Alma Bridge Road Newt Passage Project Feasibility Analysis (Phase I, Task 2)

Alma Bridge Road
Newt Passage Project
WILDLIFE CONNECTIVITY IMPROVEMENTS

Prepared by:

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April 12, 2023

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1. Introduction

Since 2017, approximately 29,000 California newts (*Taricha torosa*) have been recorded dead on the road as the result of vehicle traffic along Alma Bridge Road where it borders the east side of Lexington Reservoir in Santa Clara County, California (Newt Patrol 2022, Parsons 2021) (Figure 1). At an estimated road mortality rate for migratory newts of 39.2%, this local population may be under possible threat of extirpation (H.T. Harvey & Associates 2021, Wilkinson and Romansic 2022). Midpeninsula Regional Open Space District (Midpen) and partner Santa Clara County, along with project stakeholders Valley Water and Peninsula Open Space Trust, are looking to provide safe road passage for California newts, rough-skinned newts (*T. granulosa*), and other herpetofauna species across Alma Bridge Road. This effort is collectively referred to as the Alma Bridge Road Newt Passage Project (Project).

Project goals were developed to address the local roadkill threat to California newts and other migratory herpetofauna in a manner that is feasible, evidence-based, cost effective, and maintains recreational and other human uses of the Alma Bridge Road area. The Project Goals are to:

- Reduce roadkill and provide habitat connectivity to sustain the local newt population
- Be correctly scaled – can be designed, environmentally cleared, permitted, and implemented
- Be cost effective
- Be maintainable
- Not impede road safety, hydrology, or public use
- Facilitate existing and future use of Alma Bridge Road and the surrounding areas and facilities
    - Continued vehicle use of the roadway and parking areas
    - Continued and future recreational access to existing facilities and trails, as well as future parking and trails (such as the former Beatty Trust property Parking Area and Trails Project)
- Have support from stakeholders - comprised of both government and non-government agencies and organizations (District; County; CDFW; Peninsula Open Space Trust; and Valley Water); neighborhood representatives including the local quarry and nearby residents; advocacy group representatives (Audubon Society, Center for Biological Diversity, and Sierra Club); and recreational user group representatives (Bay Area Ridge Trail, Los Gatos Rowing Club and Sant Cruz Mountain Trail Stewards)

These goals and the Project itself are the product of collaboration between diverse Project partners and stakeholders. Through Midpen's commitment to an inclusive process, the Project will continue to seek and incorporate the input of the community to meet these goals and identify the best solution for wildlife, commuters, residents, and recreationalists.

To put the Alma Bridge Road Newt Passage Project in perspective, this is among one of the first wildlife connectivity improvement projects in California to apply a rigorous feasibility analysis to inform project design, all backed by modeling the effectiveness of various Corrective Action opportunities project-wide together with a consideration of non-environmental constraints such as engineering, design, cost, schedule, and recreation use. Specifically, this project is taking advantage of expected permeability modeling early in the conceptual design phase based on passage size and passage structure characteristics paired with what is known about migrating amphibians from existing road ecology literature (e.g., turn-around distances) to plan for population persistence.

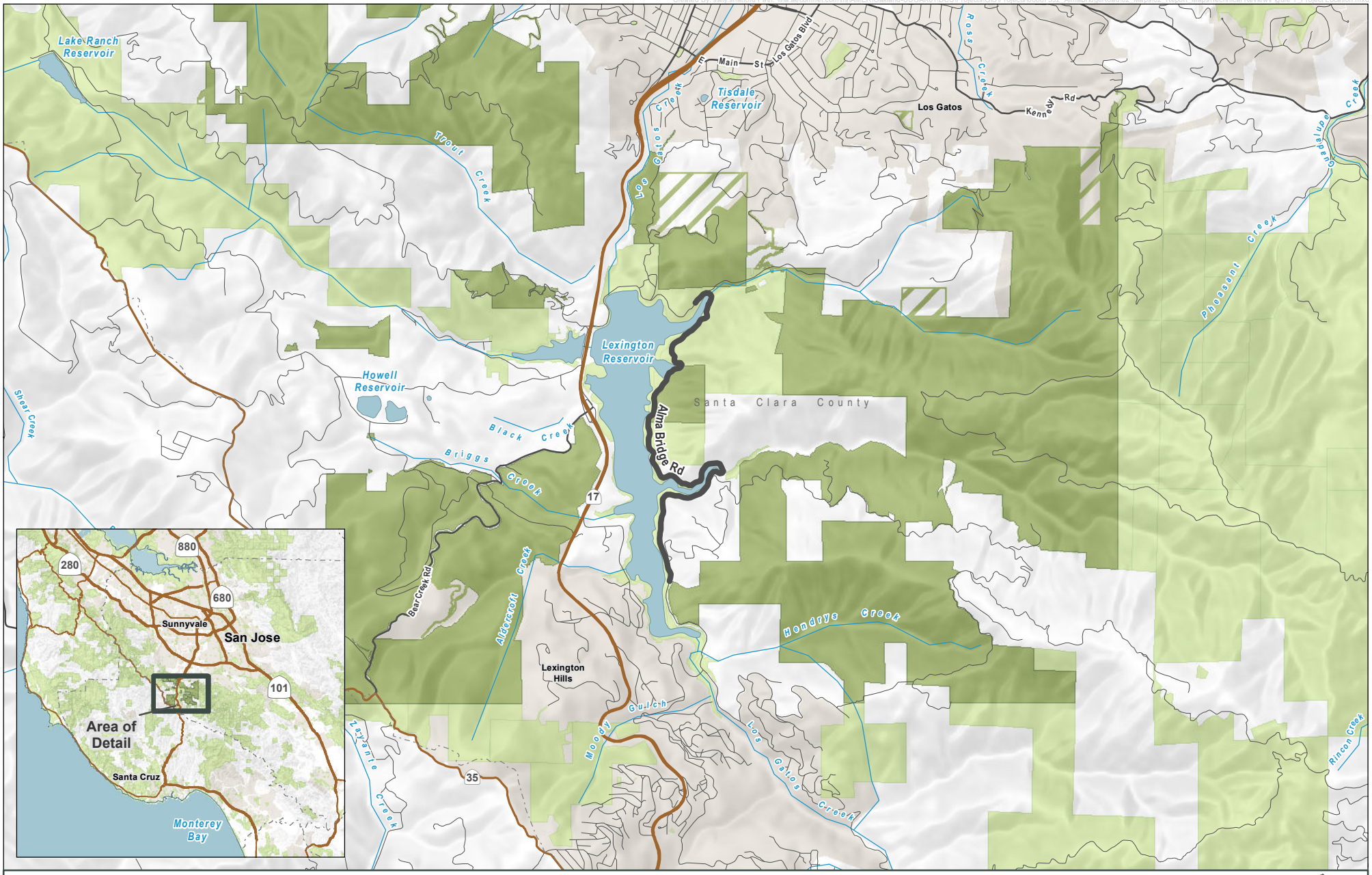

Figure 1: Project Location

- Study Area (along Alma Bridge Rd)
- Midpen Open Access
- Other Protected Land

Midpeninsula Regional Open Space District
(Midpen)
8/15/2022

Miles
0 0.5 1

MIDPENINSULA REGIONAL OPEN SPACE

AECOM

1.1. Task 1

Under Task 1 of the Project, AECOM prepared the *Alma Bridge Road Newt Passage Project – Technical Review* (Technical Review) Memorandum in October 2022 (AECOM 2022). This Technical Memorandum provides a review of the Project history, the natural history of the California newt, existing site conditions as they relate to Alma Bridge Road as a dispersal and migration impediment between upland habitat and breeding habitat at Lexington Reservoir, road crossing best management practices (BMPs), crossing design guidance, and Corrective Action opportunities. The Technical Memorandum also provides background information on the environmental and physical setting, along with land ownership, land use, and recreation uses.

Collectively, this information was prepared to better understand the constraints and opportunities posed by the current conditions at Alma Bridge Road, inform the understanding of existing newt natural history at the site, and help identify measures to anticipate future public access, including parking and trail connections on the former Beatty Trust property. The Technical Review also established the background which any recommended or novel-built or non-built "Corrective Actions" may be applied to decrease newt mortality and increase habitat permeability under subsequent Project tasks.

In particular, the Technical Review established two possible thresholds to determine whether Corrective Actions measurably decrease newt mortality and increase habitat permeability based on the previously prepared Population Growth Model (H.T. Harvey & Associates 2021). Specifically, reducing road-based mortality to between 17.667% and 20% would allow the population to persist beyond 200 years, but the population would slowly decline. However, reducing the mortality rate to 17.667% or less (an approximately 45% reduction from current levels) would sustain the population at its current size beyond 200 years (H.T. Harvey & Associates 2021).

The Technical Review also provides a high-level review of past studies, road crossing BMPs, and crossing design guidance (Task 1) pertaining to this Project. This Technical Review helps identify and recommend future Corrective Actions and feasibility analyses (Tasks 2 and 3).

1.2. Task 2

Under Task 2 of the Project, AECOM has prepared this *Alma Bridge Road Newt Passage Project Feasibility Analysis* (Feasibility Analysis). This is the product of months of collaboration between AECOM, Midpen, technical experts, and stakeholders. The work began with a September 26, 2022 site visit (see Section 3) to examine environmental and engineering constraints and opportunities. Following the site visit, AECOM and technical experts from the team developed a suite of novel-built and non-built Corrective Action combinations ("Options") (see Section 4.1.2) to mitigate the road mortality recorded within a particular Priority Zone (see Section 4.1.1). The Corrective Actions identified were informed by the Task 1 Technical Review. Options were combined across Priority Zones into "Scenarios" (see Section 5) which, in concert with each other, would potentially achieve the Project goals of decreased California newt mortality and increased habitat permeability. These Scenarios were then analyzed by the U.S. Geologic Survey (USGS) team for their predicted effects on newt population viability, mortality, and permeability (see Section 5.1). Those Scenarios that achieved the Project objectives of no further decline and increased permeability were analyzed further (see Section 5.2) and combined into a final suite of four "Alternatives" (see Section 6). Each Alternative was then evaluated for its environmental and engineering feasibility (see Section 7). The findings of this rigorous process are synthesized in the following Feasibility Analysis.

Although environmental considerations were used as the basis for establishing Zones, Corrective Action placement, and preliminary Alternatives, this Feasibility Analysis considered other, equally important factors such as engineering, permitting, public safety, cost, and schedule that could be triggered by the implementation of any Alternative. All such considerations are given equal weight, and the findings of this preliminary process are described and discussed in the sections that follow.

Preliminary feedback from County Roads suggests that certain aspects of Corrective Actions discussed herein may not be feasible due to safety concerns. Further refinement is currently underway between AECOM,

Midpen, and County Roads to better understand the constraints and opportunities associated with each Corrective Action, Option, and Alternative to inform the Alternatives that will advance to Task 3 for more detailed evaluation.

1.3. Task 3

Under Task 3 of the Project, AECOM will prepare an Alternatives Evaluation/Basis of Design technical memorandum that will further refine the preliminary Project alternatives based on input provided by Stakeholders during Task 2. The Alternatives Evaluation will include a more thorough review of potential environmental impacts and anticipated mitigation requirements, required regulatory permits, impacts to existing facilities, hydraulic and hydrology, maintenance needs, constructability, and high-level cost estimates with an emphasis on a subset of the Alternatives.

As part of this task, the AECOM team will also develop a Basis of Design (BOD) that will include the proposed Corrective Actions as alternatives, the design criteria, the decision-making process, draft schedule, preliminary construction costs as order of magnitude, permits required, proposed CEQA approach, and project phasing.

The findings of the Alternatives Evaluation and BOD will be used to prepare an *Alma Bridge Road Wildlife Connectivity Improvements Project – Alternatives Evaluation/Basis of Design* technical memorandum that will recommend a suite of Alternatives from the menu of proposed or novel Corrective Actions identified in the Feasibility Analysis. This evaluation will address the following considerations:

- Rationale (decision making process, constructability)
- Type(s) of structures
- Placement location(s)
- Extent (number/frequency)
- Dimensions
- Design criteria
- Preliminary hydraulics/hydrology calculations
- Tentative schedule
- Project phasing recommendations
- Preliminary cost (material) estimate (order of magnitude) for each corrective action
- Construction costs (labor)
- Identification of (a) scale, (b) equipment, and (c) timing needed to perform ongoing maintenance of each corrective action (if needed) This evaluation will also address a recommended CEQA approach and permitting strategy that covers:
- Permitting analysis (permits required), recommendations, and constraints for each corrective action alternative
- Review of pre-construction, construction and post-construction mitigation and monitoring requirements (if any)

When completed, this Alternatives Evaluation/BOD technical memorandum will provide a menu of options for the Midpen Board of Directors and Project Partners to consider two to three Alternatives during Phase 2.

2. Corrective Action Opportunities

The Task 1 Technical Review (AECOM 2022) identified the following "Corrective Actions" (Table 1) that may simultaneously decrease newt mortality and increase habitat permeability. Together, these Corrective Actions were used to inform the preliminary investigation site visit and feasibility analysis, herein.

Table 1. Preliminary Corrective Action Opportunities Identified

Corrective Action Type	Corrective Action	Goal
Wildlife Passage System		
Crossing Structures	Type 1A (mountain/hill tunnel)	Direct wildlife movement over roadway
	Type 1B (open span bridge)	Direct wildlife movement under roadway
	Type 2 (small [60-120 ft] open span bridge)	Direct wildlife movement under roadway
	Type 3 (small road underpass)	Direct wildlife movement under roadway
	Type 4 (small culvert)	Direct wildlife movement under roadway
	Type 5 (small culvert/passage)	Direct wildlife movement under roadway
	Type 6 (microbridge/elevated road segment [ERS])	Raise traffic above movement corridor
Barriers	Guide Walls	Redirect wildlife movement
	Fencing[1]	Redirect wildlife movement
Traffic Control and Calming		
Signage	Destination and Distance Signs	Shorten route(s), minimize travel time and distance
	Street Name Signs	Shorten route(s), minimize travel time and distance
	Advance Street Name Signs	Shorten route(s), minimize travel time and distance
Islands and Medians	Raised Island	Discourage additional traffic to the area
	Channelizing Island	Discourage additional traffic to the area
Transverse Rumble Strip Markings and Perceptual Treatments	Rumble Strips	Heighten driver awareness to speed reduction
	Perceptual Treatments	Heighten driver awareness to speed reduction
Speed Bumps/Speed Humps	Speed Bumps/Humps	Discourage additional traffic to the area
Lighting	Directional Lighting	Discourage species residency
	Lighting Existing Signs	Heighten driver awareness of newt crossing
Temporary Area and Road Closures and/or Permit Only Road Usage *(considered but not feasible)*	Temporary (or Seasonal) Area Closures or Permit Only Use	Lessen traffic during peak migration periods
	Temporary (or Seasonal) Road Closures or permit only use	Eliminate traffic during peak migration months
Habitat Creation		

[1] *Temporary fencing to redirect wildlife to Type 5 micro-passages could require annual inspections, maintenance, and periodic replacement in perpetuity. Temporary fencing placement would be determined during future design phases of the Project*

Corrective Action Type	Corrective Action	Goal
Accessible Breeding Habitat	Establish New Breeding Sites	Direct wildlife to breed in created ponds east of the roadway to provide alternative breeding locations for the local newt population

In addition to a Type 1B bridge, four additional Corrective Action crossing structure types were identified during Task 1 that are further explored here in Task 2. Each of these crossing structure types are described in more detail below. During the selection process, other Corrective Actions were considered that were determined infeasible due to site constraints and the resulting engineering, permitting, maintenance, public safety, and recreation consequences (among others) and their influence on inhibiting the Project from sufficiently decreasing newt mortality and increasing habitat permeability. The rationale behind why certain Corrective Actions were not advanced, and why some of those Corrective Actions that were advanced may not be feasible due to safety concerns, is addressed below.

2.1. Corrective Actions

In addition to a Type 1B bridge, four primary Corrective Actions identified during Task 1 were identified for further consideration during the Wildlife Crossing Conceptual Design Workshops (see Section 4.1):

- Type 4 purpose-built passage structure with built-in guide walls and climbing barriers,
- Type 5 micro-passage with directional fencing,
- Type 6 elevated road segment, and
- Modified cattle grate.

In general, any corrective action utilizing an elevated road segment would involve the use of Type 4 purpose-built passage structures, and modified cattle grates are recommended at the beginning and end of any elevated road segment. The exact lengths and placements of directional fencing associated with Type 5 micro-passages and modified cattle grates will be determined during Task 3, based on finer scale review of exact site conditions.

Additionally, any recommendations for Corrective Action types may change during subsequent review of crossing structure Type designs in Task 3; for example, a recommendation for repeating Type 4 purpose-built passage structures may be replaced by Type 6 elevated road segments if the recommended frequency or the modified design specifications of the purpose-built Type 4 passage structure more closely matches the characteristics of a Type 6 elevated road segment.

Due to the current traffic/usage level of the road, including Alma Bridge Road's emergency access designation, road closures and/or permit only use of the road is not considered feasible. Furthermore, these options would divert road traffic onto other local roadways, preclude and limit recreational use of the area, and be challenging to effectively implement and enforce. Given this, permanent road closures are not considered further as a potential Corrective Action. Furthermore permanent closure of Alma Bridge Road is not feasible because California law sets forth limitations on permanently closing roads. Alma Bridge Road is under the jurisdiction of the County of Santa Clara, whereby Streets & Highways Code ("SHC") Section 942.5 states that a county may only permanently close a county highway when the closing is necessary for protection of the public, protection of the highway during storms, or during construction/improvement/maintenance operations. Vehicle Code ("VC") Section 21101 only allows for permanent road closure when the road is no longer needed for vehicular traffic. Any "full" road closures described in this document refer specifically to temporary closures that could take place in Zone 1 under Option 1 during the construction of the bridge, which may be necessary for a limited time to establish the primary staging area, import bridge materials, or during the construction of the landward footing(s).

Culvert modifications were considered as part of Task 1 and Task 2 analyses and feasibility studies but were not identified as an optimal solution. To optimize an existing culvert to serve the double purpose as a drainage culvert and a wildlife crossing would require directional fencing that may impair the culvert's primary drainage functions on the uphill side. During high-flow events, the drainage culvert would become inaccessible to wildlife movement in both directions. Those drainage culverts in the Project area that terminate on the down-hill side via an overhanging culvert would need to be shortened flush with the embankment, which would require energy dissipation measures such as rip-rap or an apron to reduce erosive conditions that could impair wildlife movement approaching the culverts from the Reservoir side (heading east) and could require earthmoving, additional permitting, and maintenance, as well as landowner coordination, encroachment permits, licenses, and land rights acquisitions.

2.1.1. Type 4 Purpose-Built Passage Structure

Type 4 passage structures typically consist of small to medium sized (< 10 ft wide) box culverts or drainage culverts that may serve the primary purpose of drainage (i.e., any dry, ephemeral, intermittent, or annual drainage structure), or may be instead repurposed or purpose-built to address wildlife movement (Illustration A). Type 4 passage structures are typically repurposed culverts constructed from concrete, galvanized steel, or High-Density Polyethylene (HDPE), and can be square, rectangular, arched, round, half or three-quarters round (FHWA 2011, Langton and Clevenger 2021). Elevated road segments would require raising the road above the existing grade to a height of between 8 inches up to two feet.

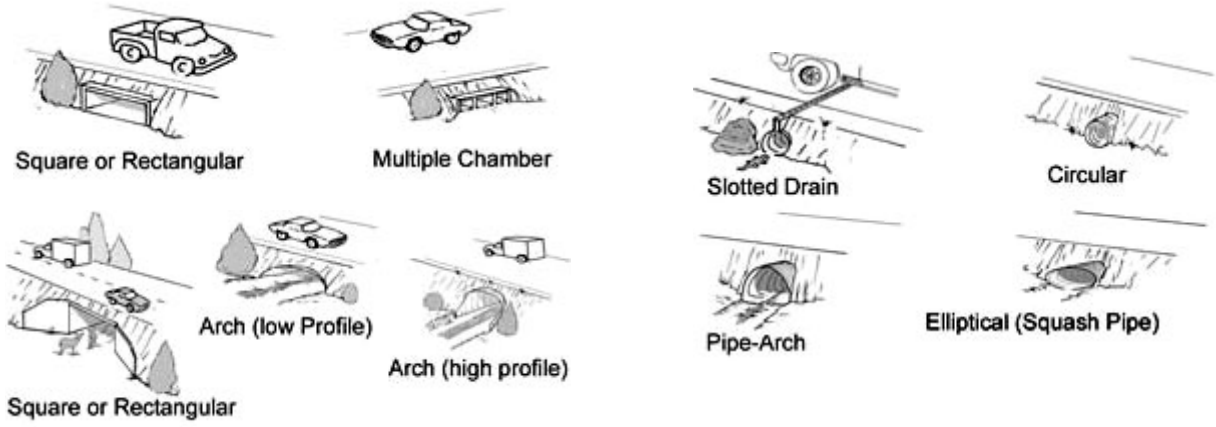

Illustration A. Examples of Type 4 Passage Structures. Variations include design considerations to facilitate drainage as a primary or secondary function, material, size, shape, and substrate (e.g., soil vs concrete bottom) type. Such structures may be designed to accommodate a wet channel or moist passage base and may include a grated top to provide ambient lighting and easy access for maintenance. (Source: https://www.fs.usda.gov/wildlifecrossings/glossary/common-types2.php)

At Alma Bridge Road, several Type 4 passage structures could be considered, including pre-cast box culverts, bridge culverts (i.e. a specific type of culvert whose design is technically similar in form and function to a formal bridge, but on a reduced scale), and/or culverts that would be designed with either a horizontal or drain-style metal grate on the road level (see Illustration A. "slotted drain"). A grated top to the culvert would provide easier access for routine maintenance, and allow for ambient lighting necessary for migratory orientation and continuous ambient moisture to enhance permeability for migrating newts. A grated top may also require additional maintenance, upkeep, repair, and replacement, and may require additional design considerations for pedestrian and bicycle safety. Type 4 culverts may either have a concrete or natural soil bottom throughout the passage. Any at-grade grate-work in the active roadway would be bicycle-proof for visitor safety. Repeating Type 4 purpose-built passage structures would be placed at regularly spaced intervals ("repeating") along/underneath elevated road segments that would serve the primary purpose of wildlife movement and

would include built-in guide walls and climbing barrier. Type 4 passage structures are also likely to convey runoff under the roadway when located in low lying areas. Additional analysis of the hydrologic and hydraulic conditions specific to the placement of a Type 4 passage structure would be required. Use of Type 4 passage structures may require the placement of energy dissipation measures such as an apron to prevent erosive conditions due to increased velocities at newly formed concentrated outfall locations.

