,136	\$ 4,211,378	\$2,434,242	OE&E change associated with Personal Services; same as above.
Consulting & Professional Services External	\$1,316,970	\$3,616,518	\$2,299,548	<p>FY 18/19 no change.</p> <p>FY 19/20 expenditures higher than planned for BA as project extended 32 months.</p> <p>This represents both implementation vendor and the consulted PM and BA. The requested \$2.4M mentioned in the page 8 table is only for the future implementation vendor work, and the remaining amount includes PM and BA</p>



				services funded through a separate source as well as previously expended funds.
Project Oversight	\$108,000	\$337,680	\$229,680	Extend oversight through project lifecycle.
Total, One-Time Costs	<b>\$4,422,651</b>	<b>\$9,490,151</b>	<b>\$5,067,500</b>	Overall increase in One-Time Costs.

### Final FY Annual Maintenance & Operations

Final FY Annual Maintenance & Operations	Stage Gate 4 PAL	SPR 1.0	Change	Reason for Change
Personal Services	\$128,153	\$151,459	\$23,306	Salaries and benefits increase adjustment.
Operating Expenses & Equipment (OE&E)	\$43,179	\$91,179	\$48,000	OE&E change associated with Personal Services;
Consulting & Professional Services External	\$0	\$0	\$0	No change.
Project Oversight	\$0	\$0	\$0	No change.
Other Items of Expense	\$0	\$0	0	No change.
IT OE & E	\$0	\$0	\$0	No change.
Total, One-Time Costs	<b>\$129,072</b>	<b>\$152,378</b>	<b>\$23,307</b>	Includes M&O Professional Services.

## Appendix A – Acronym/Abbreviation Table

BCP	Budget Change Proposal
CDT	California Department of Technology
CIO	Chief Information Officer
FAW	Financial Analysis Worksheet
ISO	Information Security Office
IT	Information Technology
ITPOC	IT Project Oversight Division
IV&V	Independent Verification and Validation
OE&E	Operating Expenses and Equipment
PAL	Project Approval Lifecycle
PM	Project Manager
PMBOK	Project Management Body of Knowledge
PMF	Project Management Framework
PMI	Project Management Institute
PMO	Project Management Office
S2AA	Stage 2 Alternative Analysis
S3SD	Stage 3 Solution Development
S4PRA	Stage 4 Project Readiness and Approval
SFL	Spring Finance Letter
SME	Subject Matter Expert
SPR	Special Project Report

**Acronym/Abbreviation Table**