EXHIBIT 10

Selection of Wildlife Crossing Structures

Proposed Ordinance Establishing Setbacks from 16 Wildlife Crossing Structures in the Northern Portion of the Ventura County Unincorporated Area

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Wildlife Crossing Structure Selection Process

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Background

Multiple studies of terrestrial wildlife movement through freeways and highways, including US 101, SR-23, SR-126, and SR-118 in Ventura County, conclude that culverts and underpasses are used by a variety of wildlife to bypass these barriers (Brown and Riley, 2014; Riley et al., 2014; Sikich and Riley, 2012). Culverts under smaller roadways are also important for wildlife passage and studies indicate wildlife are willing to try to cross small roadways, resulting in mortality from vehicle collisions (Ament et al., 2008, Riley et al., 2006, Brown and Riley 2014, Van Langevelde et al., 2009). In addition, studies conducted in the Ventura River watershed show that fish passage through culverts and bridges associated with roads in the northern portion of Ventura County are extremely important for aquatic wildlife that migrate for a portion of their life cycle such as the federally endangered steelhead trout (*Oncorhynchus mykiss*)[1].

Studies have also shown that terrestrial wildlife of all sizes utilize crossings and that different species have different preferences for crossings with different features which may increase or decrease their use of a given crossing (Clevenger et al., 2001, McDonald and St Clair, 2004). These features can include position in the landscape, the crossing's "openness" as defined by its height, width, and length, and proximity to high quality habitat. Wildlife most susceptible to landscape-scale connectivity issues are those that generally avoid roads, have multiple resource needs, require large geographic areas, occur at low densities, and have low reproductive rates. Medium and larger animals tend to utilize crossings with a larger openness ratio (defined as the cross-sectional area of a crossing divided by the length) which often means it has a larger diameter. However, many wildlife species that occur in Ventura County (e.g., bobcat, coyote) tend to be opportunistic users of crossings, making many existing crossings capable of facilitating wildlife movement (Kintsch et al., 2015).

The availability of vegetative cover near the entrance of a crossing structure can determine whether a particular species will use it. Natural vegetation can enhance the "attractiveness" of crossing structures to different animals, allow a continuity of habitat, and reduce negative effects of lighting and noise (Clevenger and Waltho, 2005; Rodriguez et al., 1996; McDonald & St Clair, 2004). Other best management practices recommended for areas adjacent to wildlife crossing structure include the following: fencing to funnel wildlife to crossing entrances, limit development and other human activities associated with lighting, noise, domesticated animal keeping, use of poisons,

[1] https://storymaps.arcgis.com/stories/193dc29701ae4e6b81f57a5c9cd024ef

habitat loss and degradation (trails, off highway vehicle use), and minimizing wildlife attractants (Beier et al., 2008a; California State Parks, 2000; Clevenger and Waltho, 2005; Rodriguez et al., 1996).

For aquatic wildlife in Ventura County, the suitability of the culvert or bridge for fish passage depends upon the timing and presence of water, in addition to the types of fish species present. These factors will be used to assess the structure's functional design (Caltrans, 2014). If a federally or state protected species is present, then specific criteria will depend on which regulating agency has jurisdiction for the protected species (R. Marlow, personal communication, April 27th, 2021). While the wildlife crossing structure assessment in this exhibit is limited to identifying **existing** road crossing structures that are **currently functional** for terrestrial wildlife, a summary of existing road crossing structures that have been prioritized for important **aquatic retrofits** for the northern portion of Ventura County can be found in the Ventura River Watershed Management Plan (Ventura River Watershed Council, 2015). However, while many of the identified terrestrial wildlife crossing structures may overlap or are nearby identified structures identified for aquatic retrofits (e.g., Bridge ID 52-0043/44) as discussed in the next paragraph, the proposed setback distance selected for this amendment would also support the needs of aquatic species that utilize these identified wildlife crossing structures (conserve riparian vegetative cover). For example, water quality associated with runoff and increased temperatures from lack of a riparian buffer are also responsible for decreasing steelhead population sizes (Katz et al., 2013; Sloat and Osterback 2013; Dagit et al., 2020).

