4 May 2021

Shannon Loftus
Transcon Environmental, Inc.
1942 University Avenue, Suite 206
Berkeley, CA 94704

RE: Paleontological Resources Technical Report Addendum – Assessment of New Alternative Segments, Digital 299 Broadband

Dear Ms. Loftus:

This letter report provides an analysis of newly proposed alternatives for the Digital 299 Broadband project (Proposed Action) as an addendum to the original report—"Paleontological Resource Technical Report, Digital 299 Broadband, Humboldt, Trinity, and Shasta Counties, California"—completed in March 2020 (PaleoServices, 2020). It is our understanding that, since that time, three new segments have been designed and are under consideration as alternatives to several segments of the original proposed route.

This report considers the new alternative segments under the same framework as the original proposed route and alternatives. It provides baseline data on the nature, distribution, and concentration of paleontological resources in the vicinity of the new alternative segments, examines potential construction-related impacts to paleontological resources along these segments, and suggests mitigation measures to reduce potential impacts to paleontological resources to less than significant levels. Also provided is a Geographic Information System (GIS) database containing geologic mapping of the area encompassing a one-mile buffer of the new alternative segments and a paleontological resource potential map of the new alternative segments (also provided in map book format as Appendix A to this report). This report was written by Katie M. McComas and Thomas A. Deméré of the Department of PaleoServices, SDNHM. The GIS database was compiled by Katie M. McComas.

Description of New Alternative Segments

Three new alternative segments are being proposed, and are outlined below and depicted in the overview map (Figure 1) and Appendix A.

- **Alternative Segment Arcata:** The first alternative segment is located along Segment 01 in the City of Arcata. The approximately 0.17-mile-long alternative segment extends southwest from the intersection of Alliance Road and M Street to 12th Street, and includes a small spur along 12th Street east of M Street to connect to a planned fiber optic network in the Arcata area. This alternative segment replaces a small portion of Segment 01 of the original route
- **Alternative Segment 11A:** The second alternative segment extends from the end of Segment 09 to the beginning of Segment 13, between the communities of Salyer and Burnt Ranch. The approximately 10.25-mile-long alternative segment follows State Route (SR) 299 in place of the dirt roads followed by Segments 11 and 12 (Note: there is no Segment 10 in the original route).

- **Alternative Segment 14A:** The third alternative segment extends from the end of Segment 13 to the beginning of Segment 17, between the communities of Burnt Ranch and Big Bar. The approximately 16.73-mile-long alternative segment follows SR 299 in place of the dirt roads followed by Segments 14, 15, 15A, and 16.

Methods

Each new alternative segment was evaluated using the methods outlined in the original technical report (PaleoServices, 2020). The paleontological records searches (SDNHM, and online searches of the paleontological databases at the University of California Museum of Paleontology [UCMP] and the Department of Invertebrate Paleontology-Natural History Museum of Los Angeles County [LACMIP]) and literature review completed for the original route were expanded to include the new alternative segments, where necessary. The geologic units underlying the new alternative segments were assigned a paleontological resource potential utilizing the Potential Fossil Yield Classification (PFYC) system developed by the United States Forest Service (USFS; USFS, 1996) and Bureau of Land Management (BLM; BLM, 2007, 2016). Under this system, geologic units with a higher potential to contain fossils are assigned a higher class number. The PFYC system is described in greater detail in Section 2.3 of the original technical report (PaleoServices, 2020). Geological mapping covering the new alternative segments plus a one-mile radius buffer was compiled into a GIS database containing geological and paleontological data: geologic unit name, geologic unit age, fossils known from the geologic unit, and the assigned paleontological resource potential of the geologic unit. A static version of this dataset showing the paleontological resource potential of geologic units exposed along the new alternative segments is presented in map book format in Appendix A. Finally, an impact analysis of the new alternative segments was conducted to determine whether construction-related earthwork activities along these segments will disturb potentially fossil-bearing geologic units (i.e., those rated as PFYC 5 4, 3, or U). As the construction design is currently not available for review, only a general discussion of standard types of impacts resulting from the various proposed construction methods is provided.

