

# memorandum

date November 11, 2019

to Rosanne Humphrey, City of Carlsbad

cc Alanna Sullivan, Environmental Science Associates

from Adrienne Lee, Environmental Science Associates

subject Roadkill Study Results – El Camino Real and Cannon Road

This memorandum summarizes the results of adaptive wildlife movement monitoring, in the form of roadkill monitoring at the intersection of El Camino Real and Cannon Road, that occurred for 1 year between August 30, 2018, and August 30, 2019. All roadkill species detected were recorded.

## Introduction

Wildlife movement is the ability for individuals from different wildlife populations to move across the landscape successfully. Wildlife corridors, typically the most efficient wildlife movement pathways, connect fragmented patches of habitat allowing migration, dispersal, and gene flow of wildlife species. However, wildlife movement can become restricted when wildlife corridors intersect with the urban interface, such as through roadways, and become “pinch points” where animal movement becomes funneled into specific locations due to the lack of alternative movement routes. Roads are a significant threat to wildlife movement, particularly when they bisect habitat throughout the city with dense, fast-moving traffic. Wildlife that travel across roads are at high risk of being struck by oncoming traffic and becoming roadkill, in addition to being a road hazard and human safety concern. A safer alternative to traveling across a road would be traveling underneath a road through an underpass, bridge, or culvert.

From 2006 to 2017, on behalf of the City of Carlsbad (city), Environmental Science Associates (ESA) mapped and defined wildlife corridors within the city and identified potential wildlife movement constraints along these corridors.<sup>1</sup> As stated in the 2015 *City of Carlsbad Wildlife Movement Analysis Final Report*,<sup>2</sup> three primary regional east-west corridors within the city were identified, East/West 1 (EW1), East/West 2 (EW2), and East/West 3 (EW3). EW2 is a movement corridor that connects Agua Hedionda Lagoon east to Calavera Mountain/Calavera Lake (northern branch) and along Agua Hedionda Creek/La Mirada Creek out to the Carlsbad Raceway Preserve and city of Vista (southern branch). Four pinch points have been identified at the El Camino

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<sup>1</sup> Environmental Science Associates (ESA). 2017. *Summary of Wildlife Movement Activities in Carlsbad Memo*. Prepared for City of Carlsbad.

<sup>2</sup> ESA. 2015. *City of Carlsbad Wildlife Movement Analysis Final Report*. Prepared for City of Carlsbad.

Real/Cannon Road intersection that could hinder movement eastward and northward from the lagoon (**Figure 1**). Movement along the southern branch occurs from Agua Hedionda Lagoon Ecological Reserve along underpass bridges, under Cannon Road (EW2-4) and under El Camino Real (EW2-5), along Agua Hedionda Creek. Movement through EW2-1 (from the lagoon northward under El Camino Real into Robertson Ranch Preserve) is blocked by very dense vegetation and standing water. There is only one small culvert in this location. Movement through EW2-1B (between Robertson Ranch and habitat east of Cannon Road, north of El Camino Real) is considered to be too small for wildlife movement, as silt has deposited in the box culvert over time, leaving little room for movement.

Both EW2-4 and EW2-5 undercrossings are approximately 50 feet wide and 7 to 10 feet high, with scattered, open vegetation (**Attachment A**). These corridors have been documented by wildlife cameras to support a variety of wildlife, including coyote, bobcat, opossum, raccoon, skunk, and cottontail rabbit, among others. However, the busy intersection of El Camino Real and Cannon Road is a wildlife movement pinch point, funneling wildlife to these areas, which can increase the potential for wildlife to cross “at-grade,” above at the street level. El Camino Real and Cannon Road are highly traveled as El Camino Real is a six-lane road with a speed limit of 55 miles per hour and Cannon Road is a four-lane road with a speed limit of 50 miles per hour; therefore, these roads are expected to be a barrier for wildlife movement through direct mortality from vehicle collisions. The primary focus of this study was to determine if medium to large mammal species are moving across the roads at the El Camino Real and Cannon Road intersection and getting hit by cars rather than traveling underneath. Medium to large mammal species were targeted because these species demonstrate longer-range movement patterns and are likely more threatened by habitat fragmentation from roads.<sup>3</sup> In order to assess how frequent wildlife deaths from vehicle strikes occur in the intersection, ESA biologists and volunteers from Preserve Calavera monitored the El Camino Real and Cannon Road intersection for a year to document roadkill occurrences.