A common planning tool used to address these types of negative impacts on wildlife and their habitats can be a "setback" or a "buffer" which serves to protect a target area by creating a surrounding "buffer" that restricts future development or uses. Natural vegetation may or may not currently exist within that setback. Current research associated with setback distances for wildlife along wetland, riparian or creek/river drainages (wildlife crossing structures in this project) can vary between 100 to more than 5000 feet for wildlife protection and movement. To determine a setback distance for wildlife movement (and in this case, within a creek/river to encourage entrance outside of a wildlife crossing structure), the research literature suggests that the following factors should be considered: type of wildlife species and their life-history characteristics, vegetation cover type, current condition of vegetation cover, current and future permitted land uses (Alberta, 2012; Kihslinger, et al. 2008; Beacon Environmental, 2012). Based upon these factors, an average setback distance of 200 feet was selected to balance the needs of the species (CDFW, 2018a; CDFW, 2022b; South Coast Wildlands, 2005), property owner rights, and varying environmental conditions such as vegetative cover, slope, soils, water, etc.

Methods

The Ventura County Planning Division conducted an assessment of wildlife connectivity needs in the northern portion of Ventura County using a landscape level approach to identify wildlife crossing structures for this project (Clevenger and Huijser, 2011) in the summer of 2018. Data sources included aerial photos, topographic maps, wildlife data, vegetation data, modeling data from the South Coast Missing Linkages project (South Coast Wildlands, 2005) and various types of transportation data from the California Department of Transportation (Caltrans) and the Ventura County Public Works Agency Transportation Division. The initial dataset included a total of 195 structures, 135 County maintained structures and 60 Caltrans maintained structures.

The data was evaluated with respect to a set of exclusionary features and functional features. Exclusionary features make a crossing uninviting or impractical for wildlife to utilize to overcome a roadway or other barrier. If a crossing had any one or more of the exclusionary features, it resulted in the removal of the crossing as functional for wildlife and not included as a wildlife crossing structure for the proposed amendment.

Exclusionary Features

1. A vertical pipe serves as an entrance or exit to a crossing.
2. A covering or grate over the entrance or exit may occur that would prevent all but the smallest wildlife species from accessing the entrances.
3. The crossing does not entirely traverse a barrier and instead leads from the road to adjacent areas, for instance, a road may contain culverts to divert drainage.
4. A crossing entrance with a diameter less than 24 inches, or with a cross sectional area less than 6 square feet.
5. A crossing entrance immediately adjacent to extremely steep slopes, defined as slopes with an angle of approximately 65 degrees or higher, or areas with extremely steep slopes that a majority of wildlife are likely incapable, or unwilling to scale to get to the surrounding landscape.
6. Crossings directly adjacent to Federal Lands as the Planning Division would have no land use authority in applying development setbacks on these lands.
7. Crossings on roads with extremely low traffic volumes were excluded with 200 vehicle trips per day or less.

Functional Features

The County culverts, County bridges, and Caltrans crossings were also evaluated based on approximately ten functional features used to assess their potential to provide connectivity for wildlife. The functional features for culverts and bridges are slightly different based on their characteristics. For example, the exclusionary feature of a vertical

pipe inlet was excluded from the bridge analysis. A list of these functional features along with a description of how they contribute to wildlife use is provided in Table 1 (below).

Table 1: Functional Features and their Support of Functional Connectivity

Feature	Feature Description	Feature's Contribution to Functional Connectivity
Vegetation	The presence of vegetation within approximately 40 meters of crossing entrances was evaluated. Vegetation could be any plant material, native, non-native, orchards, etc. Grass less than 12 inches high were not considered.	Natural vegetation can enhance the "attractiveness" of crossing structures to different animals and allow a continuity of habitat (Clevenger and Waltho, 2005; Rodriguez et al., 1996).
Light Visibility	Visibility through crossing entrance was based on one of the following two factors: 1) Inspection photos demonstrated visibility from one entrance; or (2) All of the following conditions were met: (a) openness ratio is greater than 0.20 feet; (b) no bend in the crossing; and (3) crossing slope is less than 10%.	Input from National Park Service wildlife biologists that study wildlife movement have stated that crossings in which light is visible at entrances appears to result in higher use by wildlife. The presence of light can indicate that a crossing will allow an individual to safely bypass a barrier.
Openness Ratio	The openness ratio is defined as the cross-sectional area of a crossing (height*width) divided by the length or distance an individual must travel to get to the other end.	Larger, more open crossings tend to get more use, especially among medium to large mammals (Beier et al., 2008b). As a result, a crossing with an openness ratio of 0.20 feet or greater was counted as a functional feature.
Suitable Habitat	The presence of suitable habitat within approximately 0.5 miles. Suitable habitat was defined broadly as areas that likely support native vegetation or provide habitat for a variety of fauna within Ventura County.	Nearby suitable habitat was shown to be a factor that strongly correlated with crossing use in a study conducted monitoring wildlife movement in Ventura and Los Angeles Counties (Ng et al. 2004).
Fencing	Fencing that funnels wildlife to a crossing or fencing that excludes wildlife from roadways can increase nearby crossing use by wildlife.	Fencing or other barriers can lead to preferential use of the crossing structure instead of crossing over the road (Ng et al 2004).