Results

The three new alternative segments are underlain by geologic units assigned PFYC rankings ranging from very low potential (PFYC 1) to low potential (PFYC 2) to moderate potential (PFYC 3) (Table 1). Because the focus of this report is to determine whether construction of the Proposed Action will impact significant paleontological resources, only earthwork (e.g., mass grading, trenching, large diameter boreholes, etc.) that will disturb potentially fossil-bearing geologic units has the potential to result in significant impacts to paleontological resources. Of the geologic units underlying the new alternative segments, only the late Jurassic-age Galice Formation (PFYC 3) is considered to potentially contain significant paleontological resources. For an in-depth description of the geology and paleontology of the Galice Formation, refer to Section 3.2.9 of the original technical report (PaleoServices, 2020). The expanded records searches covering Segments 11A and 14A did not identify any recorded fossil localities within a one-mile radius of these segments. A brief analysis of each new alternative segment is provided below.

- **Alternative Segment Arcata:** This segment is entirely underlain by Holocene-age surficial deposits, which are assigned a low potential (PFYC 2). Therefore, potential impacts to

paleontological resources are not anticipated for construction-related earthwork located along this segment. The original route this area (portion of Segment 01) is also underlain by Holocene-age surficial deposits.

- **Alternative Segment 11A:** The majority of this segment (approximately 9.5 linear miles out of a total of approximately 10.3 linear miles) is underlain by the Galice Formation, which is assigned a moderate potential (PFYC 3). Therefore, potential impacts to paleontological resources are anticipated for construction-related earthwork located along this segment. By comparison, approximately 8.8 linear miles along Segment 11 and 3.1 linear miles along Segment 12 in the original route are underlain by paleontologically sensitive strata of the Galice Formation.
- **Alternative Segment 14A:** This segment is primarily underlain by rocks of the Rattlesnake Creek terrane and Hayfork terrane and landslide deposits, which are assigned a low potential (PFYC 2), and igneous and meta-igneous rocks, which are assigned a very low potential (PFYC 1). The Galice Formation, which is assigned a moderate potential (PFYC 3), is exposed only near the junction of Segment 13 and Alternative Segment 14A, totaling approximately 560 linear feet (or 0.1 linear miles) along this segment. Therefore, potential impacts to paleontological resources are anticipated only for construction-related earthwork located at the far northwestern end of Alternative Segment 14A. Potential impacts to paleontological resources are not anticipated along the remainder of Alternative Segment 14A. By comparison, approximately 4.7 linear miles along Segment 14 in the original route are underlain by paleontologically sensitive strata of the Galice Formation.

In summary, construction-related earthwork along Alternative Segment 11A and the northwestern end of Alternative Segment 14A will likely disturb a geologic unit assigned a PFYC ranking of 3, as outlined above and in Table 1 (also see Appendix), and thus may negatively impact paleontological resources. A preliminary analysis of the proposed construction methods is provided below.

As currently understood, approximately 90% of the buried optic cable and conduit will be installed using the **horizontal directional drilling (HDD) method**. This hydraulic drilling method typically produces spoils of pulverized sedimentary rock in a slurry of lubricant and water, and thus destroys most, if not all, macrofossil remains that may have been present. In addition, the precise stratigraphic context of any encountered fossils (including microfossils) is impossible to document with this construction method, eliminating their research value. The drilling is, therefore not recommended for paleontological monitoring. However, excavation of the sending and receiving bore pits (measuring 10 feet by 10 feet, excavated to a maximum depth of 4.5 feet) at either end of HDD segments can be successfully monitored for paleontological resources.

In areas where HDD methods cannot be used, **plowing or trenching construction methods** are proposed. The plowing method uses a 2- to 3-inch wide stationary or vibrating blade to cut a narrow slit for the installation of conduit to a desired depth, resulting in disturbance measuring 4 to 6 inches wide. Backfill of the slit occurs as the plow machine passes, eliminating the ability to view any of the minimal spoils expected to be produced by this method. The trenching method uses trenching machines, excavators, backhoes, or rock saws to excavate an open trench measuring approximately 6 feet wide. Spoils are placed alongside the trench before being used as backfill, and can result in the successful

discovery and recovery of paleontological resources. Therefore, trenching construction methods can be successfully monitored for paleontological resources, while plowing construction methods cannot.

Barrel/access vaults will be placed approximately every 2,500 feet along the alignment, and will measure 4 feet by 4 feet, excavated to a depth of 4 feet. Excavation of access vaults is typically accomplished using excavators or backhoes, which produce spoils consisting of large blocks of rock or sedimentary matrix that can contain relatively intact fossil remains. Excavation of access vaults can, therefore, be successfully monitored for paleontological resources.