## Methodology

On August 30, 2018, ESA biologists Alanna Sullivan and Adrienne Lee met with Preserve Calavera volunteers Paige DeCino and Karen Merrill and the city’s Habitat Management Plan (HMP) coordinator, Rosanne Humphrey, to finalize the survey area (Figure 1). The El Camino Real and Cannon Road intersection survey area was monitored for a year from August 30, 2018, to August 30, 2019, with a minimum of two surveys completed per week. Because roadkill typically persists for more than 1 day, it is assumed that the data collected represents more than just the dates surveys were conducted. For the full list of survey dates, see **Appendix A, El Camino Real/Cannon Road Roadkill Survey Dates and Results**. Additionally, ESA biologists checked the roadkill pick up logs kept by the city’s Public Works Department from July 2017 to March 2019 to supplement roadkill monitoring data.

Monitoring was conducted by ESA biologists, Preserve Calavera volunteers, and a city employee. The survey area was monitored by walking or driving the intersection slowly and scanning the entire roadway and adjacent sidewalk for roadkill. If something was not identifiable from the car, the surveyor wore a safety vest and walked the survey area, using binoculars to scan the road. If roadkill was detected, a photo was taken when road conditions were safe and uploaded onto the citizen scientist mobile application iNaturalist<sup>4</sup> to create an

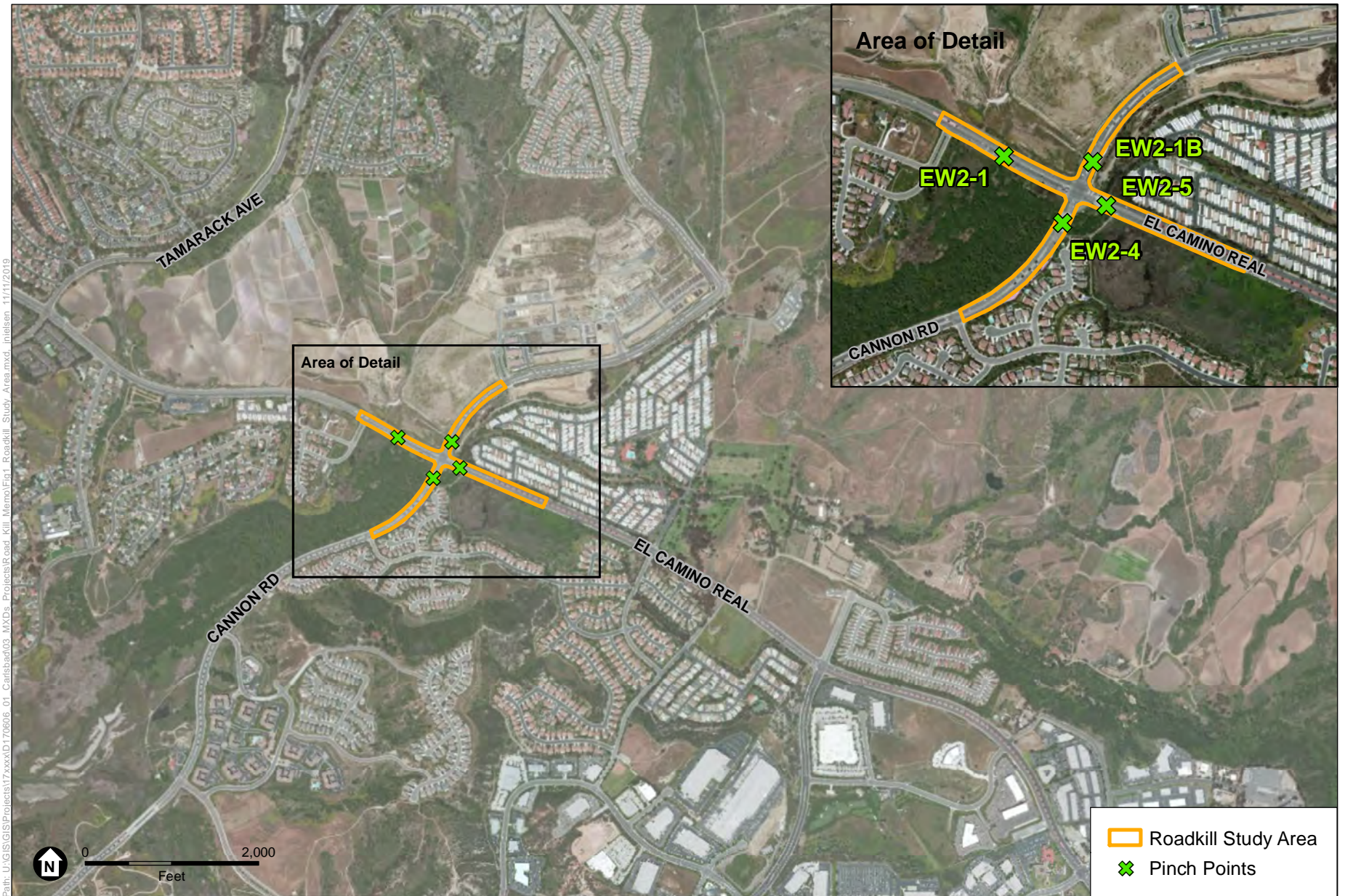
<sup>3</sup> Ng, S.J., J.W. Dole, R.M. Sauvajot, S.P.D. Riley, and T.J. Valone. 2004. *Use of highway undercrossings by wildlife in southern California*. Biological Conservation 115: 499–507.