2.1.2. Type 5 Micro-Passage

Type 5 structures typically consist of smaller (< 3 ft wide, 17-20 inch tall) at-grade drainage culverts that may serve the primary purpose of drainage (i.e., any dry, ephemeral, or intermittent drainage structure), as well as purpose-built wildlife micro-passages designed for wildlife movement (Illustration B). Exact dimensions of the crossing may vary depending on the road conditions. Type 5 crossing structures are sometimes achieved through the repurposing or construction of small cross-road drainage culverts constructed from concrete, galvanized steel, or HDPE, or the installation of purpose-built commercial wildlife passage structures, often designed specifically for reptiles and amphibians (FHWA 2011, Langton and Clevenger 2021).

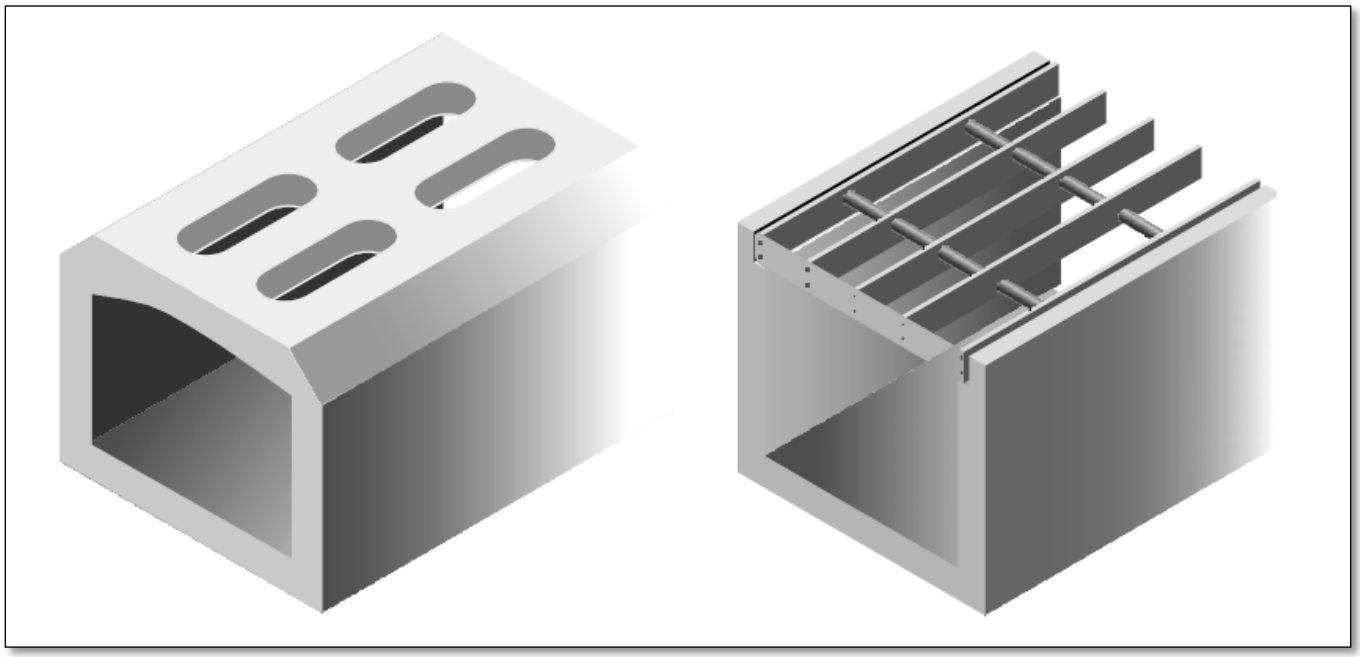

Illustration B. Examples of Type 5 Micro-passages. Micro-passages flush with the road surface maximize exposure to ambient environmental conditions and weather, including prevailing light and rainfall conditions. (Langton and Clevenger 2021)

At Alma Bridge Road, the recommended Type 5 crossing structures proposed for use throughout the project (where indicated) would consist of a commercial high-strength, slotted surface micro-passage that would serve the primary purpose of wildlife movement. Like the Type 4 passage structures, Type 5 micro-passages are also likely to convey runoff under the roadway when located in low lying areas. Additional analysis of the hydrologic and hydraulic conditions specific to the placement of a Type 5 micro-passages structure would be required. Type 5 micro-passages may require the placement of energy dissipation measures such as an apron to prevent erosive conditions due to increased velocities at newly formed concentrated outfall locations.

2.1.3. Type 6 Elevated Road Segment

Type 6 structures typically consist of microbridges and continuous elevated road segments, raising the road between 8 inches up to several feet above an existing roadway, forming a low viaduct (Illustration C). These are

typically designed to span and preserve existing wildlife movement corridors (Langton and Clevenger 2021, Brehme and Fisher 2021, Brehme et al. 2022).

At Alma Bridge Road, the recommended elevated road segment proposed for use throughout the project (where indicated) would require raising the roadway up to 2 feet from existing grade to accommodate Type 4 purpose-built passage structures with built-in guide walls and climbing barrier, as previously described, placed at regularly spaced intervals along this portion of road. Built-in guide walls would function to redirect wildlife movement to each Type 4 crossing structure and climbing barriers would prevent wildlife from over-topping the guide wall to access the roadway.

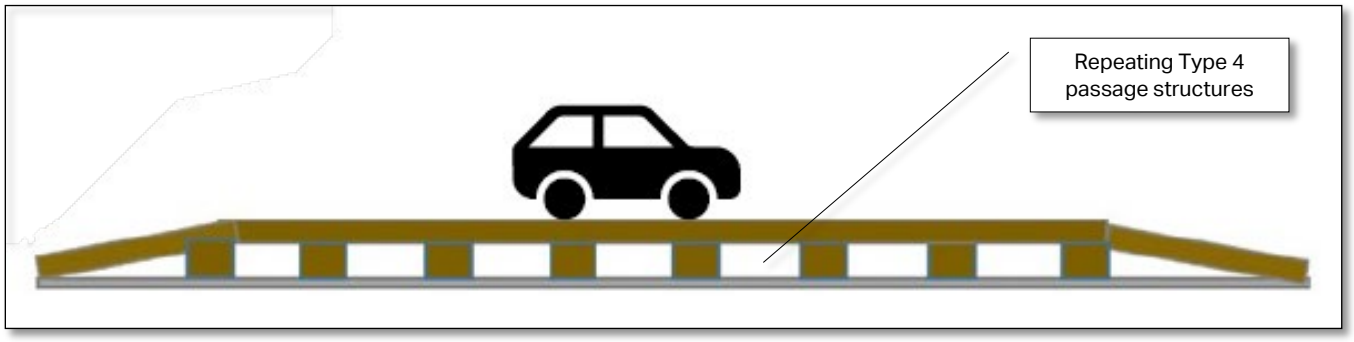

Illustration C. Example of a Type 6 Elevated Road Segment, as represented in this abbreviated representative view **(**Brehme et al. 2022). Typical elevated road segments would be permanent (non-timber, concrete-enforced type structures) and confined to the existing road prism and available shoulder and would consist of a gradually-ramped approach (ramp-up, ramp-down) at either end of one continuous long section. Throughout each continuous elevated road segment, repeating Type 4 passage structures would be placed below the road surface.

In each Zone where a section of elevated road segment is proposed, it would consist of a single gradually-ramped approach (ramp-up) ranging anywhere from 50 to 155 feet with approach grades ranging anywhere from 1.40% to 10.0%, with a single gradually-ramped end-point (ramp-down) at the end of the section. No more than one continuous section of elevated road segment would be placed in any one Zone. The shortest distance between sections of elevated road segment is approximately 250 feet between Zone 2 and 2a; however, elsewhere throughout the Project, the estimated distance between elevated road segments would be 750 feet (0.14 mile) between Zone 1 and Zone 2, and 5,560 feet (1.05 miles) between Zone 2a and Zone 3. Throughout each continuous elevated road segment, repeating Type 4 passage structures would be placed below the section of elevated road. Wherever possible, sections of elevated road segment would be placed strategically in line with the existing natural change in elevation of the roadway to ensure that drivers traveling along Alma Bridge Road would not experience a noticeable grade change. The elevated road segments would have minimal impacts to local drainage by allowing runoff that would typically cross the roadway to remain as sheet flow conditions. Ramp placement may have localized drainage impacts but those are anticipated to be minimal. Placed Type 4 passage structures would require additional hydrologic and hydraulic impact analysis.

Any elevated roadway structures would be permanent (non-timber, concrete-enforced type structures), confined to the existing road prism and available shoulder (e.g. would not require additional widening), and accommodate bicyclists consistent with existing conditions on-site, and are subject to further design; however, due to the possibility that such structures may require additional maintenance if the underlying Type 4 passage structures cannot be feasibly designed with grated tops, elevated road segments may not ultimately be supported by the County.

2.1.4. Modified Cattle Grate

Modified cattle grates typically consist of 8.5-foot-wide cattle grates with an approximately 5-inch-deep open passage below that can facilitate herpetofauna movement but could be modified to accommodate a project's

specific needs (Illustration D). The cattle grate extends across the full width of the roadway and can be constructed with round-top steel pipe, flat-top steel pipe, or steel structural H- and I-beams.

Modified cattle grates can function in two ways. When paired with directional fencing alone, modified cattle grates can act as a wildlife passage structure (similar to a Type 4 purpose-build passage structure or a Type 5 micro-passage) by directing wildlife underneath an active roadway. When paired with directional fencing and placed at either end of an elevated road segment, however, modified cattle grates would redirect newts that encounter the grate while approaching the elevated road segment along the road surface. When the newt encounters the open grate, they should fall safely through the openings into the protected passage below, where they can complete their migratory movement without further risk of a vehicle strike. Modified cattle grates require an open end at each side of the road to allow species passage.

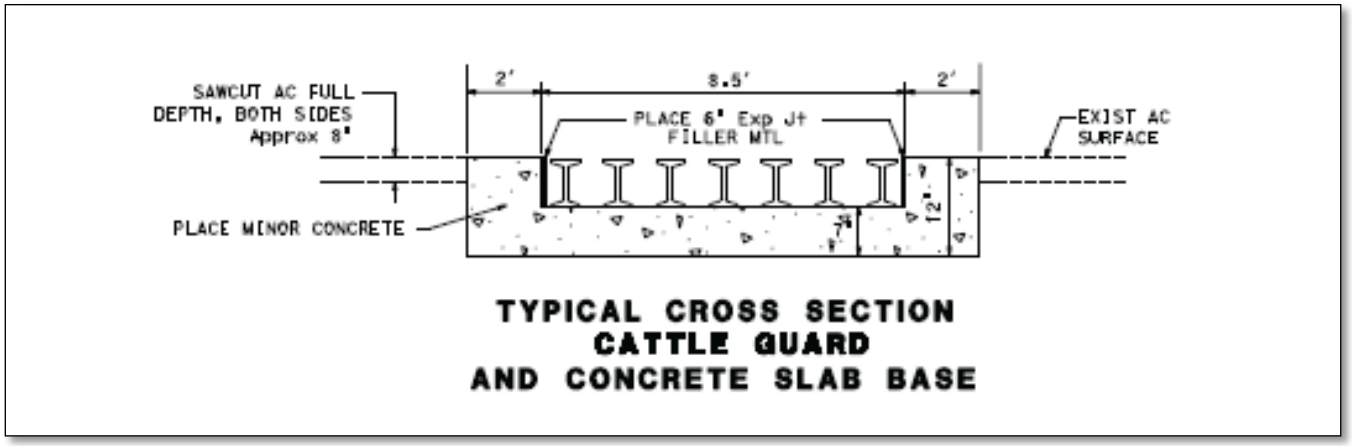

Illustration D. Example of a Modified Cattle Grate, as represented in this typical cross section from Caltrans SR-108 design. As depicted here, the steel structural I-beams create both an at-grade grated travel surface for vehicles passing overhead, and a travel path below-grade for wildlife traveling between each I-beam. (courtesy of Cheryl Brehme, USGS)

At Alma Bridge Road, cattle grates are recommended at either end of elevated road segments and other crossing structures to redirect newts traveling along the road instead of across it. Cattle grates would be outfitted with grating or smooth surface on top to safely accommodate bicycle traffic.

2.2. Corrective Action Constraints

Throughout the Project footprint, a limiting factor that influenced where Type 5 micro-passages could be placed was the narrow road shoulders, especially on the uphill (east) side of Alma Bridge Road. For Type 5 micro-passages to function optimally, ample space is required to install directional fencing angled suitably to redirect wildlife away from the active roadway toward the micro-passages. To adequately place micro-passages and directional fencing at these locations where the road shoulders are narrow or non-existent, additional earthmoving activity would be required to construct and place each Type 5 micro-passage. This work would involve additional cutslope and earthmoving, retaining walls, land acquisition, engineering design, permits, natural habitat impact and mitigation, land easements, etc. In contrast, through the use of Type 4 crossing structures along sections of elevated road segments, the raised roadway with built-in guide walls and climbing barriers would double as the wildlife barrier and would not require extensive work on the uphill slope to install.

In general, Corrective Actions with a larger opening (Type 4 passage structure) provide greater permeability than smaller openings (Type 5 micro-passage). As such, a greater number of Type 5 micro-passages would be required to achieve the same permeability as a Type 4 passage structure. The installation of repeating Type 5 micro-passages in the existing roadway at a higher frequency could impair the structural integrity of the roadway by creating deficiencies (as a consequence of the installation process) that could compound over

time, leading to additional inspections and maintenance. Each Type 5 micro-passage would require at-grade directional fencing along both sides of the existing road shoulder that may constrict the travel path and reduce the width of road shoulders for bicyclists and pedestrians, and could be subject to damage from vehicle strikes, leading to additional maintenance costs.

Preliminary feedback from County Roads suggests, for example, that elevated road segments paired with Type 4 micro-passages may not be feasible due to safety concerns, and that the installation of repeating Type 5 micro-passages in the existing roadway could impair the structural integrity of the roadway by creating deficiencies. Specifically, the multimodal nature of Alma Bridge Road requires that the roadway remain accessible to multiple users, including vehicles, bicyclists, and pedestrians. Depending on site conditions and final design, elevated road segments may constrict the travel path and reduce the width of road shoulders for bicyclists and pedestrians, putting these users at risk.

Further refinement is currently underway between AECOM, Midpen, and County Roads to better understand the constraints and opportunities associated with each Corrective Action, Option, and Alternative. Such discussion will inform the Alternatives that advance to Task 3 for rigorous evaluation and ensure the stated goals of sufficiently decreasing newt mortality and increasing habitat permeability are met.

3. Preliminary Investigation Site Visit

The Project team convened for an Alma Bridge Road site visit on September 26, 2022 to ground-truth desktop review findings, collect data on unmapped environmental and road features such as the location of drainage facilities and culverts, and examine the feasibility of numerous crossing Options. Attendees including representatives from Midpen, Santa Clara County Roads and Airports, Santa Clara County Parks, and the AECOM Consulting Team, and numerous technical experts representing various biology and engineering disciplines. In addition to collecting data, the site visit allowed the interdisciplinary team to collaboratively develop unique and cutting-edge solutions and have a productive dialogue on the diverse goals of increased passage success, continued human access for recreational and residential purposes, and sound engineering design.

Members of the Project team visited the full extent of Alma Bridge Road along Lexington Reservoir, stopping at the following key locations to discuss opportunities and constraints:

- Lexington County Park parking lot (north end of the Project area)
- Limekiln Canyon Trail parking area and associated newt mortality hotspot
- Priest Rock Trail parking area
- Former Beatty Trust property for proposed future parking area
- Miller Point parking area
- North end of Soda Springs Canyon parking area and associated newt mortality hotspot
- South end of Soda Springs Canyon parking area and associated newt mortality hotspot
- Cathedral Oaks (South end of the Project area)

Additional information about these locations is provided in the Task 1 Technical Review (AECOM 2022).

Along the full extent of Alma Bridge Road, data were collected on the mobile application ArcGIS Field Maps to ground-truth and add to existing datasets. Principally, locations of any topographic, hydrological, or engineered feature that may inform the effectiveness of proposed Corrective Actions were collected. These include berms and washouts that impede or divert newt movement; steep slopes and narrow corridors that may inhibit construction of passages and elevated roadways; and existing culverts and drainage facilities that may be retrofitted or otherwise improved to facilitate safe newt passage. The team also collected data on road segments, such as wide intersections and blind turns, that may be appropriate locations for signage, speed control, and other driving behavior-mitigating solutions.

For each feature recorded, location data, qualitative descriptions, and, where pertinent, dimensions were recorded on ArcGIS Field Maps. These data were integrated into a webmap on ArcGIS Online, along with other relevant geospatial data from the Newt Patrol, USGS, H.T. Harvey & Associates, HDR Inc., Midpen, Valley Water, and the County. These data were essential to the development of the subsequent Corrective Actions, Options, Scenarios, and Alternatives, as defined in the sections that follow, considered during the Feasibility Analysis task.

4. Site-Specific Corrective Actions

To prescribe site-specific Corrective Actions to the various newt mortality hotspots, three key Priority Zones representing the most important areas for treatment, based on newt mortality hotspot data, were designated. Within each Priority Zone (also referred to simply as a "Zone"), Corrective Actions like elevated road segments and modified cattle grates were combined into "Options" that synergize well to address site-specific mortality. These Options were developed at the Wildlife Crossing Conceptual Design Workshop and are defined and described in greater detail below.

4.1. Wildlife Crossing Conceptual Design Workshop

Based on the results of the Task 1 Technical Review and the Task 2 preliminary investigation site visit, Project team subject matter experts, biologist, engineers, hydrologists, and permitting specialists convened as part of a wildlife crossing conceptual design workshop. The intent of the workshop was to arrive at a recommendation of preliminary Scenarios—and eventually Project Alternatives—consisting of possible Corrective Actions Options based on the Project criteria of decreased California newt mortality and increased habitat permeability, while still meeting recreation and residential access needs. Of the Alternatives identified during the workshop, no more than four preliminary Alternatives (i.e., the Preliminary Alternatives) are considered during this formal Feasibility Analysis (Task 2), which will be refined during the forthcoming Alternatives Evaluation/Basis of Design (Task 3). The details of the workshop are described below.

On December 1 and December 8, 2022, Project team members Thomas Langton (technical expert), Cheryl Brehme (USGS; technical expert), Dr. Philip Gould (USGS; biostatistics), Dr. Merav Vonshak (Newt Patrol), and Dr. Jeff Wilkinson (H.T. Harvey; technical expert) collaborated with AECOM biologists and engineers and HDR Inc. hydrologists in a conceptual design workshop to identify preliminary Project Alternatives consisting of possible Corrective Actions Options based on Project criteria. The team discussed the engineering, hydrological, and environmental constraints of each proposed Corrective Action and its associated area along Alma Bridge Road.

During this workshop, the following naming conventions were established:

- **Segment:** One of 334 discrete 65-foot-long sections along Alma Bridge Road designated to subdivide the Project Footprint for road mortality modeling and analyses.
- **Priority Zone (Zone):** Discrete, designated areas consisting of a subset of segments that encompass a heightened area of newt mortality; four Priority Zones were identified – Zones 1, 2, 2a, and 3) (see Section 4.1.1).
- **Corrective Action:** A single wildlife crossing structure or traffic calming solution implemented to reduce newt mortality (i.e., Type 1 through Type 6 + signage, rumble strips, etc.) proposed at selected segments within a Priority Zone.
- **Option:** A single Corrective Action type (e.g., Type 3), or a combination of several Corrective Action types (e.g., Type 3 + Type 6), assigned to all, or a part of, a Priority Zone to reduce mortality within that Zone (see Section 4.1.2).
- **Scenarios:** A combination of Options across one or several Zones selected for analysis purposes to evaluate their effect as part of the feasibility analysis (see Section 5.1.1).
- **Alternatives:** One, or a combination of multiple, Scenarios evaluated to determine their modeled effects in reducing California newt mortality across the entire Project Footprint (see Section 6.1).