The **placement of fiber optic cable** is achieved by pulling or "blowing"/"jetting" the cable through the conduit between adjacent vault locations. This work does not require any additional excavations, as it utilizes the existing vaults and installed conduit.

Bridge attachments may be necessary where the alignment crosses waterways. Conduit would either be attached to the existing bridge or the fiber optic cable would be installed in existing conduit already attached to the bridge, where available. The only anticipated earthwork related to bridge attachments would occur at either end of the bridge crossing, where excavations measuring 3 feet wide by 10 feet long would be required to bring buried conduit above ground to attach to the bridge. Where bridge attachment is not possible, HDD methods would be used to install conduit under the waterway. Both the excavation of pits for bridge crossings and HDD sending and receiving bore pits can be successfully monitored for paleontological resources. In contrast, the actual bridge attachment work does not require earthwork and the HDD drilling cannot be successfully monitored.

Construction operations, including the use of laydown/staging areas, placement of subsurface warning tape with the buried conduit, and installation of fiber optic cable marker posts, are not anticipated to require significant excavations into previously undisturbed strata. The proposed laydown/staging areas are located along existing roads in previously disturbed areas, and further grading is not anticipated prior to their use. Placement of subsurface warning tape and marker posts is anticipated to occur within strata that were disturbed during installation of the buried cable and conduit, and therefore will not result in additional impacts to paleontological resources.

Operations and maintenance activities associated with the installed fiber optic network are generally not anticipated to require ground disturbance (i.e., use of existing access roads, and access to buried fiber optic cable via existing barrel vaults). Some minor earthwork may be associated with erosion control repairs that result from storm damage or landslides, but this work is anticipated to be superficial and unlikely to impact previous undisturbed strata.

As construction details are made available (e.g., locations of access vaults, segments of buried conduit to be installed by the trenching method, HDD sending and receiving bore pits, and bridge crossings), the included GIS database may be used to determine whether impacts to paleontological resources are likely to occur at a given location.

Table 1. Summary of geologic units underlying the new alternative segments, listed in approximate stratigraphic order from youngest to oldest.

Geologic Unit	Age	PFYC	PFYC Justification	Alternative Segment
surficial deposits, undivided	Holocene	PFYC 2: Low	Younger than 10,000 years	Arcata, 11A, 14A
landslide deposits	Quaternary	PFYC 2: Low	Diagenetic alteration	14A
Galice Formation	late Jurassic	PFYC 3: Moderate	Significant fossils widely scattered	11A, 14A
Rattlesnake Creek terrane	Permian-Jurassic	PFYC 2: Low	Diagenetic alteration	14A
Hayfork terrane	Permian-Triassic	PFYC 2: Low	Diagenetic alteration	14A
Eastern Hayfork subterrane	Permian-Triassic	PFYC 2: Low	Diagenetic alteration	14A
igneous rocks, undivided	various	PFYC 1: Very Low	Igneous rock	14A
Meta-igneous rocks, undivided	various	PFYC 1: Very Low	Metamorphic rock	14A

Recommendations for New Alternative Segments

Two of the new alternative segments would likely reduce impacts to paleontological resources if chosen to replace those portions of the original proposed route. A total of approximately 9.5 linear miles of Segment 11A is underlain by paleontologically sensitive strata, compared to a total of approximately 11.9 linear miles of Segments 11 and 12. Similarly, only 560 linear feet (or 0.1 linear miles) of Segment 14A is underlain by paleontologically sensitive strata, compared to a total of approximately 4.7 linear miles of Segment 14. Segments 15, 15A, and 16, which Segment 14A would also replace, are not underlain by paleontologically sensitive strata. Use of the new alternative Segment 11A and Segment 14A routes is, therefore, preferred from the standpoint of reducing potential construction-related impacts to paleontological resources. The alternative segment in Arcata is not anticipated to increase or reduce impacts to paleontologically sensitive strata when compared to the original proposed route (a portion of Segment 01).

For the new alternative segments, paleontological monitoring is recommended for excavations that will be located in areas underlain by paleontologically sensitive geologic units (i.e., the Galice Formation; see Appendix A) and that will involve earthwork that can be feasibly mitigated (e.g., trenching for underground fiber optic line, excavation of barrel/access vaults, excavation of HDD sending and receiving bore pits, and excavation of pits for bridge crossings).

The following mitigation measures are recommended to reduce potential construction-related impacts to paleontological resources to less than significant levels, and are formulated in accordance with industry standards (e.g., BLM, 2016; Murphey et al., 2019; SVP, 2010).

