

# Budget Change Proposal - Cover Sheet

Fiscal Year: 2020-21

Business Unit: 0540

Department: California Natural Resources Agency

Priority Number: [Click or tap here to enter text.](#)

Budget Request Name: 0540-029-BCP-2020-GB

Program: 0320

Subprogram: [Click or tap here to enter text.](#)

Budget Request Description: Innovation and Improving Use of Technology: Light Detection and Ranging Data (LiDAR)

Budget Request Summary: The California Natural Resources Agency requests \$80,000,000 one-time General Fund to collect and make publicly available high-quality airborne light detection and ranging (LiDAR) data for the state of California. Funding is requested to be available for expenditure and encumbrance through June 30, 2023.

Requires Legislation:  Yes  No

Code Section(s) to be Added/Amended/Repealed: [Click or tap here to enter text.](#)

Does this BCP contain information technology (IT) components?  Yes  No

*If yes, departmental Chief Information Officer must sign.*

Department CIO Name: [Click or tap here to enter text.](#)

Department CIO Signature:

Signed On Date: [Click or tap here to enter text.](#)

*For IT requests, specify the project number, the most recent project approval document (FSR, SPR, S1BA, S2AA, S3SD, S4PRA), and the approval date.*

Project Number: Click or tap here to enter text.

Project Approval Document: Click or tap here to enter text.

Approval Date: Click or tap here to enter text.

If proposal affects another department, does other department concur with proposal?

Yes  No

*Attach comments of affected department, signed and dated by the department director or designee.*

Prepared By: Nathaniel Roth

Date: January 8, 2020

Reviewed By: Joshua Nelson

Date: January 8, 2020

Department Director: Click or tap here to enter text.

Date: Click or tap here to enter text.

Agency Secretary: Bryan Cash

Date: January 8, 2020

### **Department of Finance Use Only**

Additional Reviews: Capital Outlay: ITCU: FSCU: OSAE:

Department of Technology:

PPBA: Sergio Aguilar

Date submitted to the Legislature: January 10, 2020

## A. Budget Request Summary

The California Natural Resources Agency requests \$80,000,000 one-time General Fund to collect and make publicly available high-quality airborne light detection and ranging (LiDAR) data for the state of California. Funding is requested to be available for expenditure and encumbrance through June 30, 2023.

## B. Background/History

LiDAR data is emerging as a key source for topography (a model of the earth's surface, elevation, and slopes) and vegetation globally. Modern LiDAR generates elevation maps (topography) with far more accuracy than past generations of elevation data. Within California, LiDAR is the preferred source for detailed topography critical to responding to fires, landslides, and earthquakes. This data also has the potential to better inform resource management decisions across a wide variety of applications including forest management for wildfire risk reduction, the management of vegetation in utility corridors, infrastructure project planning, and hazard assessments for flood, fire, and landslides. With improved data, the state can more effectively evaluate the relative value of projects with a topographic component, and plan and implement them more efficiently. LiDAR data complements data from aerial and satellite platforms or other sources to create more valuable information for emergency response, climate change monitoring, carbon sequestration and land use purposes. Coordinating collections of LiDAR and other sensors via a California Natural Resources Agency LiDAR Governance Board will amplify the benefit to California.

The State of California's agencies collect airborne LiDAR data for project level work, frequently in response to specific disasters. Historically, this occurs with minimal cross-agency coordination, resulting in data of inconsistent quality and poor matching in time. As a result, these collections have limited value beyond the relatively narrow purpose for which they were collected for regional or statewide analyses. Similarly, federal agencies with interests in California, such as the US Forest Service (USFS), Federal Emergency Management Agency (FEMA), Natural Resources Conservation Service (NRCS), and United States Geological Survey (USGS), also collect data. This has resulted in fragmented and incomplete coverage of California with inconsistent data standards. See current status of California's data collection at <https://www.usgs.gov/media/images/3d-elevation-program-fy19-status-3dep-quality-data-october-2019>.

The USGS is actively soliciting a partnership with California, represented by the California Natural Resources Agency, to complete LiDAR coverage of California.

## C. State Level Considerations

LiDAR mapping supports multiple key administration priorities in addition to providing long range benefits for ongoing agency activities. In particular, LiDAR provides a unique and valuable insight into forest structure, health, and related threats to people, property, and the state's resources. LiDAR can penetrate forests, essentially "seeing" through the trees to the ground, as well as differentiating the tree canopy from the ground. This allows the users to identify vegetation mass in three-dimensions and give detailed topographic information of the ground surface through the vegetation, which can inform decisions related to forest management for wildfire risk reduction, carbon storage, and water management. Similarly, LiDAR can provide a clear understanding of exactly where human structures and above ground infrastructure may either pose a risk or be at risk in forested areas.