The foremost area of evaluation was across Priority Zones. Within each Priority Zones, a combination of Corrective Actions, known as Options, were considered. Each of the four Priority Zones, and the suite of

Options considered in each Zone, are described below. The Scenarios and Alternatives identified as part of the Effectiveness Modeling are described in Section 5.

4.1.1. Priority Zones

Prior to the workshop, the Project Footprint was sub-divided into 334 discrete 65-foot-long (20 m) segments along Alma Bridge Road for analyzing road mortality rates since 2017. All subsequent data analyses and modeling were performed on a per segment basis further subdivided into 3.28 ft (1 m) sections. During the workshop, participants identified three key Priority Zones (Priority Zones 1, 2, and 3), also called "Zones," that were later modified to include an additional Priority sub-Zone (Priority Zone 2a) (Figure 2). The Priority Zones were labelled from north to south along Alma Bridge Road for the entirety of the Project Area and do not correspond to importance for mortality reduction. Zone 2a, immediately south of Zone 2, was added because the moderate newt mortality observed in this area may increase if traffic changes in response to the development of the former Beatty Trust parking area. These four discrete areas were identified based on the USGS hotspot modeling, which categorized observed newt mortality throughout the Project Footprint from low to high by segment. Hotspots were developed by analyzing Newt Patrol-observed mortality rates over the last five years along Alma Bridge Road (Newt Patrol 2022). Each Priority Zone encompasses an area of heightened newt mortality.

Priority Zone 1

Priority Zone 1 is approximately located between stations[2] 22+50 and 58+00 (Figure 2) and consists of approximately 0.66 mile (3,504 feet) of the existing 24-ft wide, two-lane county road.

Priority Zone 2

Priority Zone 2 is located between stations 61+50 and 76+50 (Figure 2) and consists of approximately 0.29 mile (1,540 feet) of the existing 24-ft wide, two-lane county road.

Priority Zone 2a

Priority Zone 2a is located between stations 76+50 and 87+00 (Figure 2) and consists of approximately 0.20 mile (1,037 feet) of the existing 24-ft wide, two-lane county road. Priority Zone 2a abuts the south end of Priority Zone 2.

Priority Zone 3

Priority Zone 3 is located between stations 144+00 and 172+50 (Figure 2) and consists of approximately 0.54 mile (2,877 feet) of the existing 24-ft wide, two-lane county road.

Secondary Zone

Alma Bridge Road's Secondary Zone consists of all road segments between station 3+50 and station 223+50 that fall outside of Priority Zones 1 through 3 (Figure 2). As with the majority of Alma Bridge Road, these interstitial segments comprise the remaining approximately 4.15 miles (21,915 feet) of the existing 24-ft wide, two-lane county road.

Within each Zone, participants collaborated on recommendations for one or a combination of Corrective Actions (i.e., wildlife crossing structures and traffic calming solutions) to reduce newt mortality. Collectively, these groupings of Corrective Actions, or Options, were assigned to all, or a part of, a Priority Zone to help reduce mortality. At times, several discrete or overlapping Options (e.g., either a bridge, or an elevated road section) were proposed within a Priority Zone to allow for flexibility during the future Alternatives Analysis, taking into account the variability associated with engineering constraints, recreation and local resident use, costs, permitting needs, schedule constraints, hydrology, and migrating newt permeability.

[2] Stationing: linear measurements tied to a baseline, used in the absence of designated mile markers

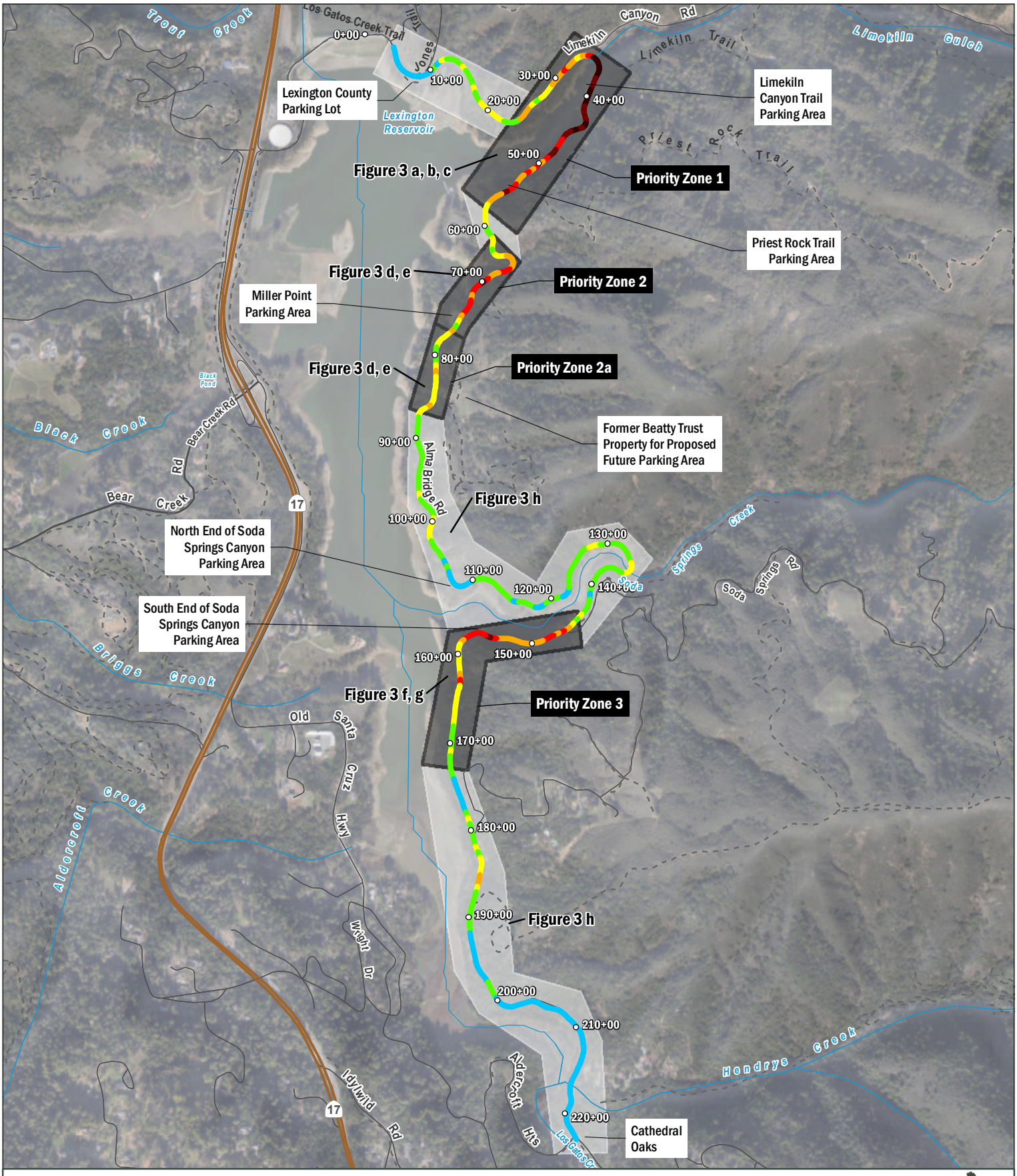

Figure 2: Priority and Secondary Zones

- Existing Trail
- Priority Zone
- Secondary Zone

Newt Mortality (USGS)

- Extremely High
- Very High
- High
- Medium High
- Medium
- Low
- Very Low

Midpeninsula Regional Open Space District
(Midpen)
3/29/2023

Feet
0 1,000 2,000

MIDPENINSULA REGIONAL OPEN SPACE

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4.1.2. Options

Based on the workshop, five Options were identified in Priority Zone 1, two Options were identified in Priority Zone 2 and Zone 2a, and two Options were identified in Priority Zone 3 (Table 2, Figures 3a through 3h). In the absence of selecting one of these Options, a no-build decision in a particular Priority Zone would not mitigate the current observed newt mortality rate at that location. The next section (Section 5) discusses which Options/combination of Options described below would be most successful in reducing newt mortality.

Table 2. Description of Priority Zone Options

Project Location	Priority Zone Corrective Action Descriptions	
	Description	Location within the Zone
Zone 1		
Option 1	Bridge (+ Partial Road Closure)	Throughout Zone 1
Option 2	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures	The "Straightaway"
Option 2a	Alternating Type 5 Micro-passages and Type 4 Purpose-Built Passage Structures	The "Hairpin" turn
Option 2b	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures	The "Extended Straightaway"
Option 3	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures	The "Curve"
Zone 2 + 2a		
Option 4	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures Type 5 Micro-passages	Priority Zone 2 Priority Zone 2a
Option 5	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures	Priority Zone 2 and 2b
Zone 3		
Option 6	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures Type 5 Micro-passages	Northern half of Zone 3 Southern half of Zone 3
Option 7	Elevated Road Segment w/ Type 4 Purpose-Built Passage Structures	Throughout Zone 3

The identified Options include the following:

Zone 1 – Option 1: Bridge (+ partial road closure)

The goal of Option 1 (Figure 3a) is to reduce traffic-related mortality along this section of Alma Bridge Road by constructing an approximately 850-900-foot multiple span bridge across the Limekiln Canyon inlet of the Lexington Reservoir and, after construction, closing the portion of Alma Bridge Road to non-quarry thru-traffic between either end of the bridge touchdown points. Quarry traffic would be preserved through to its private driveway, along which some newt mortality might persist at non-significant levels. Post-construction, this Option would restore between 3,541 linear feet (0.67 mile) of roadway located in Priority Zone 1 that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Figure 3a: Option 1 (Bridge)

Alma Bridge Rd
Existing Trail

Land Ownership
Valley Water

Option 1
Multi-Span Bridge
Full Road Closure (No Vehicle Access)
Partial Road Closure (Quarry Traffic Only)

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Feet
0 100 200

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Figure 3b: Option 2 (Straightaway) and 2a (Hairpin)

Alma Bridge Rd

Existing Trail

Land Ownership

Valley Water

Option 2

Type 4 Purpose-Built Passage Structure

Modified Cattle Grate

Type 6 Elevated Road Segment

Option 2a

Type 5 Micro-Passage

Modified Cattle Grate

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3/29/2023

Feet
0 100 200

AECOM

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

Figure 3c: Option 2b (Extended Straightaway) and 3 (Curve)

Alma Bridge Rd

Existing Trail

Land Ownership

Valley Water

Option 2b

Type 4 Purpose-Built Passage Structure

Modified Cattle Grate

Type 6 Elevated Road Segment

Option 3

Type 5 Micro-Passage

Modified Cattle Grate

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3/29/2023

Feet
0 100 200

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

Figure 3d: Option 4

Alma Bridge Rd
Existing Trail

Land Ownership
Midpen Preserve
Valley Water
SJWC
Former Beatty Trust Property

Option 4
Type 4 Purpose-Built Passage Structure
Type 5 Micro-Passage
Modified Cattle Grate
Type 6 Elevated Road Segment

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(Midpen)
3/29/2023

Feet
0 100 200

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

Figure 3e: Option 5

Alma Bridge Rd
Existing Trail

Land Ownership
Midpen Preserve
Valley Water
SJWC
Former Beatty Trust Property

Option 5
Type 4 Purpose-Built Passage Structure
Modified Cattle Grate
Type 6 Elevated Road Segment

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(Midpen)
3/29/2023

Feet
0 100 200

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

Figure 3f: Option 6

Alma Bridge Rd

Existing Trail

Option 6

Type 4 Purpose-Built Passage Structure

Type 5 Micro-Passage

Modified Cattle Grate

Type 6 Elevated Road Segment

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(Midpen)
3/8/2023

Feet
0 100 200

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

Figure 3g: Option 7

Alma Bridge Rd
Existing Trail

Option 7

Type 4 Purpose-Built Passage Structure
Type 5 Micro-Passage
Modified Cattle Grate
Type 6 Elevated Road Segment

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3/8/2023

Feet
0 100 200

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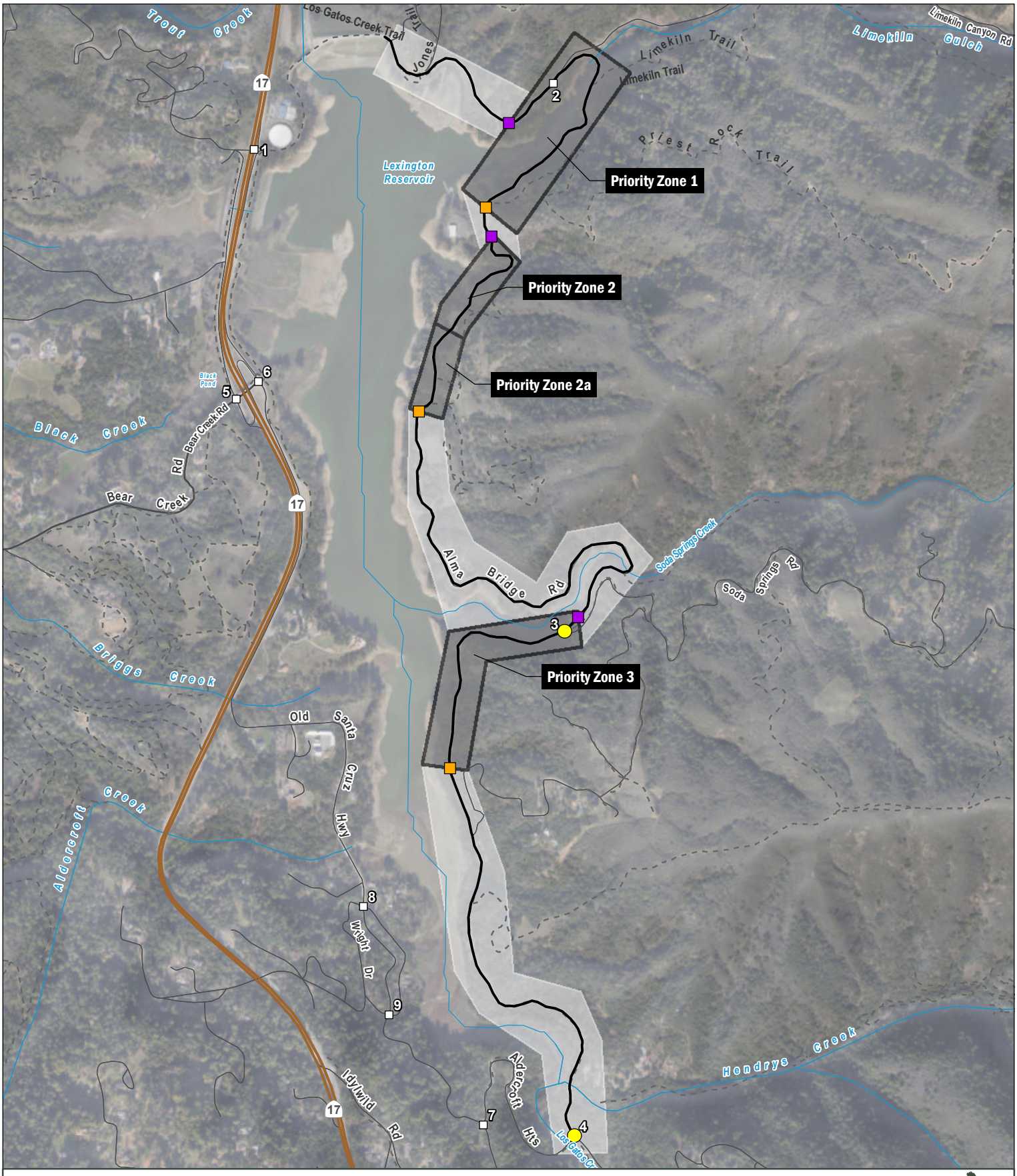

Figure 3h: Secondary Zone

- Existing Trail
- Priority Zone
- Secondary Zone
- Major Intersection

1. Highway 17 (northbound)/Alma Bridge Rd
2. Alma Bridge Rd/Limekiln Canyon Rd
3. Alma Bridge Rd/Soda Springs Rd
4. Alma Bridge Rd/Aldercroft Heights Rd
5. Hwy 17 (southbound)/Bear Creek Rd Overcrossing
6. Bear Creek Rd/Old Santa Cruz Hwy
7. Old Santa Cruz Hwy/Aldercroft Heights Rd
8. Wright Dr (north)/Old Santa Cruz Hwy
9. Wright Dr (south)/Old Santa Cruz Hwy

Secondary Zone

- Island/Median Placement
- Start of Rumble Strip/Perceptual Treatment Zone (northbound)
- Start of Rumble Strip/Perceptual Treatment Zone (southbound)

Feet
0 1,000 2,000

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Under this Option, public access to recreational facilities like the Limekiln Trail and unofficial parking turn outs or road shoulder parking areas could be preserved by constructing (or repurposing) a designated dirt, gravel, or paved parking lot as an official parking lot on an abandoned portion of Alma Bridge Road accessible from the southern bridge touchdown paired with extending the Limekiln Trail trailhead south to connect with the relocated parking area.

Zone 1 – Option 2: Elevated Road Segment ("Straightaway")

The goal of Option 2 (Figure 3b), also known as the "Straightaway," is to reduce traffic-related newt mortality along this section of Alma Bridge Road by installing an elevated road segment that incorporates repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and a modified cattle grate at either end. Post-construction, this Option would enhance habitat permeability along 1,800 linear feet (0.34 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding. The unofficial Priest Rock Trail shoulder parking would be elevated along with the elevated road segment that encompasses it. The unofficial Limekiln Trail shoulder parking would not be affected.

Zone 1 – Option 2a: Alternating Dedicated Wildlife Crossing Structures ("Hairpin")

The goal of Option 2a (Figure 3b), also known as the "Hairpin," is to reduce traffic-related newt mortality along this section of Alma Bridge Road by installing alternating Type 5 micro-passages and modified cattle grates paired with directional fencing. Post-construction, this Option would enhance habitat permeability along 744 linear feet (0.14 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Zone 1 – Option 2b: Elevated Road Segment ("Extended Straightaway")

The goal of Option 2b (Figure 3c; Figure 3c shows both Option 2b and Option 3, but they are separate Options), also known as the "Extended Straightaway," is to reduce traffic-related newt mortality along this section of Alma Bridge Road by installing an extended elevated road segment (compared to Option 2) that incorporates repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end between Limekiln Creek through to the southern boundary of Zone 1. Post-construction, this Option would enhance habitat permeability along 2,161 linear feet (0.41 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding. Unofficial Limekiln Trail and Priest Rock Trail shoulder parking would be elevated along with this stretch of roadway, allowing for continued access.

Zone 1 – Option 3: Dedicated Wildlife Crossing Structures ("Curve")

The goal of Option 3 (Figure 3c; Figure 3c shows both Option 2b and Option 3, but they are separate Options) is to reduce traffic-related newt mortality along this section of Alma Bridge Road by installing a pair of Type 5 micro-passages, a modified cattle grate at either end and directional fencing. Post-construction, this Option would enhance habitat permeability along 241 linear feet (0.05 mile) of roadway located in a high-use newt movement corridor currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Zone 2 and 2a – Option 4

The goal of Option 4 (Figure 3d) is to reduce traffic-related newt mortality in the vicinity of the Miller Point parking lot and the former Beatty Trust property by installing an elevated road segment that incorporates repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and a modified cattle grate at either end in Zone 2, combined with three Type 5 micro-passages and directional fencing at three mortality hotspots in Zone 2a. Post-construction, this Option would enhance habitat permeability along 2,169 linear feet (0.41 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Zones 2 and 2a – Option 5

The goal of Option 5 (Figure 3e) is to reduce traffic-related newt mortality in the vicinity of the Miller Point parking lot and the former Beatty Trust property by installing two elevated road segments that incorporate repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier in Zone 2 and Zone 2a, with modified cattle grates at either end of the elevated segments. Post-construction, this Option would enhance habitat permeability along 2,265 linear feet (0.43 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Zone 3 – Option 6

The goal of Option 6 (Figure 3f) is to reduce traffic-related newt mortality along this section of Alma Bridge Road by installing an elevated road segment that incorporates repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and modified cattle grates at each end of the northern portion of the Zone combined with a pair of Type 5 micro-passages and modified cattle grates with directional fencing to either side of an unnamed drainage in the southern portion of the Zone. Post-construction, this Option is predicted to enhance habitat permeability along 1,882 linear feet (0.36 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Zone 3 – Option 7

The goal of Option 7 (Figure 3g) is to reduce traffic-related newt mortality along this section of Alma Bridge Road by installing an elevated road segment that incorporates repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier throughout the entire Zone, with modified cattle grates at each end. Post-construction, this Option would enhance habitat permeability along 2,656 linear feet (0.50 mile) of roadway located in a high-use newt movement corridor that currently presents a substantial source of road mortality for newts migrating between terrestrial upland habitat and Lexington Reservoir for annual breeding.

Secondary Zone

The goal of Corrective Actions in the Secondary Zone (Figure 3h) is to reduce traffic-related newt mortality along these sections of Alma Bridge Road, and by extension, within Zones 1 through 3, by installing traffic control and calming measures that include improved signage, islands and medians, and transverse rumble strips and perceptual treatments to shorten route(s), minimize travel time and distance, discourage additional traffic to the area, heighten driver awareness to speed reduction zones and newt crossing areas, improve driver safety, and heighten visitor awareness of the Alma Bridge Road Newt Passage Project.