1. Prior to the start of construction, qualified Project Paleontologist should be retained to prepare and implement a paleontological monitoring plan (PMP) for the Proposed Action. The PMP should include (at a minimum) the following standard elements: description of the earthwork (e.g., specific areas, depths of excavation, and/or project components, to the degree that this information is available) to be monitored for paleontological resources (based on the mapping included in the PFYC GIS database); methods of paleontological monitoring; procedures for fossil discoveries and determining the significance of a discovery; field and laboratory methods for fossil collection, preparation, and curation; progress and final reporting requirements; and a curatorial agreement with a regional repository to receive any recovered fossil remains.
    - The Project Paleontologist should have a graduate degree in paleontology, paleobiology, or geobiology, and proven experience in supervising paleontological assessment and paleontological mitigation programs. The Project Paleontologist should also have all necessary agency permits as required by the BLM, NPS, USBR, USFS, and California DPR.
    - The repository should be a recognized paleontological specimen repository (e.g., an AAM-accredited museum or university) with a permanent curator, and be capable of storing fossils in a facility with adequate security against theft, loss, damage, fire, pests, and adverse climate conditions.
2. A paleontological monitor, under the supervision of the Project Paleontologist, should be on-site to inspect all relevant earthwork into previously undisturbed deposits of the Galice Formation located along Alternative Segments 11A and 14A. The monitor should take appropriate field notes and photographs to collect and document stratigraphic and paleontological data.
3. If fossils are discovered, they should be salvaged by the paleontological monitor and/or the Project Paleontologist. In most cases this fossil salvage can be completed in a short period of time (e.g., minutes to hours).
4. In the event that fossils are discovered during a period when a paleontological monitor is not on site (an inadvertent discovery), earthwork within the vicinity of the discovery site should temporarily halt and the Project Paleontologist contacted to evaluate the significance of the discovery. If the inadvertent discovery is determined to be significant, the fossils should be recovered, as per mitigation measure 3.
5. Fossil remains collected during monitoring and salvage should be cleaned, repaired, sorted, identified, and cataloged as part of the mitigation program. Fossil preparation may also include screen washing for microvertebrate fossils or other laboratory analyses, if applicable. Fossil preparation and curation activities may be conducted at the laboratory of the contracted Project Paleontologist (if so equipped), at an appropriate outside agency, and/or at the designated fossil repository, and should follow the standards of the designated repository.
6. Prepared fossils, along with copies of all pertinent field notes, photos, and maps, should be housed in the designated repository. Curation of the fossils should be accompanied by financial support for initial specimen storage (e.g., purchase of storage cabinets).

7. A final summary report should be completed that outlines the results of the mitigation program. This report will include discussions of the methods used, stratigraphic section(s) exposed, fossils collected, and significance of recovered fossils. This report should be submitted to the appropriate agencies, as well as to the designated repository (if fossils are recovered).

If you have any questions concerning these findings, please feel free to contact me at (619) 255-0264 or kmccomas@sdnhm.org.

Sincerely,

Katie M. McComas, M.S.
Paleontological Report Writer & GIS Specialist
San Diego Natural History Museum

Thomas A. Deméré, Ph.D.
Principal Paleontologist
San Diego Natural History Museum

Enc: Figure 1 – Overview map
Appendix A – PFYC map of new alternative segments for the Proposed Action

References

Bureau of Land Management (BLM). 2007. Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands. Instruction Memorandum No. 2008-009, released October 15, 2007.

Bureau of Land Management (BLM). 2016. Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands. Instruction Memorandum No. 2016-124, released July 20, 2016.