In urban and suburban settings, LiDAR data supports infill, redevelopment, and safety through providing the base data needed to construct accurate three-dimensional (3D) models of the human landscape. These models can be used to analyze locations for infill, emergency access or egress, environmental outcomes, and to support visualization of projects in a 3D context. Uses for LiDAR include infrastructure project design preparation and scoping.

LiDAR also supports other priorities for public safety and environmental protection. These include: landslide and debris flow mapping and predictive modeling; earthquake fault mapping; timber harvest plan analysis; flood risk mapping; detailed water or fluid spill drainage analysis for pollutants mapping and permitting; wildland fire risk analysis; utility network management (i.e. powerlines and vegetation); emergency response planning; and operational use during emergencies.

The bulk of the LiDAR collections in California have been in response to an event, or a specific risk such as wildland fire. This approach enables the planned and coordinated collection of data prior to an incident, the response to which will benefit from the data's immediate availability after the incident. This also allows the data to be used to identify risks and mitigate or plan for them to the extent possible in advance.

Public accessibility of these LiDAR data and collections that meet commonly accepted standards enables the use of the data by the full range of stakeholders. In addition to state government, local, regional, and federal government agencies will be able to use these data, as will academic, non-governmental organizations, and private sector users.

## D. Justification

As noted, aerial LiDAR improves dramatically on any existing data source for 3D analysis on bare earth topography and vertical structures whether natural such as

forests, or manmade and urban environments. LiDAR is one of the most frequently requested datasets in any response to landscape scale emergencies such as floods, fires, or landslides. LiDAR is also a data source of choice for conducting studies including landslide risks, earthquake fault zone mapping, flood risk, forest structure analysis, wildland fire hazard mapping, and the planning for and mitigation of those risks. A subset of other fields that can benefit from LiDAR include precision agriculture, water supply forecasting and management, oil & gas industry regulation, infrastructure planning, electrical utility network maintenance, habitat conservation and species protection, coastal conservation, recreation management, and many others.

The 2012 revision of the National Enhanced Elevation Inventory (<http://www.dewberry.com/services/geospatial/national-enhanced-elevation-assessment>), conducted by Dewberry under contract to the USGS, with components republished in a 2019 white paper specific to California (<https://pubs.er.usgs.gov/publication/fs20193029>) identified annual benefits of \$28.2 million to California from LiDAR resulting in a recouping of an \$80 million investment in approximately 3 years. This includes: \$8.4 million for infrastructure and construction management; \$4.4 million for natural resources conservation; \$4.2 million from flood risk management; \$4 million for wildfire management, planning, and response; \$2 million from agriculture and precision farming; and \$1.7 million from geologic resource assessment and hazard mitigation.

There are many opportunities to leverage a state investment in LiDAR with other groups. Most notably, the federal government, through the USGS administered 3D Elevation Program (3DEP) contributes substantial funds to the completion of LiDAR projects that meet their requirements. The 3DEP program – a consortium of federal agencies -- has the authority and interest in contributing significantly to the acquisition of LiDAR data sets. Many efforts at the federal, state, and local agency level could be leveraged by this proposed investment to include other data sets that complement LiDAR, such as bathymetric, photographic, radar, or multi- or hyperspectral imaging collected in coordination with the LiDAR data.

The bulk of these groups collect LiDAR data that meets or exceeds the standards set by the USGS for the 3DEP program. Improved coordination, supported by an investment by the state to establish and fund data collection to a minimum of USGS Quality Level 1 (suitable for basic vegetation structure mapping as well as most ground topography analysis) leveraged with federal and other partners will provide the state with a nation-leading information resource for public safety and environmental management.

## E. Outcomes and Accountability

The California Natural Resources Agency will develop and implement a plan to provide a minimum of USGS Quality Level 1 (USGS LiDAR Base Specification v2.1) for the State of California. To guide this process, the Agency will commission a LiDAR Governance Board with representation from a broad array of stakeholders including: state, federal, and local governments; subject matter experts; and other members of the data using community. This board will provide guidance to the Agency on the most efficient and effective use of the state's resources to provide high quality LiDAR coverage for the state, avoid duplication of efforts made across state and local entities, make the data publicly available, support infrastructure and training to maximize the value of the investment, and if permitted by leveraging and funding, support the collection of complementary datasets to improve the information available to state decision makers.