No-Build Option

In the absence of selecting any of these Options altogether, a no-build decision in the Project Area would not mitigate the current observed newt mortality rate that has been recorded at Alma Bridge Road, and the local California newt population is expected to continue to decline.

After the workshop, a series of Scenarios, consisting of a combination of Options across one or several Zones, were evaluated as part of the Effectiveness Modeling portion of Task 2. After a preliminary review of the Scenarios, the various Options were re-evaluated to identify a suite of Alternatives for further analysis. These steps are described below.

5. Effectiveness Modeling

To assess whether the workshop-developed Corrective Actions meet the Project goals of habitat connectivity and species persistence, the effectiveness of various Corrective Action Options was analyzed. To accomplish this, Dr. Phillip Gould (USGS) worked with Cheryl Brehme (USGS) to model spatially explicit newt population-level road permeability along Alma Bridge Road for each suite of Corrective Actions, or Options, developed. Due to the lack of information on California newt, this was based on existing research on the responses of migratory amphibians (principally, salamanders and toads) to road passages and barriers, the most recent four years of Newt Patrol road mortality data, the Newt Patrol carcass persistence study, and the study of newt road mortality versus successful road crossings by H.T. Harvey (H.T. Harvey & Associates 2021, Parsons 2021, Newt Patrol 2022; see AECOM 2022). Estimates from the permeability models for all design Scenarios were then incorporated into a USGS-modified, scientifically defensible, Bayesian version of H.T. Harvey & Associates' 2021 newt population viability assessment model (PVA) to estimate long-term projections of newt population persistence over the next 100 years. The model included an estimate that 5% of the population breeds without encountering Alma Bridge Road; this accounts for the possibility that a small proportion of newts may use large culverts at Limekiln Canyon and Soda Springs, or perhaps unknown ephemeral breeding habitats, to breed. Up to 8 different design Scenarios and a no-build decision were considered during the modeling. This was an iterative process working with the broader AECOM team.

Part 1 of the Effectiveness Modeling looked at one or several Options (see Section 4.1.2) in combinations known as Scenarios (Table 3), and modeled the population viability, expected future road mortality, and permeability of each Scenario. For each Scenario (Scenarios 1 through 9; Table 3), the modeling predicted whether the Scenarios might decrease California newt mortality and increase road permeability sufficiently to support population persistence over 100 years. Trend metrics for each option included overall permeability (successful crossings), road mortality, and predicted population size.

The information gathered in Part 1 was then used in Part 2 of the Effectiveness Modeling analysis to further refine the most permeable Options into a second suite of Scenarios (Scenarios 10 through 13; Table 3) known as the Preliminary Alternatives.

An overview of each Scenario and the underlying Corrective Actions proposed for each Zone are provided in Table 3. Each Scenario is ranked from the greatest (1st) to least (13th) modeled overall effectiveness. Designs that meet the criteria of projected long-term newt population persistence, habitat connectivity, cost, and maintainability will be considered in the Alternatives Evaluation/Basis of Design process (Task 3). Parts 1 and 2 of the Effectiveness Modeling are described below.

5.1. Effectiveness Modeling Part 1

During Part 1 of Effectiveness Modeling, each of the nine Scenarios were modeled (Table 3), including one "no-build" Scenario. Scenarios include a large open span bridge (Type 1B), micro-passages (Type 5), elevated roadways (Type 6) with repeating Type 4 passage structures (Type 4), modified cattle grates, and directional fencing. These Scenarios were input into a preliminary round of modeling by the USGS that analyzes population viability, predicted road mortality, and permeability.

5.1.1. Scenarios (Part 1)

Scenario 1

Scenario 1 consists of the no-build decision, in which no Corrective Actions are implemented within the Project Footprint.

Scenario 2

Scenario 2 consists of the construction of a bridge spanning the Limekiln Canyon inlet, and the partial road closure of a section of Alma Bridge Road between the northern and southern bridge touchdowns.

Table 3. Effectiveness Modeling Scenario Description and Rank

Priority Zone Corrective Action Descriptions					
Scenario	**Zone 1**	**Zone 2**	**Zone 2a**	**Zone 3**	**Ranking [a]**
Scenario 1	*No-Build*	*No-Build*	*No-Build*	*No-Build*	13th
Scenario 2*	Bridge (+ Partial Road Closure)	*No-Build*	*No-Build*	*No-Build*	6th
Scenario 3*	ERS [30m] + MP [30m] + CG	*No-Build*	*No-Build*	*No-Build*	9th
Scenario 4*	ERS [12.5m] + MP [12.5m] + CG	*No-Build*	*No-Build*	*No-Build*	8th
Scenario 5	ERS [60m] + MP [60m] + CG	*No-Build*	*No-Build*	*No-Build*	12th
Scenario 6*	ERS [30m] + MP [30m] + CG	ERS [30m]	*No-Build*	ERS [30m] + 2 MP + CG	4th
Scenario 7	*No-Build*	ERS [30m]	*No-Build*	*No-Build*	10th
Scenario 8	*No-Build*	*No-Build*	*No-Build*	ERS [30m] + 2 MP + CG	11th
Scenario 9*	ERS [30m] + MP [30m] + CG	*No-Build*	*No-Build*	ERS [30m] + 2 MP + CG	7th
Scenario 10 (Alt. 1)***	Bridge (+ Partial Road Closure)	ERS [28m]	ERS [30m]	ERS [30m]	1st
Scenario 11 (Alt. 2)***	ERS [30m] ["extended straightaway"]	ERS [28m]	ERS [30m]	ERS [30m]	2nd
Scenario 12 (Alt. 3)***	ERS [30m] + MP [22m] + CG ["hairpin"]	ERS [28m]	3 MP	ERS [30m] + 2 MP + CG	5th
Scenario 13 (Alt. 4)***	ERS [30m] + MP [22m] + CG ["hairpin"]	ERS [30m]	ERS [30m]	ERS [30m]	3rd

ERS = Elevated Road Section, which includes Type 4 passage structures and modified cattle grates
MP = Micro-passage CG = Modified cattle grate
** Preliminary scenario that resulted in no further newt population decline.*
*** Refined scenarios that also result in no further newt population decline.*
[a] Refer to Appendices A and B for more details on ranking designations.

Scenario 3
Scenario 3 consists of the construction of alternating Type 4 purpose-built passage structures and Type 6 modified cattle grates at the "curve" and the "hairpin" turns spaced 30 meters[3] (98.42 feet) apart, followed by elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 1.

Scenario 4
Scenario 4 consists of the construction of alternating Type 4 purpose-built passage structures and Type 6 modified cattle grates at the "curve" and the "hairpin" turns spaced 12.5 meters (41.01 feet) apart, followed by elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 12.5 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 1.

Scenario 5
Scenario 5 consists of the construction of alternating Type 4 purpose-built passage structures and Type 6 modified cattle grates at the "curve" and the "hairpin" turns spaced 60 meters (196.85 feet) apart, followed by elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 60 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 1.

Scenario 6
Scenario 6 consists of the construction of alternating Type 4 purpose-built passage structures and Type 6 modified cattle grates at the "curve" and the "hairpin" turns spaced 30 meters apart, followed by elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 1.

Zone 3 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 3. Additionally, Scenario 6 involves the installation of one Type 5 micro-passage on each side of an unnamed drainage.

Scenario 7
Scenario 7 consists of the construction of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 2.

Scenario 8
Scenario 8 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 3. Additionally, Scenario 8 involves the installation of one Type 5 micro-passage on each side of an unnamed drainage.

Scenario 9
Scenario 9 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with modified cattle grates at the beginning/end of each discrete section in Zone 3. Additionally, Scenario 9 involves the installation of one Type 5 micro-passage on each side of an unnamed drainage.

[3] All USGS effectiveness modeling was performed using the "meter" as the standard unit of measure, and is therefore reported as such throughout Section 5.

5.1.2. Discussion (Part 1)

The preliminary modeling of all nine Scenarios provided insights into which parameters (e.g., spacing between tunnels or type of crossing) are estimated to be most effective using this approach. These findings allowed the Project team to refine the model and develop an improved suite of Scenarios that were analyzed during a final round of modeling. Detailed results of the Effectiveness Modeling (Part 1) can be found in Appendix A. Signage and other proposed traffic mitigating solutions under consideration for the Secondary Zone were not modeled.

Of the nine Scenarios (Scenarios 1 through 9) evaluated during the Effectiveness Modeling (Part 1), five of the nine Scenarios met the objective of no further population decline; these were Scenarios 2, 3, 4, 6, and 9. Examination of these successful Scenarios determined that based on modeling, Zone 1 appears to be the most important for mitigation, followed by Zone 3 and then Zone 2. *However, Scenarios that address all Priority Zones scored the highest overall, especially in maintaining population viability and reducing newt mortality, indicating that future Scenario modeling should include Corrective Actions at all Priority Zones*. The preliminary modeling also indicated that 30-meter spacing or less between Type 4 structures along elevated road segments was predicted to meet criteria for population viability and mortality. Models using 60 m spacing between passages predicted a population decline comparable or worse than no road mitigation due to very low levels of permeability. As expected, 12.5-meter spacing scored higher in site permeability.

Scenarios 1, 5, 7, and 8 did not meet the objective of no further population decline. For example, although Scenario 5 primarily uses the same crossing types (elevated road segments, Type 4 wildlife crossings, and cattle grates) as Scenarios 3 and 4 but at 60-meter spacing, the permeability would worsen compared to current conditions. Scenario 5's permeability loss is likely attributable to inadequate spacing of crossings. This creates an additional barrier that may cause newts to turn around after an unsuccessful migration attempt. Scenario 5 also showed unsatisfactory improvements to population viability and reducing road mortality, scoring 6th for each metric.

Scenarios 7 and 8 each targeted one Priority Zone, Zone 2 and Zone 3, respectively. Newt Patrol mortality monitoring and preliminary modeling suggest Priority Zone 1 is the most important mortality hotspot to mitigate. While Scenario 7 was able to effectively enhance permeability in Zone 2, both Scenarios were among the worst in maintaining newt abundance and stemming road mortality.

Finally, Scenario 1, the no-build Scenario, scored the worst overall. According to the model, continued lack of intervention would lead to the weakest population viability, the greatest road mortality, and the second worst permeability, behind Scenario 5.

These findings made clear that Scenarios 1, 5, 7, and 8 were most deficient in maintaining a viable newt population, reducing road mortality, and improving permeability. Based on these findings, the second round of Effectiveness Modeling was refined by prioritizing the most optimal, or permeable, Options to further investigate the best combinations of Corrective Actions that achieve all objectives, are logistically feasible, and represent a breadth of costs.

5.2. Effectiveness Modeling Part 2

During Part 2 of Effectiveness Modeling, four additional Scenarios were modeled (Scenarios 10 through 13; Table 3) to refine the possible Corrective Action Options into optimal Preliminary Alternatives. Takeaways from the initial round of modeling informed which Scenarios and parameters of crossing Options (such as spacing and Priority Zone) were best suited to meet Project goals. These additional Scenarios were input into a second round of modeling by the USGS that analyzes population viability, predicted road mortality, and permeability.

5.2.1. Scenarios (Part 2)

Scenario 10 (Preliminary Alternative 1)

Scenario 10 consists of the construction of a bridge spanning the Limekiln Canyon inlet, and the partial road closure of a section of Alma Bridge Road between the northern and southern bridge touchdowns in Zone 1.

Zones 2 and 2a consist of the construction of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 28 meters (91.86 feet) (Zone 2) to 30 meters (Zone 2a) apart, with a modified cattle grate at either end of the approach.

Zone 3 consists of the construction of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters, with a modified cattle grate on either end of the approach.

Scenario 11 (Preliminary Alternative 2)

Scenario 11 consists of the construction of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with a modified cattle grate at either end of the approach in Zone 1 along the "extended straightaway".

Zones 2 and 2a consist of the construction of elevated road segments with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 28 meters (Zone 2) to 30 meters (Zone 2a) apart, with a modified cattle grate at either end of the approach.

Zone 3 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters, with a modified cattle grate on either end of the approach.

Scenario 12 (Preliminary Alternative 3)

Scenario 12 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with a modified cattle grate at either end of the approach in Zone 1 along the "straightaway", paired with alternating, repeating Type 4 purpose-built passage structures and Type 5 micro-passages spaced 22 meters (72.18 feet) apart in Zone 1 along the "hairpin."

Zone 2 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 28 meters apart, with a modified cattle grate at either end of the approach, followed by the construction of three type 5 micro-passages placed at three unnamed drainages) in Zone 2a.

Zone 3 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters, with a modified cattle grate on either end of the approach, followed by the construction of a pair of Type 5 micro-passages and a pair of modified cattle grates placed adjacent to an unnamed drainage.

Scenario 13 (Preliminary Alternative 4)

Scenario 13 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with a modified cattle grate at either end of the approach in Zone 1 along the "straightaway", paired with alternating repeating Type 4 purpose-built passage structures and Type 5 micro-passages spaced 22 meters apart in Zone 1 along the "hairpin".

Zones 2 and 2a consist of the construction of two elevated road segments with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters apart, with a modified cattle grate at either end of the approach.

Zone 3 consists of the construction of an elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier spaced 30 meters, with a modified cattle grate on either end of the approach.

5.2.2. Discussion (Part 2)

The preliminary modeling of all nine Scenarios was used to inform the secondary modeling of the additional four Scenarios. Doing so allowed the Project team to further refine the model and develop an improved suite of

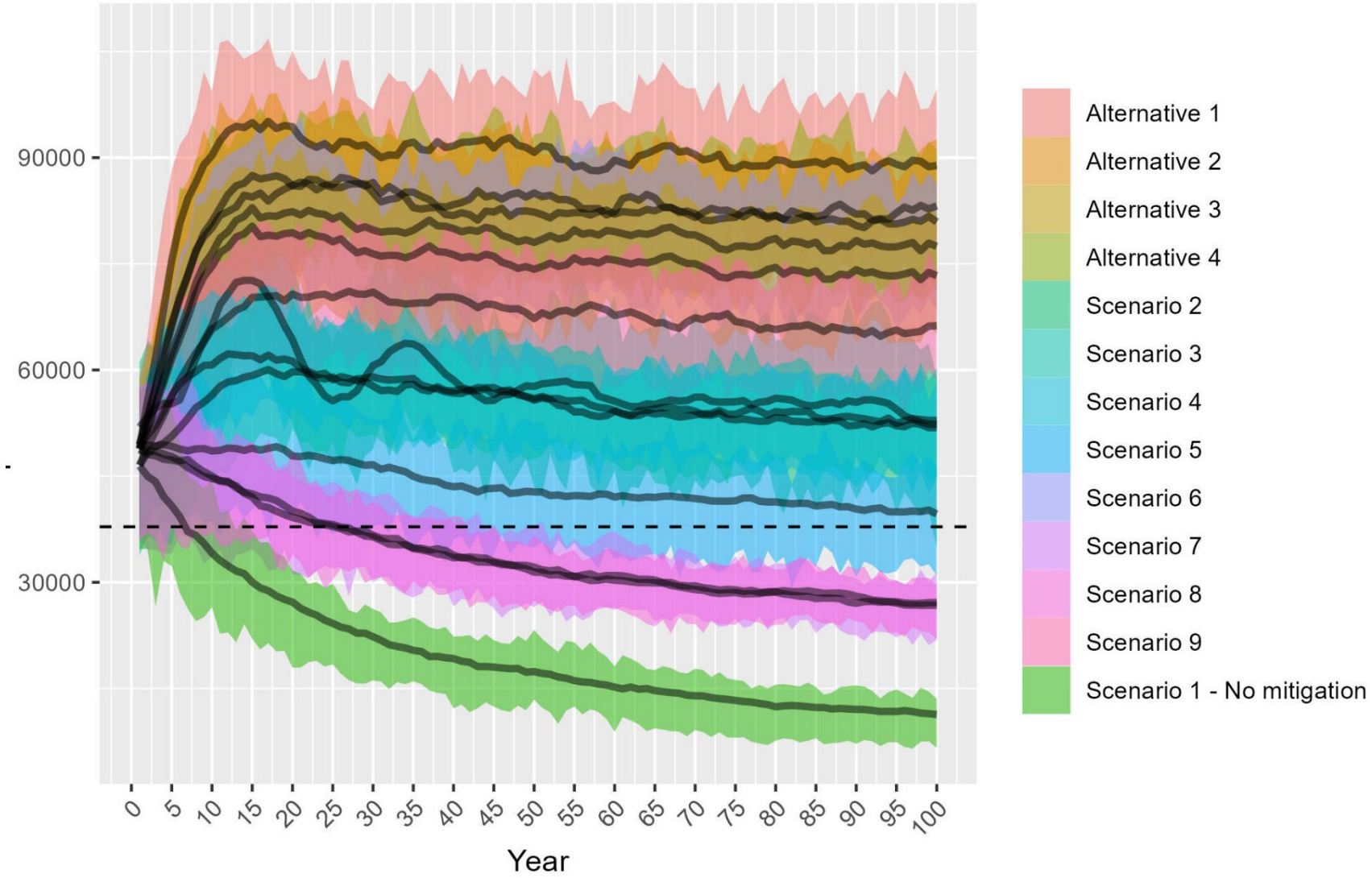
Scenarios for consideration. The results of the Effectiveness Modeling (Part 2) can be found in Appendix B. Signage and other proposed traffic mitigating solutions under consideration for the Secondary Zone were not modeled.

Appendix B, Table 5 summarizes how each Scenario performed compared to the others. Each Scenario was ranked based on their contributions to predicted increased abundance, reduction in mortality, and permeability of the mitigation design. Finally, the table reports if each Scenario achieved predicted population persistence through 100 years. Figure 4 provides a visual representation of the modeled population abundance of California newt projected across 100 years and illustrates the predicted population persistence of each modeled Scenario analyzed. The dotted line in Figure 4 represents the current estimate of population size (37,844 newts) from the mortality data and persistence analysis.

Based on the 13 Scenarios considered, eight (Scenarios 2, 3, 4, 6, 9,10, 11, 12, and 13) result in the minimum standard for success of no further population decline, which is achieved through a reduction in the road mortality rate to 17.667% or lower (approximately a 45% reduction from current levels). All four Preliminary Alternatives (Scenarios 10, 11, 12, and 13) – which had been preliminarily selected for their permeability – achieved the Project goals of increased population persistence and improved habitat permeability.

Compared to the complete suite of 13 Scenarios modeled, Scenarios 10, 11, 12, and 13 ranked 1st, 2nd, 5th, and 3rd, respectively (Appendix B, Table 5), with Scenarios 11 and 13 showing minimal differences between them. Scenario 10 also stands out in the Permeability category. While Scenarios 11, 12, and 13 perform better than all other Scenarios (except for Scenario 2, which also features a bridge in Zone 1), Scenario 10 yields significantly more permeability than the other scenarios. This can be attributed to Scenario 10's bridge providing 100% permeability to the highest priority hotspot.

Figure 4. Modeled newt abundance over time for all scenarios



6. Preliminary Alternatives

Of the 13 Scenarios considered during the Effectiveness Modeling, four Scenarios (Scenarios 10, 11, 12, and 13) have been identified as Preliminary Alternatives (Alternatives 1, 2, 3, and 4, respectively), all of which were successfully modeled to achieve the Project goals of increased population persistence and improved habitat permeability. Each preliminary Alternative was identified based on the results of the Effectiveness Modeling (Parts 1 and 2) to create a selection of Option combinations consisting of different levels of Corrective Actions that represent a wide range of costs and effort. Each Alternative is described below.

6.1. Preliminary Alternative 1

Preliminary Alternative 1 (Scenario 10) consists of the following Corrective Action Options (Figure 5a):

- **Zone 1:** construction of a bridge spanning the Limekiln Canyon inlet, and the partial road closure of a section of Alma Bridge Road between the northern and southern bridge touchdowns
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach

6.2. Preliminary Alternative 2

Preliminary Alternative 2 (Scenario 11) consists of the following Corrective Action Options (Figure 5b):

- **Zone 1:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach

6.3. Preliminary Alternative 3

Preliminary Alternative 3 (Scenario 12) consists of the following Corrective Action Options (Figure 5c):

- **Zone 1:** a combination of alternating Type 5 micro-passages and modified cattle grates between the Limekiln Quarry driveway and Limekiln Trail unofficial parking pullout, followed by section of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** three type 5 micro-passages placed adjacent to three unnamed drainages in the areas of highest newt mortality within the Priority Zone.