Feature	Feature Description	Feature's Contribution to Functional Connectivity
Crossing Potential	Crossing is at grade with the surrounding terrain, while the barrier (road) is below or above grade.	Wildlife are more likely to utilize a crossing structure instead of cross a road if it is set above or below the road grade. Clevenger and Waltho (2005) found vertebrates were 93% less susceptible to road-kills on roads raised on embankments, compared to roads at grade.
Landscape Context Crossing Potential	Crossing structures located within topographical features such as drainages, ridgelines or away from development may be more frequently utilized because most types of wildlife are more likely to follow these topographical features to travel through the landscape.	Drainages, riparian zones, ridgelines, and other topographical features are commonly used as by wildlife to travel through the landscape (Regan, K. ,2020; Carlin, M.R. 1996; Olson, D.H. 2009).
Natural Substrate	The presence of natural substrate through a crossing (e.g., soil, rock, vegetation).	Natural substrate within a crossing structure can provide a continuity of habitat for wildlife to move through a barrier uninhibited (Yanes et al., 1995; Jackson, 2000).
Proximity to Other Suitable Crossings	This factor was assessed by determining if suitable crossings were located within 0.5 miles of the crossing.	By providing multiple crossing structures nearby one another helps accommodate changing dynamics of habitat and climatic conditions, as well as wildlife populations (Clevenger and Huijser, 2011).

Analysis Process

Wildlife biologists with the California Department of Transportation (Caltrans), the National Park Service, and the RMA-Ventura County Planning Division who specialize in wildlife movements through urban landscapes and their use of road crossings used the criteria to assess the functional connectivity of each structure. The process also included site visits for a small subset of crossings to examine the conditions at crossing locations if the site was not documented by inspection crews or visited by the biologists recently. Once all biologists reached agreement on the functional capacity of the crossing structures selected, the vetting process was complete. Out of 195 bridges and culverts evaluated within the northern portion of Ventura County, 20 structures were determined to have the functional features to be classified as a wildlife crossing structures within the County. Four of the

identified structures and the surrounding lands are under federal ownership and therefore are not subject to the County's jurisdiction and the Board of Supervisor's directive for the proposed amendment. Therefore, they were not included in the proposed setback regulations.

Bibliography

Alberta. (2012). Wildlife corridor and habitat patch guidelines for the Bow Valley.

Ament, R., Clevenger, A. P., Yu, O., & Hardy, A. (2008). An assessment of road impacts on wildlife populations in US National Parks. Environmental Management, 42(3), 480-496.

Beacon Environmental Ltd. (2012). Ecological Buffer Guideline Literature Review. Prepared for Credit Valley Conservation Authority. Accessed at https://cvc.ca/wp-content/uploads//2021/06/Ecological-Buffer-Guideline-Review.pdf

Beier, P., Majka, D., Newell, S., & Garding, E. (2008)a. Best management practices for wildlife corridors. Northern Arizona University, 1(3).

Beier, P., Majka, D. R., & Spencer, W. D. (2008)b. Forks in the road: choices in procedures for designing wildland linkages. Conservation Biology, 22(4), 836-851.

Brown, J. L., and S. P. D. Riley. 2014. Wildlife study along state route 118 with mitigation recommendations. Final report prepared for Caltrans District 7. National Park Service, Santa Monica Mountains National Recreation Area, Thousand Oak, California.

California Department of Fish and Wildlife (CDFW). 2018. California Natural Diversity Data Base (CNDDB), Rarefind V. 5. Available at: https://www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed August 2018.

California Department of Fish and Wildlife (CDFW). 2018. California Wildlife Habitat Relationship (CHWR) Program. California Interagency Wildlife Task Group. 2014. CWHR version 9.0 personal computer program. Sacramento, CA

California Department of Parks and Recreation, Inland Empire District. (2000). Urban Edge Effects and their relationship with the natural environment. Gary Watts, State Park District Superintendent.

California Department of Transportation (Caltrans), 2014. Fish Passage Design for Roadway Crossings Guidance. State of California Department of Transportation Agency.

Carlin, M. R. (1996). A cartographic analysis of wildlife corridors on the northwestern periphery of metropolitan Los Angeles. California State University, Fullerton.

Clevenger, A. P., Chruszcz, B., & Gunson, K. (2002). Drainage culverts as habitat linkages and factors affecting passage by mammals. Journal of applied ecology, 38(6), 1340-1349.