<sup>4</sup> iNaturalist. Available from <https://www.inaturalist.org>.

“observation” within the University of California, Davis, California Roadkill Observation System (CROS) Project.<sup>5</sup> Once the observation was recorded, the surveyor called the city’s Public Works department for animal disposal pickup.

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<sup>5</sup> iNaturalist. California Roadkill Observation System (CROS). Available from: <https://www.inaturalist.org/projects/california-state-roadkill>



SOURCE: ESRI, 2019; ESA, 2019.

Carlsbad Roadkill Study

**Figure 1**  
El Camino Real x Cannon Road Roadkill Study Area



## Results

A total of 16 roadkill occurrences were detected during the 171 survey dates within the 2018–2019 year of monitoring. One (6.25%) roadkill observation was a medium to large mammal: coyote. Six (37.5%) roadkill observations were small mammals: rodents, rabbits, and opossums. Eight (50.0%) roadkill observations were bird species. One (6.25%) roadkill observation was a reptile species (lizard), but it was detected on the sidewalk, presumably hit by a bicyclist. All roadkill observations and their associated survey dates, times, and surveyor information are listed in **Table 1** and locations of all roadkill observations are displayed in **Figure 2**.

**TABLE 1**  
**EL CAMINO REAL X CANNON ROAD ROADKILL DETECTIONS**

Date	Survey Time	Surveyor	Species
8/30/18	0800–0900	Team <sup>a</sup>	Opossum
9/2/18	0800–0900	Karen Merrill <sup>b</sup>	Bird
9/4/18	1240–1255	Paige DeCino <sup>b</sup>	Bird
9/7/18	0800–0830	Alanna Sullivan	Bird
9/16/18	0800–0845	Karen Merrill <sup>b</sup>	Rodent
10/10/18	1620–1640	Alanna Sullivan	Rat
11/13/18	1030–1125	Alanna Sullivan	Lizard <sup>c</sup>
11/24/18	0800–0850	Karen Merrill <sup>b</sup>	Bird
1/12/19	0915–0945	Karen Merrill <sup>b</sup>	Rabbit
3/30/19	0815–0900	Karen Merrill <sup>b</sup>	Duck
4/20/19	0810–0825	Karen Merrill <sup>b</sup>	Bird
6/1/19	1020–1045	Karen Merrill <sup>b</sup>	Crow
6/15/19	0915–0940	Karen Merrill <sup>b</sup>	Mourning Dove
6/29/19	0830–0915	Karen Merrill <sup>b</sup>	Coyote
7/10/19	1200–1220	Alanna Sullivan	Rabbit
8/6/19	1130–1150	Hannah Swarhout <sup>d</sup>	Rabbit

<sup>a</sup> Team: Alanna Sullivan and Adrienne Lee (ESA), Paige DeCino and Karen Merrill (Preserve Calavera), and Rosanne Humphrey (city).