Figure 5a: Alternative 1 (Option 1 + 5 + 7)

- Alma Bridge Rd
- Existing Trail

Land Ownership

- Midpen Preserve
- Valley Water
- SJWC
- County Parks

Alternative 1

- Type 4 Purpose-Built Passage Structure
- Type 5 Micro-Passage
- Modified Cattle Grate
- Multi-Span Bridge
- Full Road Closure (No Vehicle Access)
- Partial Road Closure (Non-Quarry Traffic)
- Type 6 Elevated Road Segment

Midpeninsula Regional Open Space District
(Midpen)
3/29/2023

Feet
0 500 1,000

MIDPENINSULA REGIONAL OPEN SPACE

AECOM

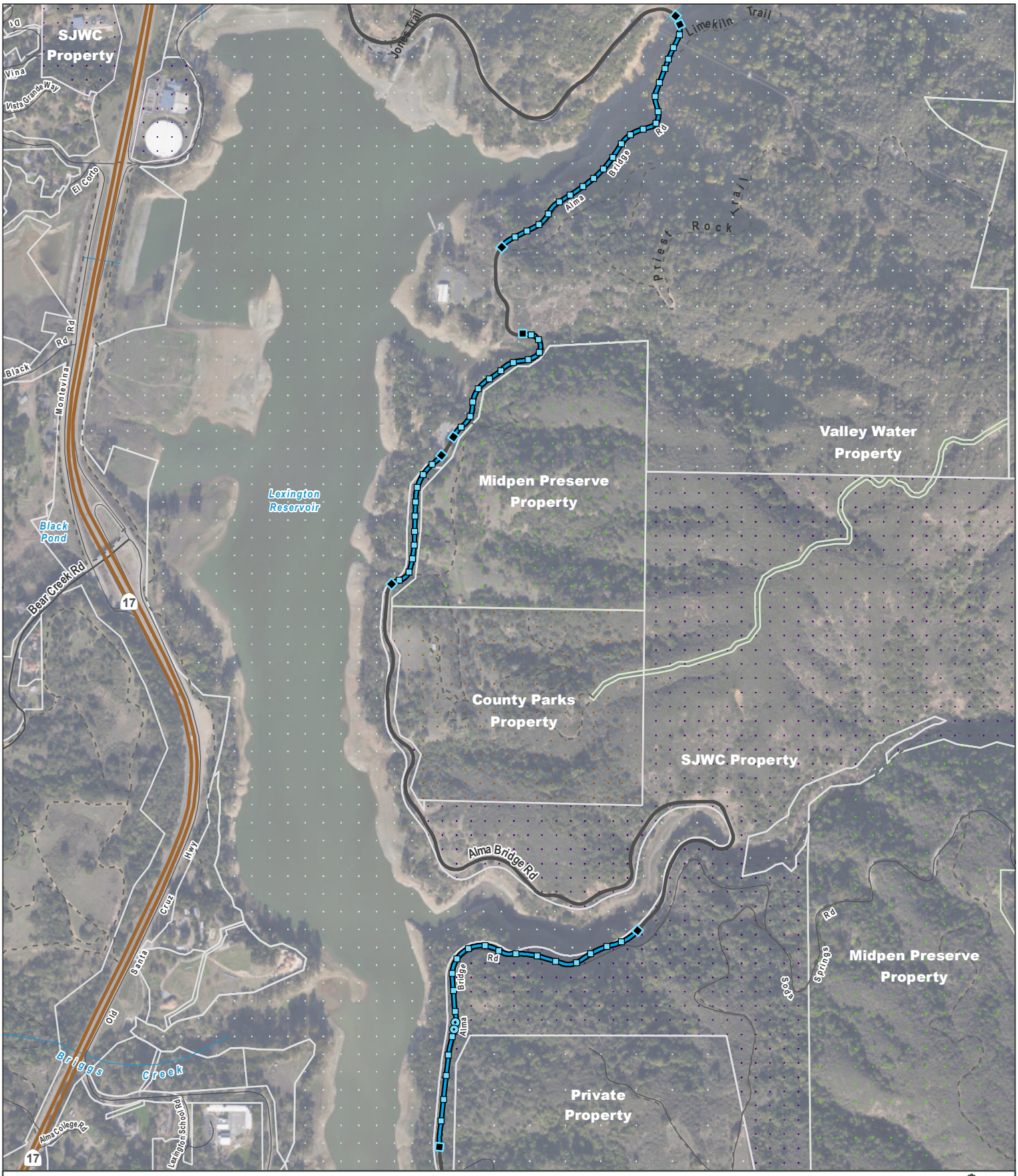


Figure 5b: Alternative 2 (Option 2b + 5 + 7)

Alma Bridge Rd
Existing Trail

Land Ownership

Midpen Preserve
Valley Water
Private
SJWC
County Parks

Alternative 2

Type 4 Purpose-Built Passage Structure
Type 5 Micro-Passage
Modified Cattle Grate
Type 6 Elevated Road Segment

Midpeninsula Regional Open Space District
(Midpen)
3/29/2023

Feet
0 500 1,000

AECOM

Figure 5c: Alternative 3 (Option 2 + 2a + 4 + 6)

Alma Bridge Rd
Existing Trail

Land Ownership
Midpen Preserve
Valley Water
Private
SJWC
County Parks

Alternative 3
Type 4 Purpose-Built Passage Structure
Type 5 Micro-Passage
Modified Cattle Grate
Type 6 Elevated Road Segment

Midpeninsula Regional Open Space District
(Midpen)
3/29/2023

0 500 1,000

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach, along with a Type 5 micro-passage, directional fencing, and a modified cattle grate placed on each side of an existing culvert (unnamed drainage)

6.4. Preliminary Alternative 4

Preliminary Alternative 4 (Scenario 13) consists of the following Corrective Action Options (Figure 5d):

- **Zone 1:** a combination of alternating Type 5 micro-passage and modified cattle grates between the Limekiln Quarry driveway and Limekiln Trail unofficial parking lot, followed by section of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach

As outlined in Table 4, the effectiveness of each Preliminary Alternative is represented by the estimated proportion of the California newt population that each Option might mitigate within either a specific Priority Zone, or throughout the Project Footprint.

The "Priority Zone" Effectiveness column in Table 4 shows the proportion of California newts within that specific Priority Zone that are treated under that particular Alternative. While this metric is helpful, the "Project Footprint" Effectiveness column aids in understanding the effectiveness of each Option across the Project as a whole. For example under Preliminary Alternative 1, the bridge and partial road closure (Option 1) would treat 37.8% of the total Alma Bridge Road newt population; Elevated road segments in Zones 2 and 2a (Option 5) would affect 9.8% and 4.4% of the population, respectively; and an elevated road segment in Zone 3 (Option 7) would affect 16.5% of the population. Cumulatively, the implementation of Options 1, 5, and 7 together in Priority Zones 1, 2/2a, and 3 respectively, is estimated to result in the treatment of 68.4 percent of the newt population throughout the Project Footprint (Table 4).

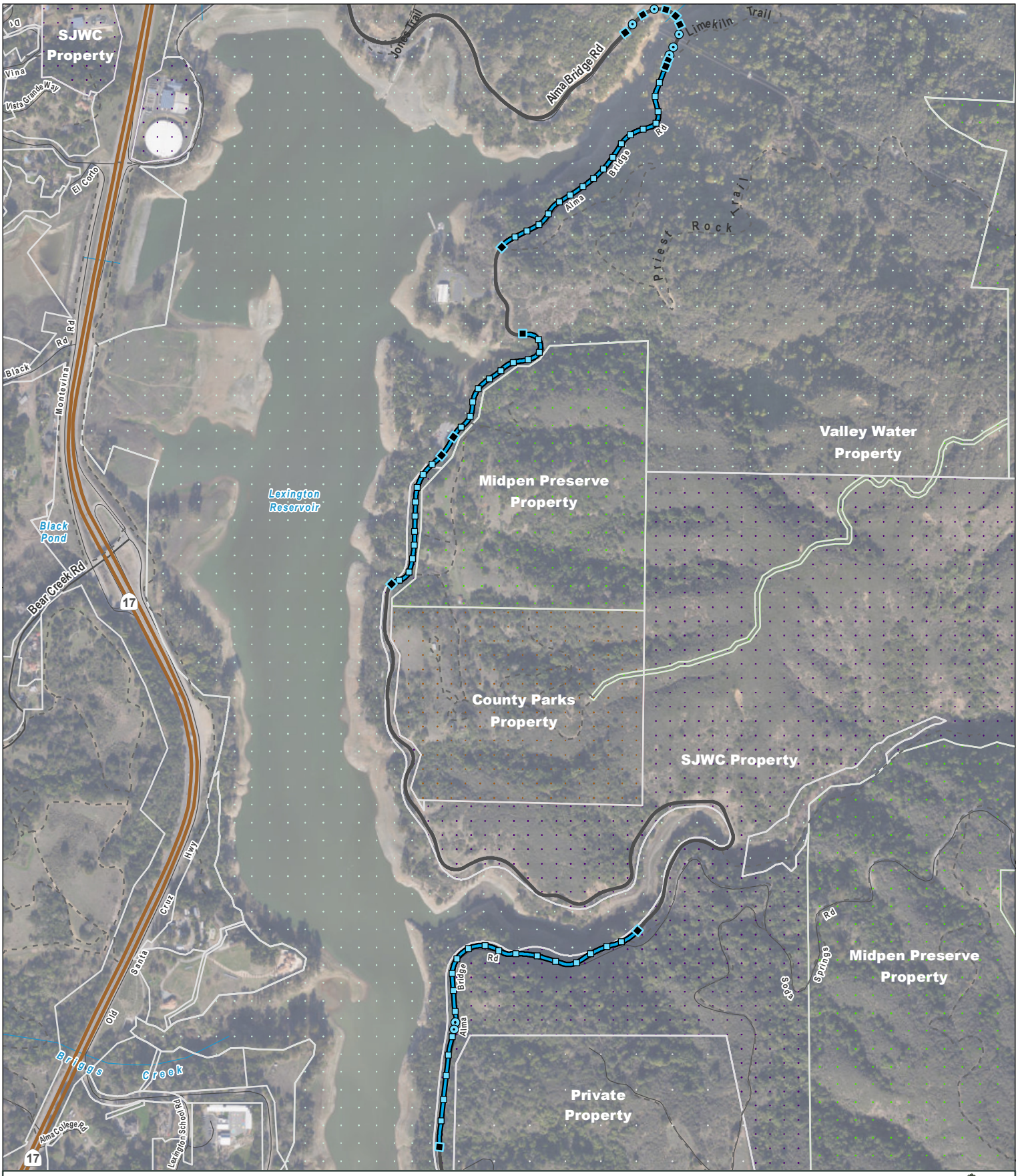


Figure 5d: Alternative 4 (Option 2 + 2a + 4 + 5 + 7)

Alma Bridge Rd

Existing Trail

Land Ownership

Midpen Preserve

Valley Water

Private

SJWC

County Parks

Alternative 4

Type 4 Purpose-Built Passage Structure

Type 5 Micro-Passage

Modified Cattle Grate

Type 6 Elevated Road Segment

Midpeninsula Regional Open Space District
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3/29/2023

0 500 1,000

MIDPENINSULA REGIONAL OPEN SPACE

AECOM

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

Table 4: Effectiveness of Preliminary Alternatives

Zone #	Option(s)	Notes	Effectiveness	
			Priority Zone[1]	Project Footprint[2]
Preliminary Alternative #1				
Zone 1	Option 1	Option 1 (Bridge + partial road closure)	**0.996**	**0.378**
Zone 2	Option 5	Zone 2 (ERS)	**0.846**	**0.098**
Zone 2a	Option 5	Zone 2a (ERS)	**1.000**	**0.044**
Zone 3	Option 7	Option 7 (ERS)	**0.960**	**0.165**
			---	**0.684**
Preliminary Alternative #2				
Zone 1	Option 2b	Option 2b (extended straightaway)	**0.778**	**0.295**
Zone 2	Option 5	Zone 2 (ERS)	**0.846**	**0.098**
Zone 2a	Option 5	Zone 2a (ERS)	**1.000**	**0.044**
Zone 3	Option 7	Option 7 (ERS)	**0.960**	**0.165**
			---	**0.602**
Preliminary Alternative #3				
Zone 1	Option 2 + 2a	Option 2 (straightaway) + Option 2a (hairpin)	**0.860**	**0.326**
Zone 2	Option 4	Zone 2 (ERS)	**0.846**	**0.098**
Zone 2a	Option 4	Zone 2a (MP)	**0.191**	**0.008**
Zone 3	Option 6	Option 6 (ERS + MP)	**0.719**	**0.123**
			---	**0.556**
Preliminary Alternative #4				
Zone 1	Option 2 + 2a	Option 2 (straightaway) + Option 2a (hairpin)	**0.860**	**0.326**
Zone 2	Option 4	Zone 2 (ERS)	**0.846**	**0.098**
Zone 2a	Option 5	Zone 2a (ERS)	**1.000**	**0.044**
Zone 3	Option 7	Option 7 (ERS)	**0.960**	**0.165**
			---	**0.633**

[1] Proportion of California newts within that specific Priority Zone that are treated by the corresponding Option.
[2] Proportion of California newts across the entire Project area that are treated by the corresponding Option.
ERS = Elevated Road Section MP = Micro-passage CG = Cattle Grate

7. Feasibility Analysis

Based on the four Preliminary Alternatives identified during the Effectiveness Modeling, a feasibility analysis was performed for each Preliminary Alterative to identify any additional constraints and opportunities posed by field-observed, engineering, environmental, and/or permitting constraints of each underlying Option by Zone, including constructability; environmental impact minimization; existing facilities impact minimization; maintenance needs/costs; environmental clearance, permits, and approvals; permitting schedule; construction schedule; and costs.

Although environmental considerations were used as the basis for establishing Zones, Corrective Action placement, and preliminary Alternatives, this Feasibility Analysis considered other, equally important factors such as engineering, permitting, public safety, cost, and schedule that could be triggered by the implementation of any Alternative. All such considerations are given equal weight, and the findings of this preliminary process are described and discussed below. All Alternatives described herein are pending the County's agreement and approval and will be further analyzed and agreed upon after further refinement in Task 3.

Depending on the final design specifications, the level of maintenance required by at-grade structures like Type 4 purpose-built passage structures and Type 5 micro-passages are unknown but could be more extensive than standard road maintenance/inspections. In lieu of a formal cost estimate for maintenance, the numbers for each crossing structure type is provided in the tables below for order-of-magnitude estimation purposes.

7.1. Alternative 1

7.1.1. Corrective Actions

Based on the Effectiveness Modeling, Alternative 1 provides the most effective combination of Corrective Action Options to address newt mortality and persistence of the local newt population (Table 5; Figure 5a). Alternative 1 would consist of the following Corrective Action Options:

- **Zone 1:** construction of a bridge spanning the Limekiln Canyon inlet, and the partial road closure of a section of Alma Bridge Road between the northern and southern bridge touchdowns
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach

Table 5. Preliminary Feasibility Analysis for Alternative 1

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Effectiveness	Estimated 84% increase in population size after 30 years. Predicted population persistence to Year 100.			
Crossing Structure Count	**Bridge:** 1	**Type 4:** 11 **Cattle Grate:** 2	**Type 4:** 10 **Cattle Grate:** 2	**Type 4:** 19 **Type 5:** 2 **Cattle Grate:** 2
Constructability	Temporary road closures over 5 years, intermittent full road closures during discrete phases of construction over 5 years, partial closure of ABR segment (quarry), full abandonment of ABR segment, construction of steel beam or precast concrete girder bridge, redesign of Limekiln Trail unofficial turnouts/shoulders, realignment of Limekiln Trail trailhead	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign	Temporary road closure over 1-2 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, elevation transition of Soda Springs Rd-Alma Bridge Rd intersection
Environmental Impact Minimization	**Impacts:** Bridge abutments (reservoir bank), footings (reservoir bed), utility relocation, staging areas, redesign of Limekiln Trail unofficial turnouts/shoulders **Minimization:** Pre-construction surveys, seasonal work restrictions, potential for on-site mitigation (roadbed restoration), repurpose ABR as official parking area, recommend AMMs	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions
Existing Facilities Impact Minimization	**Impacts:** Temporary/full road closures over 5 years, ABR segment abandonment, Limekiln Trail parking lot/trailhead abandonment **Minimization:** Reversible traffic during temporary road closures, full road closure to non-quarry	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign **Minimization:** Reversible traffic during temporary road closures, limit work to	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, short-term construction at Soda Springs Rd-

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
	traffic, partial road closure to allow quarry traffic, Limekiln Trail trailhead relocation, redesign of Limekiln Trail unofficial turnouts/ shoulders	closures, limit work to road prism, redesign of unofficial turnouts/ shoulders	road prism, redesign of unofficial turnouts/ shoulders	Alma Bridge Rd intersection **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/ shoulders
Maintenance Needs/Costs	Bridge preventative maintenance	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)
Environmental Clearance, Permits, and Approvals	**CEQA:** Initial Study/Mitigated Negative Declaration or Environmental Impact Report **NEPA:** TBD[1] but likely Categorical Exclusion or Environmental Assessment **Permits/:** 404, 401, ITP, 1602 LSAA, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions
Total Estimated Project Schedule	2 years for environmental clearance and preliminary design, 1 additional year from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting
Construction Schedule	2 – 5 years	1 year	1 year	1 – 2 years

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Construction Cost	$$$$	$	$	$$

$ = $1M - $3M
$$ = $4M - $10M
$$$ = $11M - $20M
$$$$ = $21M - $40M

ABR = Alma Bridge Road
AMMs = Avoidance & Minimization Measures
MGS = Midwest Guardrail System railing
EIR = Environmental Impact Report
LSAA = Lake & Streambed Agreement
BO = Biological Opinion
NEPA = National Environmental Policy Act

[1] The need for and type of NEPA clearance would depend on whether the Project has federal funding. If not, it is assumed that NEPA would be completed by the USACE as part of the 404 permitting process.
[2] In 2021, California Public Resources Code Section 21080.56 was added to provide a new CEQA statutory exemption until January 1, 2025, for fish and wildlife restoration projects that meet certain requirements, to be determined in coordination with CDFW.

7.1.2. Alternative 1 Discussion

Zone 1

In Zone 1, the construction of a bridge across Limekiln Canyon inlet would involve temporary single-lane road closures throughout construction over 5 years; during that same time period, intermittent full road closures could take place during discrete phases of construction which may be necessary for a limited time to establish the primary staging area, import bridge materials, or during the construction of the landward footing(s). After construction is complete, a partial road closure of Alma Bridge Road would be enforced between the northern bridge touchdown (station 22+50) and the Limekiln Quarry driveway (31+00) for all non-quarry vehicle traffic, and a full road closure of Alma Bridge Road between the Limekiln Quarry driveway and the southern the bridge touchdown (31+00 to 58+00) would be enforced to the public and quarry traffic.

Under this Alternative, public access to recreational facilities like the Limekiln Trail and unofficial parking turn outs or road shoulder parking areas could be preserved by relocating the existing unofficial turn outs and parking areas and staging area. This could be done by constructing (or repurposing) a designated dirt, gravel, or paved parking lot as an official parking lot on an abandoned portion of Alma Bridge Road accessible from either direction at the southern bridge touchdown paired with extending the Limekiln Trail trailhead south to connect with the relocated parking area. Any future official or unofficial parking areas should consider design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls.

Alternate uses for this abandoned roadway could include restoring the former roadbed to a natural condition, removing the existing road and culvert crossing Limekiln Creek, restoring the Limekiln Creek streambed and riparian corridor to its natural condition, and/or replacing all or a portion of the former roadbed with a recreational trail and informational kiosks.

Zones 2 and 2a

In Zone 2 and 2a, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and modified cattle grates at either end of a segment would take place in two discrete locations: in Zone 2 between the upper end of Zone 2 and a location immediately north of the Miller Point parking lot, and throughout Zone 2a. The portion of Alma Bridge Road along the Miller Point parking lot would be left at the current grade to avoid any need to raise the entire parking lot. In lieu of modifying the parking lot, guide walls could be placed along the west/water-facing side of the parking lot to redirect newt movement around the parking lot.

Under this Alternative, the proposed elevated road segment in Zone 2a would not involve the recommendation to modify the proposed former Beatty Trust property parking area project driveway(s) (as proposed under

Alternative 3). This elevated road segment in Zone 2a is proposed to address the likely increase in vehicle traffic and associated wildlife mortality from the development of new recreational facilities.

Zone 3

In Zone 3, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at each end of the elevated roadway, would take place throughout Zone 3. To accommodate the raised roadway at the Soda Springs Road/Alma Bridge Road intersection, minor modifications to Soda Springs Road, such as an elevated transition from Soda Springs Road, may be necessary.

Effectiveness

Preliminary Alternative 1 is estimated to protect approximately 68.5 percent of the migrating California newt population against road mortality, result in an estimated 84% increase in population size after 30 years, and is predicted to meet the goal of population persistence to Year 100.

Engineering Considerations (Constructability/Maintenance)

In Zone 1, possible engineering considerations include the need for staging areas, temporary full road closures to build the approach roadways and bridge abutments, structural engineer input, Santa Clara County Roads and Airport staff coordination during the design process. In Zones 2, 2a, and 3, possible engineering considerations would include the installation of Midwest Guardrail System railing, staging areas, the need for uphill cutslope and downhill retaining walls along all or portions of the treatment areas, speed reduction signage at select areas (due to reduced stopping sight distance along sharp horizontal curves), overhead utility pole relocation/raise, underground utility investigation/survey, the redesign (raise and reconstruct) of pullout areas along sections of raised roadway, and phased construction to maintain reversible traffic control during construction. Any unofficial parking turn outs or road shoulder parking areas adjacent to elevated road segments would need to be raised and include design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls.