Clevenger, A. P., & Huijser, M. P. (2011). Wildlife crossing structure handbook: design and evaluation in North America (No. FHWA-CFL-TD-11-003). United States. Federal Highway Administration. Central Federal Lands Highway Division.

Clevenger, A. P., & Waltho, N. (2005). Performance indices to identify attributes of highway crossing structures facilitating movement of large mammals. *Biological conservation*, *121*(3), 453-464.

Dagit, R., Booth, M.T., Gomez, M., Hovey, T., Howard, S., Lewis, S.D, Jacobson, S., Larson, M., McCanne, D., Robinson, T.H. (2020). Occurrences of Steelhead Trout (Oncorhynchus mykiss) in southern California, 1994-2018. California Fish and Game, 106(1), 38-56.

Forman, R. T., & Alexander, L. E. (1998). Roads and their major ecological effects. *Annual review of ecology and systematics*, 207-C2.

Jackson, S.D., 2000. Overview of transportation related wildlife problems. In: Evink, G.L., Garrett, P., Zeigler, D., Berry, J. (Eds.), Proceedings of the International Conference on Wildlife Ecology and Transportation. FL-ER-69-98. Florida Department of Transportation, Tallahassee, FL, pp. 1–4.

Katz, J., Moyle, P. B., Quiñones, R. M., Israel, J., & Purdy, S. (2013). Impending extinction of salmon, steelhead, and trout (Salmonidae) in California. *Environmental Biology of Fishes*, *96*(10), 1169-1186.

Kihslinger, R. L., McElfish Jr, J. M., & Nichols, S. S. (2008). Planner's guide to wetland buffers for local governments.

Kintsch, J., Jacobson, S., & Cramer, P. (2015, September). The Wildlife Crossing Guilds decision framework: A behavior-based approach to designing effective wildlife crossing structures. In *Proceedings of the 2015 International Conference on Ecology and Transportation (ICOET 2015) Session* (Vol. 201).

McDonald, W., and C. C. St Clair. 2004. Elements that promote highway crossing structure use by small mammals in Banff National Park. *Journal of Applied Ecology* 41:82–93.

Ng, S. J., Dole, J. W., Sauvajot, R. M., Riley, S. P., & Valone, T. J. (2004). Use of highway undercrossings by wildlife in southern California. *Biological Conservation*, *115*(3), 499-507.

Olson, D. H., & Burnett, K. M. (2009). Design and management of linkage areas across headwater drainages to conserve biodiversity in forest ecosystems. Forest ecology and management, 258, S117-S126.

Ragan, K. (2020). It All Comes Out in the Wash: Mammal Use of Riparian Corridors in Semi-Arid Sonora, Mexico (Doctoral dissertation, Arizona State University).

Riley, S. P. D., J. P. Pollinger, R. M. Sauvajot, E. C. York, C. Bromley, T. K. Fuller, and R. K. Wayne. 2006. A southern California freeway is a physical and social barrier to gene flow in carnivores. *Molecular Ecology* 15:1733–1741.

Riley, S. P., Brown, J. L., Sikich, J. A., Schoonmaker, C. M., & Boydston, E. E. (2014). Wildlife friendly roads: the impacts of roads on wildlife in urban areas and potential remedies. In Urban Wildlife Conservation (pp. 323-360). Springer, Boston, MA.

Rodriguez, A., Crema, G., & Delibes, M. (1996). Use of non-wildlife passages across a high-speed railway by terrestrial vertebrates. *Journal of applied ecology*, 1527-1540.

Sikich, J., and S. P. D. Riley. 2012. Effects of State Route 23 widening project and accompanying mitigation measures on culvert use and road mortality of wildlife. Final report prepared for Caltrans district 7 division of environmental planning. Thousand Oaks: National Park Service, Santa Monica Mountains National Recreation Area.

Sloat, M. R., & Osterback, A. M. K. (2013). Maximum stream temperature and the occurrence, abundance, and behavior of steelhead trout (Oncorhynchus mykiss) in a southern California stream. *Canadian Journal of Fisheries and Aquatic Sciences*,*70*(1), 64-73.

South Coast Wildlands. 2005. South Coast Missing Linkages: A Linkage Design for the Sierra Madre-Castaic Connection. Produced in cooperation with partners in the South Coast Missing Linkages Initiative. Available online at http://www.scwildlands.org.

Van Langevelde, F., van Dooremalen, C., & Jaarsma, C. F. (2009). Traffic mortality and the role of minor roads. Journal of Environmental Management, 90(1), 660-667.

Yanes, M., Velasco, J., Suarez, F., 1995. Permeability of roads and railways to vertebrates: the importance of culverts. Biological Conservation 71, 217–222.