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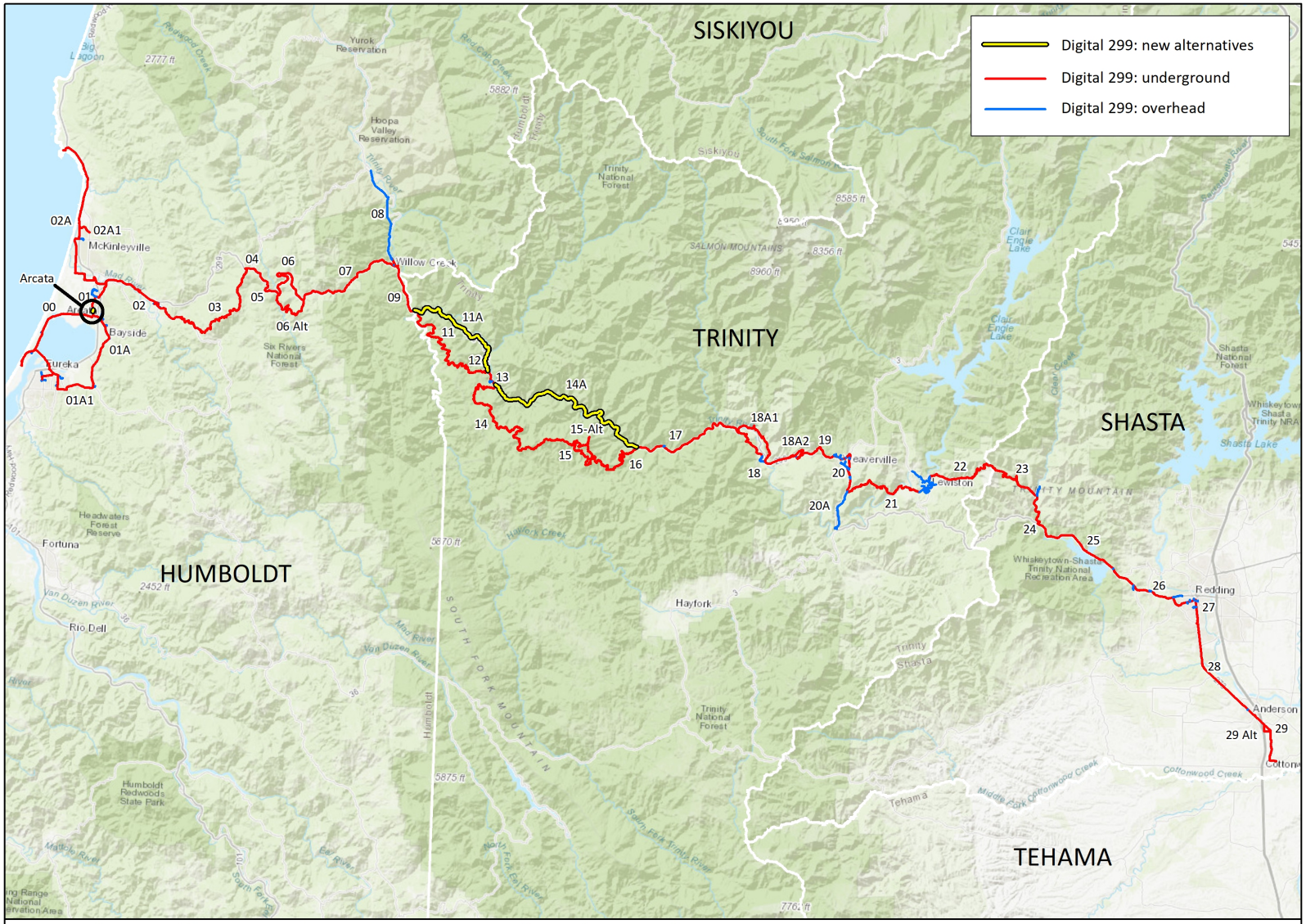
SISKIYOU
TRINITY
SHASTA
HUMBOLDT
TEHAMA
Digital 299: new alternatives
Digital 299: underground
Digital 299: overhead
02A
02A1
McKinleyville
Arcata
00
01
02
03
04
05
06
06 Alt
07
08
09
11A
11
12
13
14A
14
15-Alt
15
16
17
18A1
18A2
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20A
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23
24
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26
27
28
29
29 Alt
Bayside
01A
Eureka
01A1
Willow Creek
Weaverville
Lewiston
Redding
Anderson
Fortuna
Rio Dell
Hayfork
Yurok Reservation
Hoopa Valley Reservation
Six Rivers National Forest