To both preserve and repair the bridge and its components against deterioration over time, bridge preventive maintenance would be required in perpetuity, which could include washing and cleaning, sealing deck joints and overlays, clearing drainage areas, sealing cracks, painting exposed elements, removing trash and debris, protecting against scour, lubricating bearings, concrete repair, paint/coat all steel components, installing cathodic protection systems, installing jackets and other protective systems around concrete piles, and repairing/replacing fatigue- and fracture-prone components. Such activities may take place as frequently as every one to two years, or as infrequently as every five, ten, fifteen, or twenty years. Depending on the final design specifications, the level of maintenance required by at-grade structures like Type 4 purpose-built passage structures and Type 5 micro-passages could be more extensive than standard road maintenance/inspections, and will be further investigated in either Task 3 or Phase 2.

Existing Facilities Impact Minimization

To minimize impacts to existing facilities, minimization measures could include implementing reversible traffic during temporary road closures, implementing a partial road closure to non-quarry public between the northern bridge landing and the private quarry driveway, implementing a full road closure to public traffic beyond the northern bridge landing, the relocation of the Limekiln Trail trailhead, the redesign of the Limekiln Trail unofficial turnouts/shoulders, limiting work to the road prism, and the redesign of any additional unofficial turnouts/shoulders.

Environmental Impact Minimization

To minimize impacts to the environment during construction, minimization measures could include conducting pre-construction surveys prior to construction of the bridge, seasonal work restrictions, on-site restoration (i.e., restoring former Alma Bridge Road roadbed), repurposing portions of Alma Bridge Road as official parking areas for the Limekiln Trail trailhead, and implementing standard construction avoidance and minimization

measures (i.e., pre-construction nesting bird surveys, erosion control, seasonal work restrictions), and will be further investigated with Stakeholder input in either Task 3 or Phase 2.

Environmental Clearance, Permits, and Approvals

The Project's final environmental clearance, permits, and approval needs are uncertain at this early stage in the planning process, and will depend on future Stakeholder input, the Alternative(s) selected, the project footprint, and detailed design specifications. Probable project permits and approvals required may include an Initial Study/Mitigated Negative Declaration or Environmental Impact Report under CEQA, a Categorical Exclusion or Environmental Assessment under NEPA, and a Regional Water Quality Board (RWQCB) 401 permit, U.S. Army Corp of Engineers (USACE) 404 permit, California Department of Fish and Wildlife (CDFW) Incidental Take Permit (ITP), CDFW 1602 Lake and Streambed Alteration Agreement, and U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO). In addition, approvals such as landowner coordination, encroachment permits, licenses, and land rights acquisitions may be necessary. The Project's final environmental clearance, permits, and approval needs will be further investigated during Task 3 and refined in Phase 2.

Total Estimated Project Schedule

To construct a bridge in Priority Zone 1, the total estimated Project schedule could range from 2 years to complete environmental clearance and preliminary design, and 1 year from the time of 65% design to permit the project. To construct Corrective Actions throughout the remainder of the Project Footprint, the total estimated Project schedule could range from 1 to 1.5 years to complete environmental clearance and preliminary design, and an estimated 6 to 12 months from the time of 65% design to permit the project.

Construction Schedule

Project construction could take anywhere from one year if phased by individual Zones, to as many as 2-5 years if built altogether.

Construction Cost

Estimated costs range from $21M to $40M for Priority Zone 1, $1M to $2M apiece for Priority Zones 2 and 2a, and $4M to $10M for Priority Zone 3, for a total of $27M to $54M across the Project footprint.

7.2. Alternative 2

7.2.1. Corrective Actions

Based on the Effectiveness Modeling, Alternative 2 provides the second most effective combination of Corrective Action Options, along with Alternative 4, to address newt mortality and persistence of the local newt population (Table 6; Figure 5b). Alternative 2 would consist of the following Corrective Action Options:

- **Zone 1:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach

Table 6. Preliminary Feasibility Analysis for Alternative 2

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Effectiveness	Estimated 72% increase in population size after 30 years. Predicted population persistence to Year 100.			
Crossing Structure Count	**Type 4:** 21 **Cattle Grate:** 3	**Type 4:** 11 **Cattle Grate:** 2	**Type 4:** 10 **Cattle Grate:** 2	**Type 4:** 19 **Type 5:** 2 **Cattle Grate:** 2
Constructability	Temporary road closure over 1-3 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of Limekiln Trail unofficial turnouts/ shoulders,	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign	Temporary road closure over 1-2 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, elevation transition of Soda Springs Rd-Alma Bridge Rd intersection
Environmental Impact Minimization	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, Limekiln Trail unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions
Existing Facilities Impact Minimization	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, Limekiln Trail unofficial parking area redesign **Minimization:** Reversible traffic control during temporary road closures, limit work to road prism, redesign of Limekiln Trail unofficial parking area	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, short-term construction at Soda Springs Rd-Alma Bridge Rd intersection **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Maintenance Needs/Costs	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)
Environmental Clearance	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions
Total Estimated Project Schedule	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 months additional from time of 65% design for permitting
Construction Schedule	1 – 3 years	1 year	1 year	1-2 years
Construction Cost	$$	$	$	$$

$ = $1M - $3M
$$ = $4M - $10M
$$$ = $11M - $20M
$$$$ = $21M - $40M

ABR = Alma Bridge Road
AMMs = Avoidance & Minimization Measures
MGS = Midwest Guardrail System railing
EIR = Environmental Impact Report
LSAA = Lake & Streambed Agreement
BO = Biological Opinion
NEPA = National Environmental Policy Act

[1] The need for and type of NEPA clearance would depend on whether the Project has federal funding. If not, it is assumed that NEPA would be completed by the USACE as part of the 404 permitting process.
[2] In 2021, California Public Resources Code Section 21080.56 was added to provide a new CEQA statutory exemption until January 1, 2025, for fish and wildlife restoration projects that meet certain requirements, to be determined in coordination with CDFW.

7.2.2. Alternative 2 Discussion

Zone 1

In Zone 1, the construction of an extended length of elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and a modified cattle grate at each end would take place from Limekiln Creek (station 35+50) along the Limekiln Trail unofficial parking areas to the south end of Zone 1 (57+00).

Under this Alternative, the change in grade of the roadway would require raising the informal parking areas to maintain public access to recreational facilities like the Limekiln Trail. This would involve constructing raised, designated paved parking and staging areas that incorporate newt passages extending underneath. Any future designated parking area should consider design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls.

Zones 2 and 2a

In Zone 2 and 2a, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and modified cattle grates at either end of a segment would take place in two discrete locations: in Zone 2 between the upper end of Zone 2 and a location immediately north of the Miller Point parking lot, and throughout Zone 2a. The portion of Alma Bridge Road along the Miller Point parking lot would be left at the current grade to avoid any need to raise the entire parking lot. In place of modifying the parking lot, guide walls could be placed along the west/water-facing side of the parking lot to redirect newt movement around the parking lot.

Under this Alternative, the proposed elevated road segment in Zone 2a would not involve the recommendation to modify the proposed former Beatty Trust property parking area project driveway(s) (as proposed under Alternative 3). This elevated road segment in Zone 2a is proposed to address the likely increase in vehicle traffic and associated newt mortality from the development of new recreational facilities.

Zone 3

In Zone 3, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at each end of the elevated roadway, would take place throughout Zone 3. To accommodate the raised roadway at the Soda Springs Road/Alma Bridge Road intersection, minor modifications to Soda Springs Road, such as an elevated transition from Soda Springs Road, may be necessary.

Effectiveness

Preliminary Alternative 2 is estimated to protect approximately 60.2 percent of the migrating California newt population against road mortality, result in an estimated 72% increase in population size after 30 years, and is predicted to meet the goal of population persistence to Year 100.

Engineering Considerations (Constructability/Maintenance)

In Zones 1, 2, 2a, and 3, possible engineering considerations include the installation of Midwest Guardrail System railing, staging areas, the need for uphill cutslope and downhill retaining walls along all or portions of the treatment areas, speed reduction signage at select areas (due to reduced stopping sight distance along sharp horizontal curves), overhead utility pole relocation/raise, underground utility investigation/survey, the redesign (raise and reconstruct) of pullout areas along sections of raised roadway, and phased construction to maintain reversible traffic control during construction. Any unofficial parking turn outs or road shoulder parking areas adjacent to elevated road segments would need to be raised, and include design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls. Depending on the final design specifications, the level of maintenance required by at-grade structures like Type 4 purpose-built passage structures and Type 5 micro-passages could be more extensive than standard road maintenance/inspections.

Existing Facilities Impact Minimization

To minimize impacts to existing facilities, minimization measures could include implementing reversible traffic during temporary road closures, the redesign of the Limekiln Trail unofficial turnouts/shoulders, limiting work to the road prism, and the redesign of any additional unofficial turnouts/shoulders.

Environmental Impact Minimization

To minimize impacts to the environment during construction, minimization measures could include limiting work to the road prism, seasonal work restrictions, and implementing standard construction avoidance and minimization measures (i.e., pre-construction nesting bird surveys, erosion control, seasonal work restrictions).

Environmental Clearance, Permits, and Approvals

The Project's final environmental clearance, permits, and approval needs are uncertain at this early stage in the planning process, and will depend on future Stakeholder input, the Alternative(s) selected, the project footprint, and detailed design specifications. Probable project permits and approvals required may include a Statutory Exemption, Categorical Exemption, or Initial Study/Mitigated Negative Declaration under CEQA, a Categorical Exclusion under NEPA, and a RWQCB 401 permit, USACE 404 permit, CDFW ITP and 1602 LSAA, and USFWS BO. In addition, approvals such as landowner coordination, encroachment permits, licenses, and land rights acquisitions may be necessary. The Project's final environmental clearance, permits, and approval needs will be further investigated during Task 3 and refined in Phase 2.

Total Estimated Project Schedule

To construct Corrective Actions throughout the Project Footprint, the total estimated Project schedule could range from 1 to 1.5 years to complete environmental clearance and preliminary design, and 6 to 12 months from the time of 65% design to permit the project.

Construction Schedule

Project construction could take anywhere from one year if phased by individual Zones, to as many as 2-3 years if built altogether.

Construction Cost

Estimated costs range from $1M to $2M apiece for Priority Zones 2 and 2a, and $4M to $10M apiece for Priority Zones 1 and 3, for a total of $10M to $24M across the full Project footprint.

7.3. Alternative 3

7.3.1. Corrective Actions

Based on the Effectiveness Modeling, Alternative 3 provides the least effective combination of Corrective Action Options to address newt mortality and persistence of the local newt population (Table 7; Figure 5c). Alternative 3 would consist of the following Corrective Action Options:

- **Zone 1:** a combination of alternating Type 5 micro-passages and modified cattle grates between the Limekiln Quarry driveway and Limekiln Trail unofficial parking pullout, followed by section of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** three type 5 micro-passages placed adjacent to three unnamed drainages in the areas of highest newt mortality within the Priority Zone.
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach, along with a Type 5 micro-passage, directional fencing, and a modified cattle grate placed on each side of an existing culvert (unnamed drainage)Table 7. Preliminary Feasibility Analysis for Alternative 3

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Effectiveness	Estimated 56% increase in population size after 30 years. Predicted population persistence to Year 100.			
Crossing Structure Count	**Type 4:** 18 **Type 5:** 5 **Cattle Grate:** 8	**Type 4:** 10 **Cattle Grate:** 2	**Type 5:** 3	**Type 4:** 10 **Type 5:** 2 **Cattle Grate:** 4
Constructability	Temporary road closure over 1-3 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of Limekiln Trail unofficial turnouts/shoulders	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of former Beatty Trust property project access points	Temporary road closure over 2 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, elevation transition of Soda Springs Rd-Alma Bridge Rd intersection
Environmental Impact Minimization	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, Limekiln Trail unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign, redesign of former Beatty Trust property project access points **Minimization:** Limit work to road prism, recommend AMMs, redesign of former Beatty Trust property project access points, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions
Existing Facilities Impact Minimization	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, Limekiln Trail unofficial parking area redesign **Minimization:** Reversible traffic control during temporary road closures, limit work to road prism,	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road closures, limit work to road prism,	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, redesign of former Beatty Trust property project access points **Minimization:** Reversible traffic during temporary	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, short-term construction at Soda Springs Rd-Alma Bridge Rd intersection **Minimization:** Reversible traffic during temporary

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
	redesign of Limekiln Trail unofficial parking area	redesign of unofficial turnouts/shoulders	road closures, limit work to road prism, redesign of unofficial turnouts/shoulders, redesign of former Beatty Trust property project access points	road closures, limit work to road prism, redesign of unofficial turnouts/shoulders
Maintenance Needs/Costs	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)
Environmental Clearance	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, Initial Study/Mitigated Negative Declaration, or Environmental Impact Report **NEPA:** TBD[1] but likely Categorical Exclusion or Environmental Assessment **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions
Total Estimated Project Schedule	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting
Construction Schedule	1 – 3 years	1 year	1 year	1-2 years

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Construction Cost	$$	$	$	$

$ = $1M - $3M
$$ = $4M - $10M
$$$ = $11M - $20M
$$$$ = $21M - $40M

ABR = Alma Bridge Road
AMMs = Avoidance & Minimization Measures
MGS = Midwest Guardrail System railing
EIR = Environmental Impact Report
LSAA = Lake & Streambed Agreement
BO = Biological Opinion
NEPA = National Environmental Policy Act

[1] The need for and type of NEPA clearance would depend on whether the Project has federal funding. If not, it is assumed that NEPA would be completed by the USACE as part of the 404 permitting process.
[2] In 2021, California Public Resources Code Section 21080.56 was added to provide a new CEQA statutory exemption until January 1, 2025, for fish and wildlife restoration projects that meet certain requirements, to be determined in coordination with CDFW.

7.3.2. Alternative 3 Discussion

Zone 1

In Zone 1, alternating modified cattle grates and Type 5 micro-passages with directional fencing would be constructed throughout the hairpin turn between the Limekiln Quarry driveway and unofficial Limekiln Trail parking turnout. Additionally, an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier would be built from south of the Limekiln Trail unofficial parking area to the end of Zone 1 (57+00).

Under this Alternative, the change in grade of the roadway would require raising the informal parking areas to maintain public access to recreational facilities like the Limekiln Trail. This would involve constructing raised, designated paved parking and staging areas that incorporate newt passages extending underneath. Any future designated parking area should consider design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls.

Zones 2 and 2a

In Zone 2 and 2a, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier would take place in between the upper end of Zone 2 (approximately station 64+00) and a location immediately north of the Miller Point parking lot, followed by Type 5 micro-passages placed adjacent to three existing culverts (unnamed drainages) in Zone 2a where newt mortality is highest within the Priority Zone. The roadway along the Miller Point parking lot would be left at the current grade to avoid any need to raise the entire parking lot; in place of modifying the parking lot, guide walls could be place along the west/water-facing side of the parking lot to redirect newt movement around the parking lot.

Under this Alternative, the lack of elevated road segment in Zone 2a would accompany the recommendation to modify the proposed former Beatty Trust property parking area by relocating the proposed parking lot public access point to a single driveway in Zone 2 located immediately opposite the Miller Point parking lot, creating a new 4-way intersection. Relocating the former Beatty Trust property driveway would focus vehicle traffic in Zone 2, and prevent additional vehicles, and vehicle-related newt mortality, from encroaching from Zone 2 into Zone 2a.

Zone 3

In Zone 3, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier with modified cattle grates on either end would take place throughout the first half of Zone 3 between the Soda Springs Road/Alma Bridge Road junction (station 146+00) and station 158+50. Further south along Alma Bridge Road, Type 5 micro-passages, modified cattle

grates, and directional fencing would be placed on each side of an existing culvert (unnamed drainage) by station 163+00. To accommodate the raised roadway at the Soda Springs Road/Alma Bridge Road junction, minor modifications to Soda Springs Road, such as an elevated transition from Soda Springs Road onto Alma Bridge Road, may be necessary.

Effectiveness

Preliminary Alternative 3 is estimated to protect approximately 53.1 percent of the migrating California newt population against road mortality, result in an estimated 56% increase in population size after 30 years, and is predicted to meet the goal of population persistence to Year 100.

Engineering Considerations (Constructability/Maintenance)

In Zones 1, 2, 2a, and 3, possible engineering considerations would include the installation of Midwest Guardrail System railing, staging areas, the need for uphill cutslope and downhill retaining walls along all or portions of the treatment areas, speed reduction signage at select areas (due to reduced stopping sight distance along sharp horizontal curves), overhead utility pole relocation/raise, underground utility investigation/survey, the redesign (raise and reconstruct) of pullout areas along sections of raised roadway, and phased construction to maintain reversible traffic control during construction. Any unofficial parking turn outs or road shoulder parking areas adjacent to elevated road segments would need to be raised and include design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls.

In Zone 1, the placement of alternating modified cattle grates and Type 5 micro-passages with directional fencing throughout the hairpin turn between the Limekiln Quarry driveway and unofficial Limekiln Trail parking turnout was identified as requiring additional engineering consideration. Along the western/uphill side of this hairpin turn, there may not be sufficient room to accommodate Type 5 micro-passages and directional fencing without elevating this section of roadway. The costs associated with these additional engineering considerations, when compared to the mortality rate recorded at these locations, may not justify mitigating the entire length of the hairpin turn. As a result of this finding, the Option 2b. Extended Straightaway was developed as a hybrid of the hairpin turn and the straightaway. Depending on the final design specifications, the level of maintenance required by at-grade structures like Type 4 purpose-built passage structures and Type 5 micro-passages could be more extensive than standard road maintenance/ inspections.

Existing Facilities Impact Minimization

To minimize impacts to existing facilities, minimization measures could include implementing reversible traffic during temporary road closures, the redesign of the Limekiln Trail unofficial turnouts/shoulders, limiting work to the road prism, and the redesign of any additional unofficial turnouts/shoulders.

Environmental Impact Minimization

To minimize impacts to the environment during construction, minimization measures could include limiting work to the road prism, seasonal work restrictions, and implementing standard construction avoidance and minimization measures (i.e., pre-construction nesting bird surveys, erosion control, seasonal work restrictions).

Environmental Clearance, Permits, and Approvals

The Project's final environmental clearance, permits, and approval needs are uncertain at this early stage in the planning process, and will depend on future Stakeholder input, the Alternative(s) selected, the project footprint, and detailed design specifications. Probable project permits and approvals required may include a Statutory Exemption, Categorical Exemption, or Initial Study/Mitigated Negative Declaration under CEQA, a Categorical Exclusion under NEPA, and a RWQCB 401 permit, USACE 404 permit, CDFW ITP and 1602 LSAA, and USFWS BO. In addition, approvals such as landowner coordination, encroachment permits, licenses, and land rights acquisitions may be necessary. The Project's final environmental clearance, permits, and approval needs will be further investigated during Task 3 and refined in Phase 2.

Total Estimated Project Schedule

To construct Corrective Actions throughout the Project Footprint, the total estimated Project schedule could range from 1 to 1.5 years to complete environmental clearance and preliminary design, and 6 to 12 months from the time of 65% design to permit the project.

Construction Schedule

Project construction could take anywhere from one year if phased by individual Zones, to as many as 2-3 years if built altogether.

Construction Cost

Estimated costs range from $1M to $2M apiece for Priority Zones 2, 2a, and 3, and $4M to $10M for Priority Zone 1, for a total of $7M to $16M across the Project footprint.

7.4. Alternative 4

7.4.1. Corrective Actions

Based on the Effectiveness Modeling, Alternative 4 provides the second most effective combination of Corrective Action Options, along with Alternative 2, to address newt mortality and persistence of the local newt population (Table 8; Figure 5d). Alternative 4 would consist of the following Corrective Action Options:

- **Zone 1:** a combination of alternating Type 5 micro-passage and modified cattle grates between the Limekiln Quarry driveway and Limekiln Trail unofficial parking lot, followed by section of elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at either end of the approach
- **Zone 2a:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach
- **Zone 3:** elevated road segment with repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate on either end of the approach

Table 8. Preliminary Feasibility Analysis for Alternative 4

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
Effectiveness	Estimated 70% increase in population size after 30 years. Predicted population persistence to Year 100.			
Crossing Structure Count	**Type 4:** 18 **Type 5:** 5 **Cattle Grate:** 8	**Type 4:** 10 **Cattle Grate:** 2	**Type 4:** 10 **Cattle Grate:** 2	**Type 4:** 19 **Type 5:** 2 **Cattle Grate:** 2
Constructability	Temporary road closure over 1-3 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of Limekiln Trail	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing	Temporary road closure over 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign	Temporary road closure over 1-2 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, elevation transition of Soda Springs Rd-

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
	unofficial turnouts/shoulders			Alma Bridge Rd intersection
Environmental Impact Minimization	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, Limekiln Trail unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions	**Impacts:** Staging areas, uphill cutslope, downhill retaining walls, utility relocation, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs, seasonal work restrictions
Existing Facilities Impact Minimization	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, Limekiln Trail unofficial parking area redesign **Minimization:** Reversible traffic control during temporary road closures, limit work to road prism, redesign of Limekiln Trail unofficial parking area	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders	**Impacts:** Temporary road closure, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, short-term construction at Soda Springs Rd-Alma Bridge Rd intersection **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders
Maintenance Needs/Costs	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)
Environmental Clearance	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner

Design Consideration	Zone 1	Zone 2	Zone 2a	Zone 3
	permits, licenses, and land rights acquisitions	coordination, encroachment permits, licenses, and land rights acquisitions	coordination, encroachment permits, licenses, and land rights acquisitions	coordination, encroachment permits, licenses, and land rights acquisitions
Total Estimated Project Schedule	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting
Construction Schedule	1 – 3 years	1 year	1 year	1 – 2 years
Construction Cost	$$	$	$	$$

$ = $1M - $3M
$$ = $4M - $10M
$$$ = $11M - $20M
$$$$ = $21M - $40M

ABR = Alma Bridge Road
AMMs = Avoidance & Minimization Measures
MGS = Midwest Guardrail System railing
EIR = Environmental Impact Report
LSAA = Lake & Streambed Agreement
BO = Biological Opinion
NEPA = National Environmental Policy Act

[1] The need for and type of NEPA clearance would depend on whether the Project has federal funding. If not, it is assumed that NEPA would be completed by the USACE as part of the 404 permitting process.
[2] In 2021, California Public Resources Code Section 21080.56 was added to provide a new CEQA statutory exemption until January 1, 2025, for fish and wildlife restoration projects that meet certain requirements, to be determined in coordination with CDFW.