<sup>b</sup> Volunteer from Preserve Calavera

<sup>c</sup> Found dead on sidewalk, presumably hit by bicyclist

<sup>d</sup> Employee with the City of Carlsbad

In comparison to roadkill, the number of wildlife detections under Cannon Road was significantly higher during the same time period. Two cameras have been installed under the Cannon Road underpass (EW2-4) since 2015<sup>6</sup>. A total of 152 and 94 wildlife detections were documented by the two cameras during the roadkill survey period (**Table 2**). Note that Camera 2 was pulled in January 2019 due to high water level, which flooded the camera. The greatest number of mammals detected on the cameras was coyotes (69 detections by Camera 1 and 45 by Camera 2, representing 45.4% and 47.9% of the total detections, respectively), and bobcats (67 detections by Camera 1 and 22 by Camera 2, representing 44.1% and 23.4% of the total detections, respectively). Other wildlife species detected included birds, opossums, raccoons, and skunks.

<sup>6</sup> City of Carlsbad, Environmental Science Associates, and Center for Natural Lands Management. 2015. *City of Carlsbad Wildlife Movement Analysis Final Report*. Prepared for City of Carlsbad.

**TABLE 2**  
**WILDLIFE CAMERA DETECTIONS (AUGUST 2018–AUGUST 2019)**

Species	Number of Detections (%)	
	EW2-4 Camera 1	EW2-4 Camera 2
Bird	6 (3.9%)	6 (6.4%)
Bobcat	67 (44.1%)	22 (23.4%)
Coyote	69 (45.4%)	45 (47.9%)
Opossum	2 (1.3%)	7 (7.4%)
Raccoon	6 (3.9%)	13 (13.8%)
Skunk	2 (1.3%)	1 (1.1%)
<b>TOTAL</b>	<b>152</b>	<b>94</b>

Note: some individuals could have been detected by both cameras.



SOURCE: ESRI, 2019; ESA, 2019.

Carlsbad Roadkill Study

**Figure 2**  
Roadkill Monitoring Results

## Discussion

The primary focus of this study was to determine if medium to large mammal species are moving across the roads at the El Camino Real and Cannon Road intersection and getting hit by cars rather than traveling underneath. Medium to large mammals demonstrate longer-range wildlife movement patterns and are likely more threatened by habitat fragmentation from roads than smaller species.<sup>7</sup> While roadkill monitoring occurred 171 days out of the year, it is likely that these results represent all roadkill data for the year as roadkill typically persists for more than one day, and animal disposal records from the city's Public Works department were also monitored during the survey year. A single coyote roadkill was detected during the year of study, suggesting that medium to large mammal species are either able to cross the intersection at street level relatively successfully or are using the EW2-4 and EW2-5 undercrossings instead. Based on the results from the wildlife cameras, which documented a total of 152 and 94 wildlife during the roadkill survey period, most of which were coyote and bobcat, it appears that these undercrossings are providing an important avenue for wildlife movement.

As seen in Figure 2, roadkill occurrences of birds are congregated around the intersection of El Camino Real and Cannon Road and less so in the extremities of the survey area. Other studies have found that birds are one of the top taxa to be impacted by vehicle collisions,<sup>8, 9, 10</sup> particularly in areas that support native vegetation and full-time or migratory habitat for birds.<sup>11</sup> This may explain the location and why birds represented the highest number of roadkill occurrences in this study, as native vegetation exists adjacent to the intersection along Agua Hedionda Creek.