Trinity National Forest
Shasta National Forest
Whiskeytown-Shasta-Trinity National Recreation Area
Whiskeytown Shasta Trinity NRA
Shasta Lake
Clair Engle Lake
Headwaters Forest Reserve
Humboldt Redwoods State Park
SALMON MOUNTAINS
SOUTH FORK MOUNTAIN
TRINITY MOUNTAIN
Sources: County boundaries, California Department of Forestry and Fire Protection, 2015; World Topographic Map, Esri et al., 2021
PaleoServices
FIGURE 1
Overview Map
Digital 299 Broadband - New Alternatives
Humboldt, Shasta, and Trinity counties, California
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scale in miles
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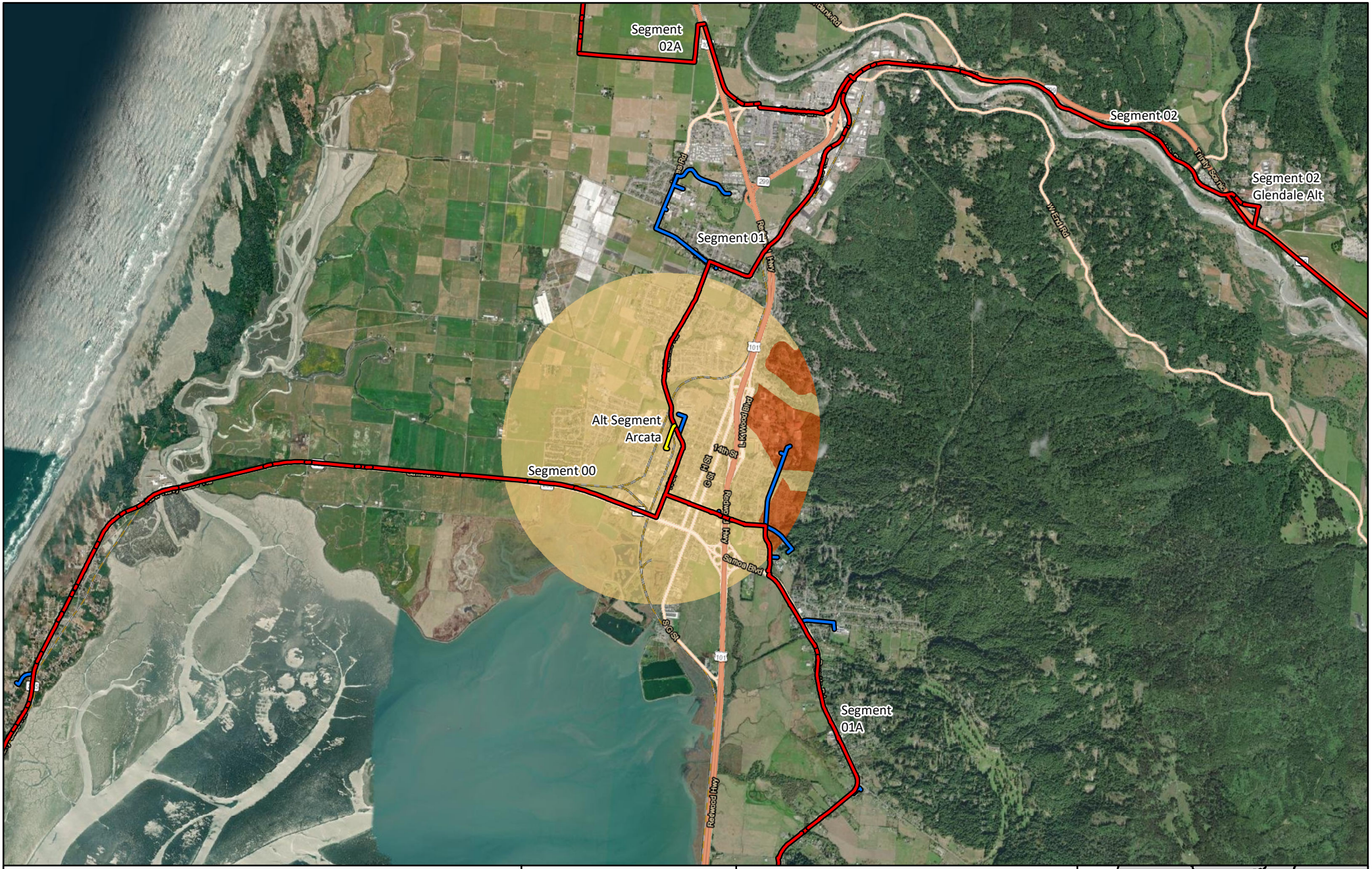
Appendix A