7.4.2. Alternative 4 Discussion

Zone 1

In Zone 1, alternating modified cattle grates and Type 5 micro-passages with directional fencing would be constructed throughout the hairpin turn between the Limekiln Quarry driveway and the Limekiln Trail unofficial road shoulder parking area. Additionally, an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier would be built from south of the Limekiln Trail unofficial road shoulder parking area to the end of Zone 1.

Under this Alternative, the change in grade of the roadway would require raising the informal parking areas to maintain public access to recreational facilities like the Limekiln Trail. This would involve constructing raised, designated paved parking and staging areas that incorporate newt passages extending underneath. Any future designated parking area should consider design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls.

Zones 2 and 2a

In Zone 2 and 2a, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, and modified cattle grates at either end of a segment would take place in two discrete locations: in Zone 2 between the upper end of Zone 2 and a location immediately north of the Miller Point parking lot, and throughout Zone 2a. The portion of Alma Bridge Road along the Miller Point parking lot would be left at the current grade to avoid any need to raise the entire parking

lot. In place of modifying the parking lot, guide walls could be placed along the west/water-facing side of the parking lot to redirect newt movement around the parking lot.

Under this Alternative, the proposed elevated road segment in Zone 2a would not involve the recommendation to modify the proposed former Beatty Trust property project driveway(s) (as proposed under Alternative 3). This elevated road segment in Zone 2a is proposed to address the likely increase in vehicle traffic and associated newt mortality from the development of new recreational facilities.

Zone 3

In Zone 3, the construction of an elevated road segment involving repeating Type 4 purpose-built passage structures with built in guide walls and climbing barrier, with a modified cattle grate at each end of the elevated roadway, would take place throughout Zone 3. To accommodate the raised roadway at the Soda Springs Road/Alma Bridge Road intersection, minor modifications to Soda Springs Road, such as an elevated transition from Soda Springs Road, may be necessary.

Effectiveness

Preliminary Alternative 4 is estimated to protect approximately 60.9 percent of the migrating California newt population against road mortality, result in an estimated 70% increase in population size after 30 years, and is predicted to meet the goal of population persistence to Year 100.

Engineering Considerations (Constructability/Maintenance)

In Zones 1, 2, 2a, and 3, possible engineering considerations would include the installation of Midwest Guardrail System railing, staging areas, the need for uphill cutslope and downhill retaining walls along all or portions of the treatment areas, speed reduction signage at select areas (due to reduced stopping sight distance along sharp horizontal curves), overhead utility pole relocation/raise, underground utility investigation/survey, the redesign (raise and reconstruct) of pullout areas along sections of raised roadway, and phased construction to maintain reversible traffic control during construction. Any unofficial parking turnouts or road shoulder parking areas adjacent to elevated road segments would need to be raised and include design elements that would minimize mortality and permit or enhance newt movement, including directional fencing and/or guide walls. Depending on the final design specifications, the level of maintenance required by at-grade structures like Type 4 purpose-built passage structures and Type 5 micro-passages could be more extensive than standard road maintenance/inspections.

Existing Facilities Impact Minimization

To minimize impacts to existing facilities, minimization measures could include implementing reversible traffic during temporary road closures, the redesign of the Limekiln Trail unofficial turnouts/shoulders, limiting work to the road prism, and the redesign of any additional unofficial turnouts/shoulders.

Environmental Impact Minimization

To minimize impacts to the environment during construction, minimization measures could include limiting work to the road prism, seasonal work restrictions, and implementing standard construction avoidance and minimization measures (i.e., pre-construction nesting bird surveys, erosion control, seasonal work restrictions).

Environmental Clearance, Permits, and Approvals

The Project's final environmental clearance, permits, and approval needs are uncertain at this early stage in the planning process, and will depend on future Stakeholder input, the Alternative(s) selected, the project footprint, and detailed design specifications. Probable project permits and approvals required may include a Statutory Exemption, Categorical Exemption, or Initial Study/Mitigated Negative Declaration under CEQA, a Categorical Exclusion under NEPA, and a RWQCB 401 permit, USACE 404 permit, CDFW ITP and 1602 LSAA, and USFWS BO. In addition, approvals such as landowner coordination, encroachment permits, licenses, and land rights acquisitions may be necessary. The Project's final environmental clearance, permits, and approval needs will be further investigated during Task 3 and refined in Phase 2.

Total Estimated Project Schedule

To construct Corrective Actions throughout the Project Footprint, the total estimated Project schedule could range from 1 to 1.5 years to complete environmental clearance and preliminary design, and 6 to 12 months from the time of 65% design to permit the project.

Construction Schedule

Project construction could take anywhere from one year if phased by individual Zones, to as many as 2-3 years if built altogether.

Construction Cost

Estimated costs range from $1M to $2M apiece for Priority Zones 2 and 2a, and $4M to $10M apiece for Priority Zones 1 and 3, for a total of $10M to $24M.

7.5. Secondary Zone

Under each of the Alternatives analyzed above, a suite of traffic control and calming options and other considerations are recommended to decrease newt mortality throughout the Project Area (Figure 3h). A no-build decision in the Secondary Zone would result in no additional wildlife crossing structures or traffic calming options and would not help mitigate the current observed newt mortality rate. None of the proposed Alternatives can treat the entire road, so the following measures are critical to protect newts in the Secondary Zone where there would be no formal wildlife passage systems installed.

7.5.1. Traffic Control and Calming

Signage: To shorten route(s) and minimize travel time and distance, improved signage is recommended at the following key intersections (see Figure 3h):

- Highway 17 (northbound)/Alma Bridge Road (#1)
- Alma Bridge Road/Limekiln Canyon Road (#2)
- Alma Bridge Road/Soda Springs Road (#3)
- Alma Bridge Road/Aldercroft Heights Road (#4)
- Highway 17 (southbound)/Bear Creek Road-Gillian Cichowski Memorial Overcrossing (#5)
- Bear Creek Road/Old Santa Cruz Highway (#6)
- Old Santa Cruz Highway/Aldercroft Heights Road (#7)
- Wright Drive (north)/Old Santa Cruz Highway (#8)
- Wright Drive (south)/Old Santa Cruz Highway (#9)
- Old Santa Cruz Highway/Idylwild Drive (#10)

At each of these locations, a study should be performed that includes: (a) a least cost path analysis to determine how new or improved destination, distance, street name, and advance street name signage might influence travel time and distance to key attractions along Alma Bridge Road (e.g. trailheads, Lupin Lodge, residential neighborhoods, recreational amenities), (b) visibility of existing signs, with recommendations on the need to relocate, replace, or remove obstructions (e.g., overgrown vegetation, tree limbs) or increase visibility (e.g., reflectivity) during day- and night-time conditions, (c) alternative route signage to redirect thru-traffic around Alma Bridge Road in response to road-closures or peak traffic along Highway 17.

Islands and Medians: To discourage additional traffic to the area related to street racing and sideshows, islands/medians are recommended at two primary intersections:

- intersection of Alma Bridge Road and Soda Springs Road,
- intersection of Alma Bridge Road and Aldercroft Heights Road

Because raised channelizing islands and medians may function similarly to a barrier wall to migratory newts; jump-outs or other considerations for newt movement would be a necessary component of the island design, although newts are expected to traverse small impediments like curbs or islands easily.

Transverse Rumble Strips/Perceptual Treatments: To heighten driver awareness to speed reduction zones and newt crossing areas, and to improve driver safety, transverse rumble strips or perceptual treatments are recommended at the approach to all elevated road segments

7.5.2. Other Considerations

Bay Area Ridge Trail: At present, the Priest Rock Trail in Sierra Azul Open Space Preserve (OSP) is part of the Bay Area Ridge Trail (Ridge Trail) (Figure 6). As such, the trailhead for the Priest Rock Trail and the nearby Banjo Point parking area on Alma Bridge Road may attract additional visitors and recreational access to portions of the road in Priority Zone 1 that currently experience a heightened newt mortality rate.

Midpen's Highway 17 Wildlife and Regional Trail Crossings and Trail Connections Project includes potential trail improvements in this area. Two Options are proposed to help close east-west gaps between Ridge Trail segments to the east and west of SR 17. Only one of the two options would be constructed.

The first option is the Jones Trail to Priest Rock Trail (Trail #6), which would improve trail access along Alma Bridge Road between the two existing trailheads. The western end of this trail option would be at the Jones Trailhead along Alma Bridge Road, directly across from the Lexington Reservoir County Park parking lot near Lenihan Dam. The Lexington Reservoir County Park parking lot supports 32 official parking spaces (4 mini spaces, 1 handicap, and 27 regular spaces) appears to have sufficient space to accommodate additional recreational traffic in an area outside of any known newt mortality hotspots. The eastern end of this trail option would be the trailhead for Priest Rock Trail. This trail option could help to reduce automotive traffic on Alma Bridge Road associated with the Ridge Trail, especially with implementation of a public information campaign encouraging Ridge Trail users to park at the lot near Lenihan Dam. Although trail users would still cross through Priority Zone 1 on foot or bicycles, this option could reduce newt mortality compared to the existing condition.

The second option is a combination of new and improved existing trail segments, the Manzanita Trail to Limekiln Trail (Trail #5) and the Alma Bridge Road to Manzanita Trail (Trail #7), which would provide a Ridge Trail connection through open space and private lands to the north of Alma Bridge Road. As with the first option, the western end of this trail option would be at the Jones Trailhead. The eastern end of this trail option would connect to the existing Limekiln Trail, which intersects with the Priest Rock Trail 2.2 miles east of the Limekiln Trailhead on Alma Bridge Road. This option would require public access rights to be secured and part of the Ridge Trail (and Juan Bautista de Anza National Historic Trail, or Anza Trail) to be redesignated from the Priest Rock Trail to the Limekiln Trail, Manzanita Trail, and Jones Trail. These requirements would require coordination with private landowners, Bay Area Ridge Trail Council, and the National Park Service, and would therefore involve additional time and cost. However, this trail option would have a greater potential to reduce newt mortality than the Trail #6 option because it would allow for all traffic related to the Ridge Trail to bypass Alma Bridge Road between the trailheads for the Jones Trail and the Priest Rock Trail, and thereby reduce travel through Priority Zone 1.

Educational/Interpretive Signage and Brochures: Educational and interpretive signage and brochures placed at parking areas and trailheads/kiosks, and other key attractions may be instrumental in helping to educate the public about the local population of newts and other herpetofauna, wildlife migration and dispersal, and the importance of wildlife crossings to provide safe passage for newts and other species across Alma Bridge Road.

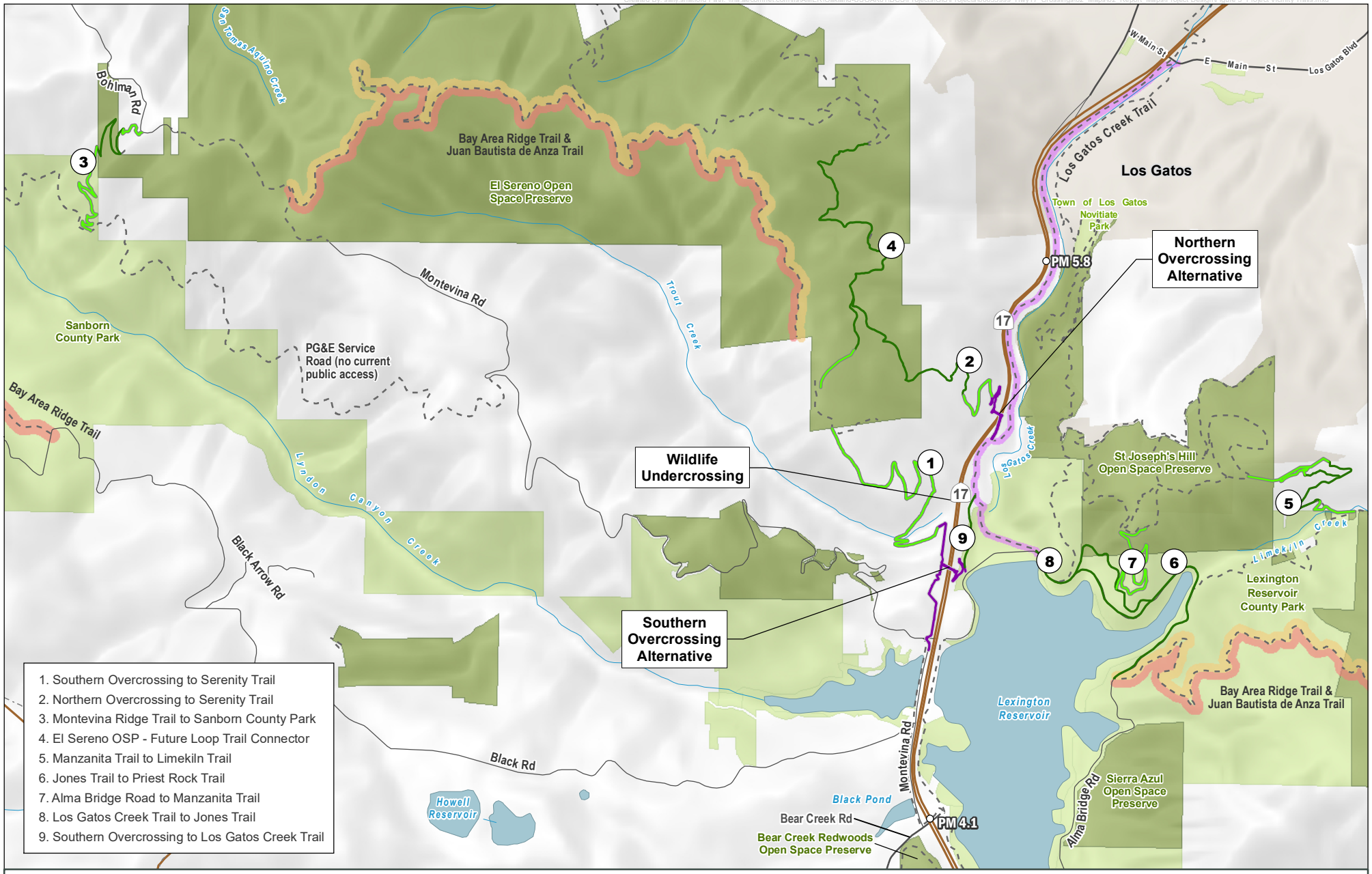

Figure 6: Proposed Trails

- Project Post Mile
- River/Stream
- Midpen Open Space
- Other Protected Land

Trails

- Proposed Trail
- Existing Trail - Proposed Improvements
- Proposed Overcrossing Trail
- Existing Trail
- Bay Area Ridge Trail
- Bay Area Ridge Trail & Juan Bautista de Anza Trail
- Los Gatos Creek Trail

Midpeninsula Regional Open Space District
(Midpen)
1/6/2023

Miles
0 0.25 0.5

While the District strives to use the best available digital data, these data do not represent a legal survey and are merely a graphic illustration of geographic features.

8. Feasibility Analysis Findings

8.1. Alternative Effectiveness Modeling Summary

As stated, all four Alternatives are predicted to achieve the Project goals of increased population persistence and improved habitat permeability according to the modeling conducted. Alternative 1 stands out as the most effective option due to its inclusion in Zone 1 of the bridge with a partial road closure. Alternatives 2 and 4 follow, showing minimal overall differences between them. Alternative 3 performs the poorest in all analyzed categories (abundance, mortality, and permeability).

Under Preliminary Alternative 1, the construction of a bridge paired with a partial road closure would not only maximize permeability in Zone 1, but also create additional opportunities for on-site restoration in the Limekiln Canyon watershed. Such opportunities include restoring or repurposing portions of the former Alma Bridge Road roadway to native vegetation or an extension of the Limekiln Trail.

Due to the potential for increased costs and schedule delays associated with any Alternative that includes the construction of a bridge under Option 1, finding other ways to maximize crossing success in Zone 1 is paramount. A key finding of the Alternatives Effectiveness Modeling concerns Zone 1 and the significance of mitigating mortality along the hairpin turn in Priority Zone 1. USGS modeling determined that Alternatives that mitigate the hairpin turn (Option 2a) *and* the straightaway (Option 2), including the extended straightaway (Option 2b) that represents a hybrid of the hairpin and straightaway, as opposed to the straightaway alone (Option 2), have a significant beneficial effect on preventing newt extirpation.

Under Preliminary Alternative 3, Zone 2a includes the recommendation to modify the proposed former Beatty Trust property project (Figure 3d and 3e) by relocating the former Beatty Trust property parking area public access point to a single driveway in Zone 2 located immediately opposite the Miller Point parking lot. This would create a new 4-way intersection to, and focus vehicle traffic in, Zone 2, preventing additional vehicles and vehicle-related newt mortality from encroaching from Zone 2 into Zone 2a. Under this recommendation, Zone 2a vehicle mortality would instead be mitigated through the placement of Type 5 micro-passages at key mortality hotspots rather than the more costly elevated road segment.

The former Beatty Trust property, which has yet to be developed and opened to the public, was identified as a key location where proposed development influenced Option design and Corrective Action placement in the Project Footprint. The section of Alma Bridge Road that parallels the proposed future parking at the former Beatty Trust property (Priority Zone 2a) is not currently a newt mortality hotspot. One possible explanation for low mortality along this section of Alma Bridge Road is that the Miller Point parking lot, located immediately north (Priority Zone 2) and accessed by car predominantly from the north, is currently the focal point for recreational traffic. With the future development of the proposed former Beatty Trust property, however, recreational traffic is likely going to continue farther south to take advantage of the additional parking facilities and trail access. Given that this section of Alma Bridge Road (Priority Zone 2a) currently experiences a lower level of traffic than sections north of the Miller Point parking lot (Priority Zone 2), newt mortality could also increase into Zone 2a after the former Beatty Trust property is developed.

Time/schedule, costs, and permitting needs will be vital to consider as well, especially when choosing Alternatives or Options with similar newt crossing effectiveness. Due to the cost of the bridge, Alternative 1 would be the costliest to construct. Alternatives 2 and 4 are very similar in their effectiveness, and Alternative 3 is the most inexpensive.

8.2. Corrective Action Constraints

Due to the Project's prevailing condition consisting of narrow road shoulders, especially on the uphill (east) side of Alma Bridge Road, the predominant Corrective Action recommended consists of elevated road segments paired with Type 4 passage structures. However, preliminary feedback from County Roads suggests, for

example, that elevated road segments paired with Type 4 micro-passages may not be feasible due to safety concerns related to the multimodal nature of Alma Bridge Road which requires that the roadway remain accessible to multiple users, including vehicles, bicyclists, and pedestrians. Depending on site conditions and final design, elevated road segments may constrict the travel path and reduce the width of road shoulders for bicyclists and pedestrians, putting these users at risk. However, by replacing elevated road segments (paired with Type 4 passage structures) with Type 5 micro-passages, the Project may not be able to achieve the stated goal of sufficiently decreasing newt mortality and increasing habitat permeability.

For Type 5 micro-passages to function optimally, ample space is required to install directional fencing angled suitably to redirect wildlife away from the active roadway toward the micro-passages. The work required to install Type 5 micro-passages would involve additional cutslope and earthmoving, retaining walls, land acquisition, engineering design, permits, natural habitat impact and mitigation, land easements, etc. Additionally, a greater number of Type 5 micro-passages would be required to achieve the same permeability as a Type 4 passage structure. However, the installation of repeating Type 5 micro-passages in the existing roadway at a higher frequency could impair the structural integrity of the roadway by creating deficiencies (as a consequence of the installation process) that could compound over time, leading to additional inspections and maintenance. Each Type 5 micro-passage would require at-grade directional fencing along both sides of the existing road shoulder that may constrict the travel path and reduce the width of road shoulders for bicyclists and pedestrians, and could be subject to damage from vehicle strikes, leading to additional maintenance costs.

The concerns raised above are examples of potential issues related to County approval and safety, Other concerns may be identified during future Project development that require additional consideration. Given these constraints, further refinement is currently underway between AECOM, Midpen, and County Roads to better understand the constraints and opportunities associated with each Corrective Action, Option, and Alternative to inform the Alternatives that advance to Task 3 for more detailed evaluation.