The collected data, and a set of standard derived products, will be available at a minimum through the CNRA Open Data Portal. The Governance Board will evaluate and if appropriate implement alternate delivery methods for these data that provide additional functionality.

## F. Analysis of All Feasible Alternatives

Alternative 1: Do not approve the BCP

Pro:

- No cost to the General Fund for this project

Con:

- Continued uncoordinated LiDAR data collections (standards, time, and location)
- Higher state costs per square mile of data collected
- Gaps between collected areas
- Reduced usability of the data spanning collection boundaries
- Continued rushed and inefficient purchases of LiDAR in emergency response situations
- Continued challenges in providing analysis based on high resolution elevation data

Alternative 2: Approve funding as requested

Pro:

- Systematic, coordinated, and standardized data collection for the entire state
- LiDAR data will be publicly available
- LiDAR data will be available for immediate use in an incident response (fire, landslide, earthquake, flood)
- LiDAR data will be available to inform risk mitigation and management actions
- Investment may be leveraged with local and regional governmental

organizations, academic institutions, private industry, and federal agency dollars

- LiDAR collections can be coordinated with other supporting and synergistic data from aerial and satellite-based systems

Con:

- General Fund initial investment for data collection, distribution, training, and analysis.
- Requires careful coordination with ongoing projects to minimize disruption.

Alternative 3: Approve \$40 million one-time General Fund

Pro:

- Less cost to the General Fund for this project

Con:

- Continued uncoordinated LiDAR data collections (standards, time, and location)
- Higher state costs per square mile of data collected
- Gaps between collected areas
- Reduced usability of the data spanning collection boundaries
- Continued rushed and inefficient purchases of LiDAR in emergency response situations
- Continued challenges in providing analysis based on high resolution elevation data

## G. Implementation Plan

The California Natural Resources Agency will establish a project Governance Board, conduct outreach, create and publish a LiDAR collection plan, and enter into agreements with USGS and others as needed to complete the plan and leverage the state investments to maximize benefits to the state.

## H. Supplemental Information

The California Natural Resources Agency will need both time and authority to enter into agreements with other state and federal Agencies, as well as local governments and other private sector partners. Based on prior experience with LiDAR agreements with the USGS, these agreements are both complex and time consuming to finalize.

The California Natural Resources Agency, acting on behalf of the LiDAR Governance Board, will need to establish agreements with multiple LiDAR vendors to complete the collection. These agreements will include standard language specifying the deliverable's standards and the validation of deliverable quality.

The LiDAR Governance board will review and possibly recommend the use of a data

delivery platform for making the data available to the public to improve the usability of the data and improve the tracking of users for reporting.

## I. Recommendation

The California Natural Resources Agency recommends Alternative 2. Authorize \$80,000,000 one time General Fund to complete this project with three years to encumber the funds. This will provide a comprehensive collection of publicly available LiDAR data that can be used by multiple agencies across the state.



## BCP Fiscal Detail Sheet

BCP Title: Innovation and Improving Use of Technology: Light Detection and Ranging Data (LiDAR)

BR Name: 0540-029-BCP-2020-GB

Budget Request Summary

### Operating Expenses and Equipment

Operating Expenses and Equipment	FY20 Current Year	FY20 Budget Year	FY20 BY+1	FY20 BY+2	FY20 BY+3	FY20 BY+4
5340 - Consulting and Professional Services - External	0	80,000	0	0	0	0
<b>Total Operating Expenses and Equipment</b>	<b>\$0</b>	<b>\$80,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

### Total Budget Request

Total Budget Request	FY20 Current Year	FY20 Budget Year	FY20 BY+1	FY20 BY+2	FY20 BY+3	FY20 BY+4
<b>Total Budget Request</b>	<b>\$0</b>	<b>\$80,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

### Fund Summary

#### Fund Source

Fund Source	FY20 Current Year	FY20 Budget Year	FY20 BY+1	FY20 BY+2	FY20 BY+3	FY20 BY+4
State Operations - 0001 - General Fund	0	80,000	0	0	0	0
<b>Total State Operations Expenditures</b>	<b>\$0</b>	<b>\$80,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Total All Funds</b>	<b>\$0</b>	<b>\$80,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

### Program Summary

#### Program Funding

Program Funding	FY20 Current Year	FY20 Budget Year	FY20 BY+1	FY20 BY+2	FY20 BY+3	FY20 BY+4
0320 - Administration of Natural Resources Agency	0	80,000	0	0	0	0
<b>Total All Programs</b>	<b>\$0</b>	<b>\$80,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>