PFYC map of new alternative segments for the Proposed Action.



PFYC Ranking

- 4: High
- 3: Moderate
- 2: Low
- 1: Very low
- W: Water

Project Alignment

- D299 alignment, alternatives
- D299 alignment, underground
- D299 alignment, aerial

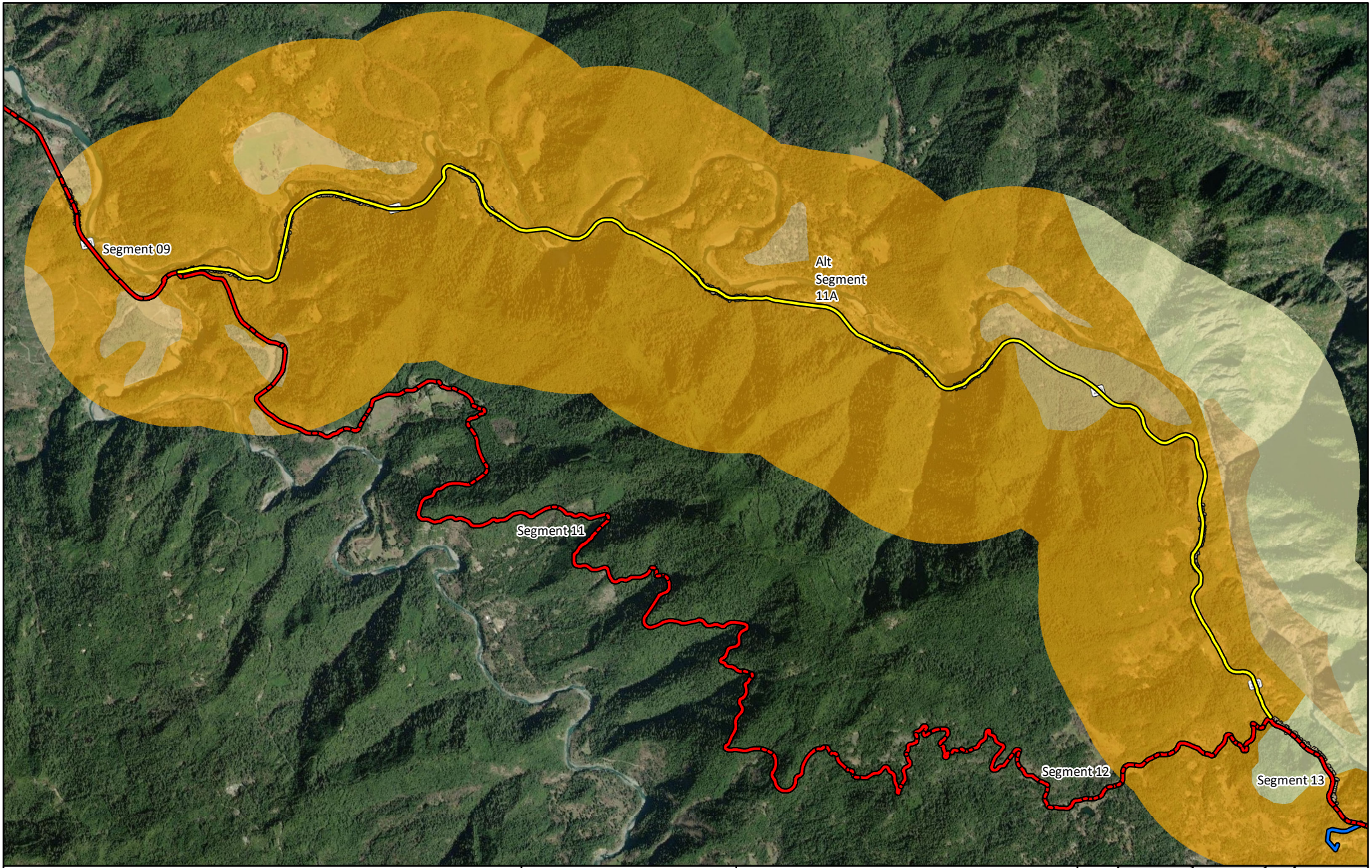
0 1

scale in miles

PALEOSERVICES
SAN DIEGO NATURAL HISTORY MUSEUM

Sources: Geology modified from Fraticelli et al., 2012, and McLaughlin et al., 2000;
World Transportation & World Imagery, Esri et al., 2021

Appendix: Paleontological Potential Map, Digital 299 Broadband Alternatives, Humboldt, Trinity, and Shasta Counties, California



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scale in miles

PaleoServices
San Diego Natural History Museum

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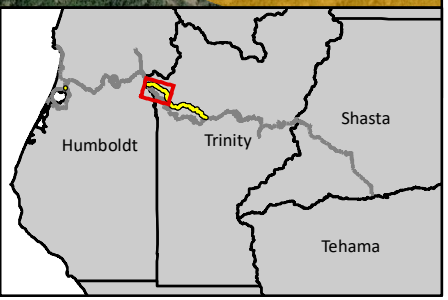