ESA continues to monitor animal disposal pickup records from the city's Public Works department to determine potential pinch points within the city that may benefit from future roadkill monitoring. Additional pinch point roadkill monitoring is currently being conducted at Faraday Avenue (pinch point M5-2) and Village H (pinch points M1-1 to M1-4).

## Attachments

A – Photographs of El Camino Real and Cannon Road Undercrossings

B – Photographs of Roadkill at El Camino Real and Cannon Road

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<sup>7</sup> Ng, S.J., J.W. Dole, R.M. Sauvajot, S.P.D. Riley, and T.J. Valone. 2004. *Use of highway undercrossings by wildlife in southern California*. *Biological Conservation* 115: 499–507.

<sup>8</sup> Kioko, J., C. Kiffner, N. Jenkins, and W.J. Collinson. 2015. *Wildlife roadkill patterns on a major highway in northern Tanzania*. *African Zoology* 50: 17–22.

<sup>9</sup> Loss, S.R., T. Will, and P.P. Marra. 2014. *Estimation of bird-vehicle collision mortality on U.S. roads*. *The Journal of Wildlife Management* 78: 763–771.

<sup>10</sup> Wilson, D.D. 2012. *Hotspot analysis of roadkill in Southern California: A GIS Approach*. Master's Thesis for California State University, Northridge.

<sup>11</sup> Ha, H. and F. Shilling. 2017. *Modelling potential wildlife-vehicle collisions (WVC) locations using environmental factors and human population density: A case-study from 3 state highways in Central California*. *Ecological Informatics* 43: 212–221.



## ATTACHMENT A

# Photographs of El Camino Real and Cannon Road Undercrossings

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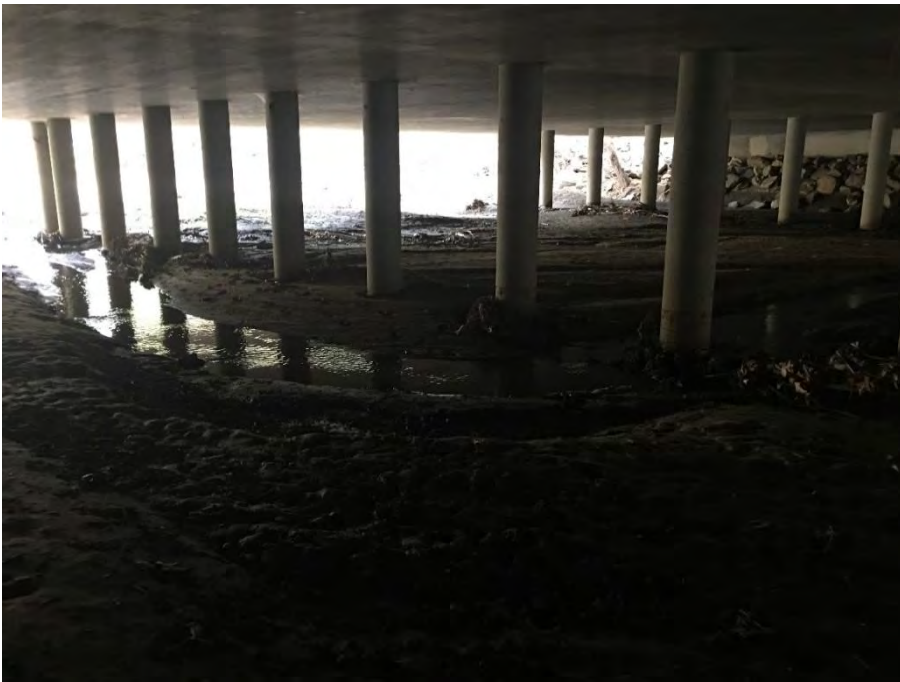
*Looking northeast toward the El Camino Real underpass at EW2-5*



*Looking south underneath the underpass at EW2-5*



*Looking southwest toward the Cannon Road underpass at EW2-4*



*Looking east underneath the underpass at EW2-4*



## **ATTACHMENT B**

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### Photographs of Roadkill at El Camino Real and Cannon Road



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