8.3. Phased Implementation

In addition to the selection of a preferred Alternative, special consideration should be taken regarding the ability to phase the implementation of a recommended Alternative in parts, sequentially, to allow time to sufficiently fund, implement, and monitor the success of each Corrective Action. For example, by phasing Project implementation by Priority Zone (Year 1: Zone 1, Year 3: Zone 2+2a, Year 5: Zone 3), ample time could be built into the Project to allow for an intermediate study of a given Corrective Action's ability to achieve the expected performance and success criteria and allow time to integrate adaptive management into subsequent design plans.

Additionally, the Alternatives Analysis helped determine the highest Priority Zones for mitigation. In particular, the analysis determined that Zone 1 is the highest priority for mitigation because it contains the hotspots with the greatest newt mortality and highest newt carrying capacity. Zone 3 is the second highest Priority Zone, followed by Zone 2 (Appendices A and B). If funding, permitting, or other logistics require a phased approach, treatment of these zones can be ordered accordingly.

Priority Zones 1, 2, 2a, and 3 were identified and delineated during the Task 2 Wildlife Crossing Conceptual Design Workshop from north to south in the Project Area. Any future recommendations for phased implementation and order of importance (i.e., Zone 1, Zone 3, Zone 2, and Zone 2a) are based on the newt mortality observed and are independent of each Zone's designation number in the Project Area (i.e., Zone 1, Zone 2, Zone 2a, and Zone 3). In other words, the nomenclature used to designate each Zone should not be confused with future recommendations of phased implementation order.

8.4. Additional Recommendations

8.4.1. Adaptive Management and Monitoring

To allow for the need for adaptive management, USGS will develop a monitoring program to determine the efficacy of road passage system after construction. This program would include a monitoring protocol to

determine the permeability of passages and barriers to newt movement and to estimate annual road mortality along Alma Bridge Road after construction. The protocol would include both data collection and analysis methods. In the future, USGS would update the persistence probabilities based upon updated permeability information to inform efficacy of the newt connectivity improvements and conservation efforts.

8.4.2. Future Studies

To complement the implementation of the final preferred Alternative selected, additional studies may be warranted regarding the following topics.

Predatory Fish

In addition to road mortality, another source of mortality that may be influencing the success of the local California newt population at Lexington Reservoir is the presence of predatory fish species. Future investigations could include a review of past recreational survey data or present-day creel surveys (aka angler surveys) to determine the composition and relative abundance of fish in Lexington Reservoir, and determine what impact, if any, predatory fish may have on newt recruitment.

Habitat Creation

During the conceptual design workshop, the creation of breeding habitat was identified as possible a Corrective Action, and in some cases could serve as an alternative to wildlife crossing structures. In theory, the construction of an artificial breeding pond on the uphill (east) side of Alma Bridge Road could attract and focus breeding activity at that location (rather than Lexington Reservoir), thereby shortening the dispersal distance during seasonal migratory movement, removing Alma Bridge Road as a barrier to movement, and obviating the need for wildlife crossing structures along that specific section of road. At present, only one breeding location is known outside of Lexington Reservoir (notwithstanding any breeding that may take place along Limekiln Creek, Soda Springs Creek, or Hendrys Creek, or unnamed drainages in the vicinity). This breeding site consists of a small seep and pooling water in a concrete cistern located at the Priest Rock Trail staging area and has been confirmed as a location where successful breeding has been observed for several years (Newt Patrol, pers. comm.). Additional study would be necessary to determine whether this seep could be augmented or enhanced in a way to attract and support additional breeding at this location; however, modifications to this existing breeding pool also come with the risk of irreversibly altering this breeding site in such a way as to discourage breeding activity if the enhancement is unsuccessful.

Given the steep terrain, the availability of suitable level ground on the uphill (east) side of Alma Bridge Road to accommodate the construction of a breeding pond is limited. However, one such location that might be able to accommodate a wetland is the former Beatty Trust property. As before, further study would be necessary to determine whether the soils, grade, and hydrology on site are suitable to support wetland creation. This may also be a suitable location for educational signage and other outreach about newt conservation and wildlife movement.

The creation of breeding habitat alone, without the implementation of any additional Corrective Actions, would not be a viable solution for several reasons. Firstly, newts have high site fidelity for breeding and dispersal sites and tend to reproduce where they were born. Additionally, hypothetical breeding ponds would attract only a portion of the overall breeding population whose existing travel path during breeding and dispersal events passes within a certain distance from the newly constructed pond. All newts north or south of the created pond with breeding or dispersal activity centered on Lexington Reservoir would still be subject to the same levels of mortality and habitat fragmentation from Alma Bridge Road. Furthermore, of the portion of newts drawn to a created breeding pond, a subset of those individuals might still approach and cross Alma Bridge Road as they travel to and from the pond. Barrier fencing along Alma Bridge Road could prevent road mortality at this localized location but would only treat that specific location unless it was part of a greater, more expansive suite of Corrective Actions implemented throughout the Project. In and of itself, habitat creation is not a viable cure-all to meet the Project's goals.

Natural History/Baseline Conditions

During future adaptive management and monitoring activities, future investigation should prioritize collecting additional data on the following topics to better inform our understanding of California newt natural history: local population size (i.e. geographic boundaries), estimated population decline as a result of road mortality, first year newt survival/annual recruitment as a result of road mortality, juvenile-to-adult dispersal distance (maximum, 90%), newt breeding surveys to identify core breeding habitat (i.e., surrounding creeks, ponds, wetlands, seasonal water bodies), carrying capacity of different micro-habitats, effects of road mortality on age structure and life expectancy/survival, habitat use south and west of Lexington Reservoir, permeability of Corrective Action types, newt response (e.g. "give up distance") to movement barriers, additional traffic profiles during daytime and nighttime conditions.

Utilities

All Options identified above could result in impacts to existing utilities. A desktop review of potential utilities in the Project Footprint identified overhead electrical poles/lines, as well as underground utilities indicated by the presence of at-grade utility boxes (Figure 7). Additional investigations and formal utility mapping will be necessary to inform future design phases, which could include contacting utility agencies, preparing refined utility maps, field surveys, and investigatory potholing.

8.5. Feasibility Analysis Limitations

The best available data has been used to inform the parameters of the modeling and preliminary Corrective Action recommendations. Inherent in the exercise of modeling a natural system is the need to make certain assumptions to predict the system's response to change based on the best available evidence. As a non-listed species, research into the basic life history elements of the California newt's natural history is limited. This lack of a baseline understanding is reflected in the scientific literature and carries into the assumptions that are made if modeling is used to estimate this population's response to movement barriers and vehicle mortality, as well as their response to the Corrective Actions proposed to mitigate their effects.

The USGS's spatially explicit model of newt population-level road permeability along Alma Bridge Road was based on existing research on the responses of migratory amphibians (principally, salamanders and toads) to road passages and barriers, the most recent four years of Newt Patrol road mortality data, the Newt Patrol carcass persistence study, and the study of newt road mortality versus successful road crossings by H.T. Harvey (H.T. Harvey & Associates 2021, Parsons 2021, Newt Patrol 2022).

The model developed for the H.T. Harvey study (H. T. Harvey & Associates 2021, Wilkinson and Romansic 2022) in particular was conditioned on Lexington Reservoir and inlet streams on the reservoir side of Alma Bridge Road being the only breeding source for this population and the adult newts in this population crossing Alma Bridge Road to breed. However, it is possible that there are adult newts in other upland areas around Lexington Reservoir that breed in the reservoir without crossing Alma Bridge Road. Also, there are likely other breeding sources for this population besides Lexington Reservoir. For example, newts breed in the upper reaches of Limekiln Creek (approximately 16 km of creek distance upstream of Alma Bridge Road) and Soda Springs Creek (approximately 19 km of creek distance upstream of Alma Bridge Road).

If newts are breeding in Lexington Reservoir without crossing Alma Bridge Road or are breeding in these other locations, annual recruitments from the reservoir or these other sources might be sustaining or supplementing the population, even though the high mortality rate of crossing Alma Bridge Road to breed would represent a population sink for the overall metapopulation.

The H.T. Harvey study also assumed that all adults in the California newt population attempt to breed (i.e., undergo the breeding migration) every year. In some salamander populations, males may attempt to breed every year while females skip at least some years between attempts, foregoing the breeding migration in some years to avoid unfavorable conditions or to acquire energy for use in later breeding attempts. Also, there may be a higher annual breeding potential of the females than their assumed 0.5%.

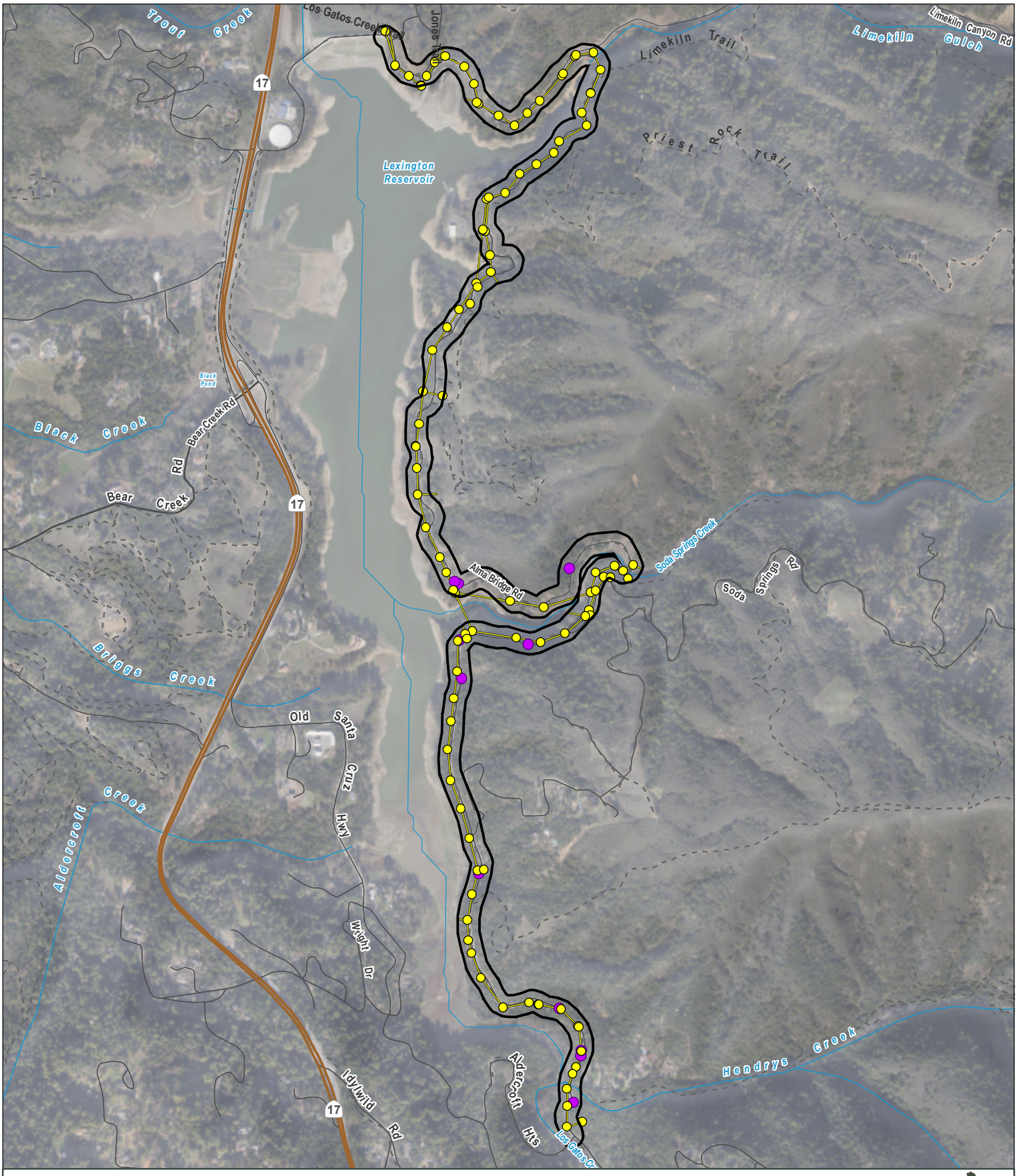

Figure 7: Preliminary Utility Locations

Existing Trail
100-ft Buffer

Existing Utility

Overhead Utility
Underground Utility
Overhead Utility

Midpeninsula Regional
Open Space District
(Midpen)
2/24/2023

Feet
0 1,000 2,000

MIDPENINSULA REGIONAL OPEN SPACE

AECOM

If any of these assumptions are incorrect, then the H.T. Harvey model may be over or underestimating the population size and mortality rate for this population.

The USGS model of newt population-level road permeability also relied on assumptions. The current estimates of movement distances are based on California tiger salamander data. The USGS models do not consider the potential for future traffic patterns to change, which may alter the estimated road mortality rate. The estimates of vital rates, especially larval/juvenile survival, are somewhat less informed than other metrics; consequently, these place limitations on rates at which the model allows populations to grow, favoring more conservative growth patterns, rather than allowing rapid growth.

There is an altogether lack of information regarding passage permeability, due in part to a lack of information on the natural movements of migrating amphibians (vs non-migrating amphibians), specifically California newts. During the design phase, certain changes to the characteristics of Type 4 purpose-built passage structure or other passage structures (i.e., not allowing open top for moisture and night sky visibility) are expected to reduce passage permeability. There is the least amount of data on the permeability of modified cattle guards; however, early data from Yosemite toads on State Route 108 is promising. Designs that incorporate greater numbers of passages inherently are less certain. If assumptions about passage permeability or fence movement are incorrect, these uncertainties would more strongly impact alternatives with more passages or greater passage spacing. As most designs included permeability, the overall interpretation of relative efficacy should not vary.

Table 9. Summary of Feasibility Analysis for Preliminary Alternatives 1 through 4 and Secondary Zone

Design Consideration	Preliminary Alternative 1	Preliminary Alternative 2	Preliminary Alternative 3	Preliminary Alternative 4	Secondary Zone
Effectiveness	Estimated 84% increase in population size after 30 years. Achieves population persistence to Year 100.	Estimated 72% increase in population size after 30 years. Achieves population persistence to Year 100.	Estimated 56% increase in population size after 30 years. Achieves population persistence to Year 100.	Estimated 70% increase in population size after 30 years. Achieves population persistence to Year 100.	Not modeled.
Crossing Structure Count	**Structure:** Bridge **Type 4:** 40 **Type 5:** 2 **Cattle Grate:** 6	**Type 4:** 61 **Type 5:** 2 **Cattle Grate:** 9	**Type 4:** 38 **Type 5:** 10 **Cattle Grate:** 14	**Type 4:** 57 **Type 5:** 7 **Cattle Grate:** 14	
Constructability	Temporary/full road closures over 5 years, partial closure of ABR segment (quarry), full abandonment of ABR segment, construction of steel beam or precast concrete girder bridge, redesign of Limekiln Trail unofficial turnouts/shoulders, realignment of Limekiln Trail trailhead, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing, elevation transition of Soda Springs Rd-Alma	Temporary road closure up to 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of Limekiln Trail unofficial turnouts/shoulders, Miller Point parking area guide fencing, elevation transition of Soda Springs Rd-Alma Bridge Rd intersection.	Temporary road closure up to 1 year, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of Limekiln Trail unofficial turnouts/shoulders, Miller Point parking area guide fencing, redesign of former Beatty Trust property project access points, elevation transition of Soda Springs Rd-Alma Bridge Rd intersection.	Temporary road closure up to 1-2 years, raise ABR up to two feet, uphill cutslope, downhill retaining wall, utility relocation, MGS railing, staging areas, unofficial parking area redesign, redesign of Limekiln Trail unofficial turnouts/shoulders, Miller Point parking area guide fencing, elevation transition of Soda Springs Rd-Alma Bridge Rd intersection.	**Traffic Control** Traffic study (i.e., least cost path analysis, visibility, alternate route signage), temporary road closure, signage replacement/ enhancement, islands/medians, transverse rumble strips/ perceptual treatments **Bay Area Ridge Trail** Trail designation(s), construction, improvements

Design Consideration	Preliminary Alternative 1	Preliminary Alternative 2	Preliminary Alternative 3	Preliminary Alternative 4	Secondary Zone
	Bridge Rd intersection.				
Environmental Impact Minimization	**Impacts:** Bridge abutments (reservoir bank), footings (reservoir bed), utility relocation, staging areas, uphill cutslope, downhill retaining walls, unofficial parking area redesign, redesign of Limekiln Trail unofficial turnouts/shoulders **Minimization:** Pre-construction surveys, potential for on-site mitigation (roadbed restoration), repurpose ABR as official parking area, limit work to road prism, recommend AMMs	**Impacts:** Utility relocation, staging areas, uphill cutslope, downhill retaining walls, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs	**Impacts:** Utility relocation, staging areas, uphill cutslope, downhill retaining walls, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs	**Impacts:** Utility relocation, staging areas, uphill cutslope, downhill retaining walls, unofficial parking area redesign **Minimization:** Limit work to road prism, recommend AMMs	**Traffic Control** None (all work on paved surfaces) **Bay Area Ridge Trail** To be determined
Existing Facilities Impact Minimization	**Impacts:** Temporary/ full road closures over 5 years, ABR segment abandonment, Limekiln Trail parking lot/trailhead abandonment, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing	**Impacts:** Temporary road closures, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders	**Impacts:** Temporary road closures, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, redesign of former Beatty Trust property project access points, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial	**Impacts:** Temporary road closures, raise ABR up to two feet, utilities relocation, staging areas, unofficial parking area redesign, Miller Point parking area guide fencing **Minimization:** Reversible traffic during temporary road closures, limit work to road prism, redesign of unofficial turnouts/shoulders	**Traffic Control** **Impacts:** Existing signage removal/replacement, temporary road closures, staging areas **Minimization:** Reversible traffic during temporary road closures, limit work to road prism **Bay Area Ridge Trail** **Impact:** Trail designation(s),

Design Consideration	Preliminary Alternative 1	Preliminary Alternative 2	Preliminary Alternative 3	Preliminary Alternative 4	Secondary Zone
	Minimization: Reversible traffic during temporary road closures, full road closure to non-quarry traffic, partial road closure to allow quarry traffic, Limekiln Trail trailhead relocation, redesign of Limekiln Trail unofficial turnouts/shoulders, limit work to road prism, redesign of unofficial turnouts/ shoulders		turnouts/shoulders, new driveway to connect former Beatty Trust property to the Miller Point parking area intersection		construction, improvements **Minimization:** To be determined
Maintenance Needs/Costs	Bridge preventative maintenance, standard County road maintenance/ inspections, annual inspection of crossing structures	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/ inspections, annual inspection of crossing structures (minimum; based on final Corrective Action design)	Standard County road maintenance/inspections
Environmental Clearance	**CEQA:** Statutory Exemption[2], Categorical Exemption, Initial Study/Mitigated Negative Declaration, or Environmental Impact Report **NEPA:** TBD[1] but likely Categorical Exclusion or Environmental Assessment **Permits/:** 404, 401, ITP, 1602 LSAA, BO **Approvals:** landowner	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**CEQA:** Statutory Exemption[2], Categorical Exemption, Initial Study/Mitigated Negative Declaration, or Environmental Impact Report **NEPA:** TBD[1] but likely Categorical Exclusion or Environmental Assessment **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination,	**CEQA:** Statutory Exemption[2], Categorical Exemption, or Initial Study/Mitigated Negative Declaration **NEPA:** TBD[1] but likely Categorical Exclusion **Permits:** 404, 401, ITP, 1602, BO **Approvals:** landowner coordination, encroachment permits, licenses, and land rights acquisitions	**<u>Traffic Control</u>** **CEQA:** Statutory Exemption[2] or Categorical Exemption **NEPA:** Categorical Exclusion **Permits/Approvals:** ITP/BO (unlikely) **<u>Bay Area Ridge Trail</u>** To be determined

Design Consideration	Preliminary Alternative 1	Preliminary Alternative 2	Preliminary Alternative 3	Preliminary Alternative 4	Secondary Zone
	coordination, encroachment permits, licenses, and land rights acquisitions		encroachment permits, licenses, and land rights acquisitions		
Total Estimated Project Schedule	2 years for environmental clearance and preliminary design, 1 additional year from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	1 to 1.5 years for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting	6 to 12 months for environmental clearance and preliminary design, 6 to 12 additional months from time of 65% design for permitting
Construction Schedule (once funding acquired)	2-5 years	1-3 years	1-3 years	1-3 years	1-2 years
Construction Cost	$$$$	$$	$$	$$	$

$ = $1M - $3M
$$ = $4M - $10M
$$$ = $11M - $20M
$$$$ = $21M - $40M

ABR = Alma Bridge Road
AMMs = Avoidance & Minimization Measures
MGS = Midwest Guardrail System railing
EIR = Environmental Impact Report
LSAA = Lake & Streambed Agreement
BO = Biological Opinion
NEPA = National Environmental Policy Act

[1] The need for and type of NEPA clearance would depend on whether the Project has federal funding. If not, it is assumed that NEPA would be completed by the USACE as part of the 404 permitting process.

[2] In 2021, California Public Resources Code Section 21080.56 was added to provide a new CEQA statutory exemption until January 1, 2025, for fish and wildlife restoration projects that meet certain requirements, to be determined in coordination with CDFW.

9. References

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Appendix A

USGS Effectiveness Modeling (Part 1)

Appendix B

USGS Effectiveness Modeling (Part 2)