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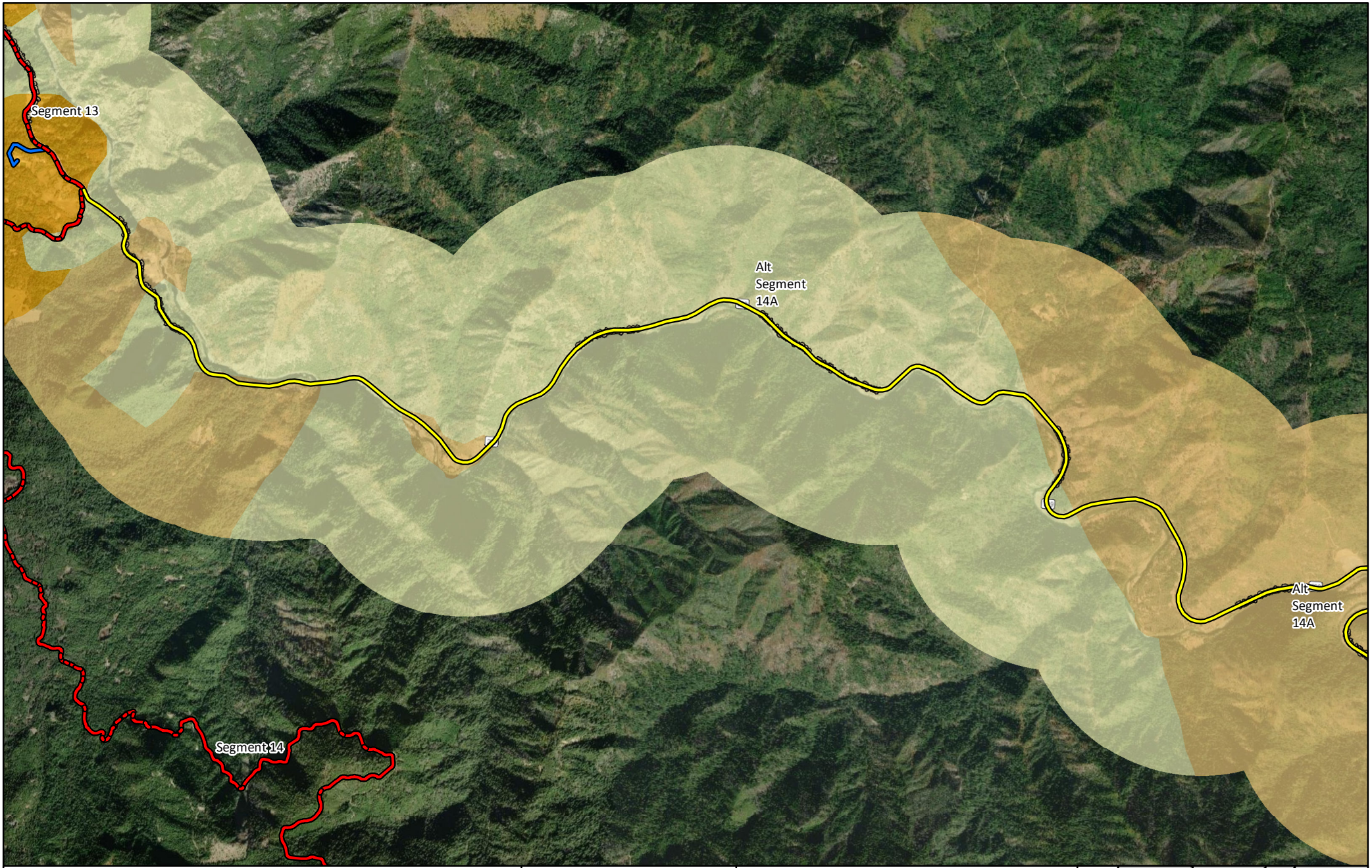

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scale in miles

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San Diego Natural History Museum

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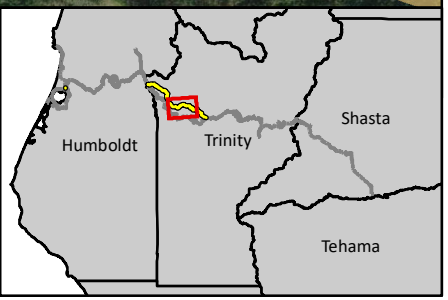

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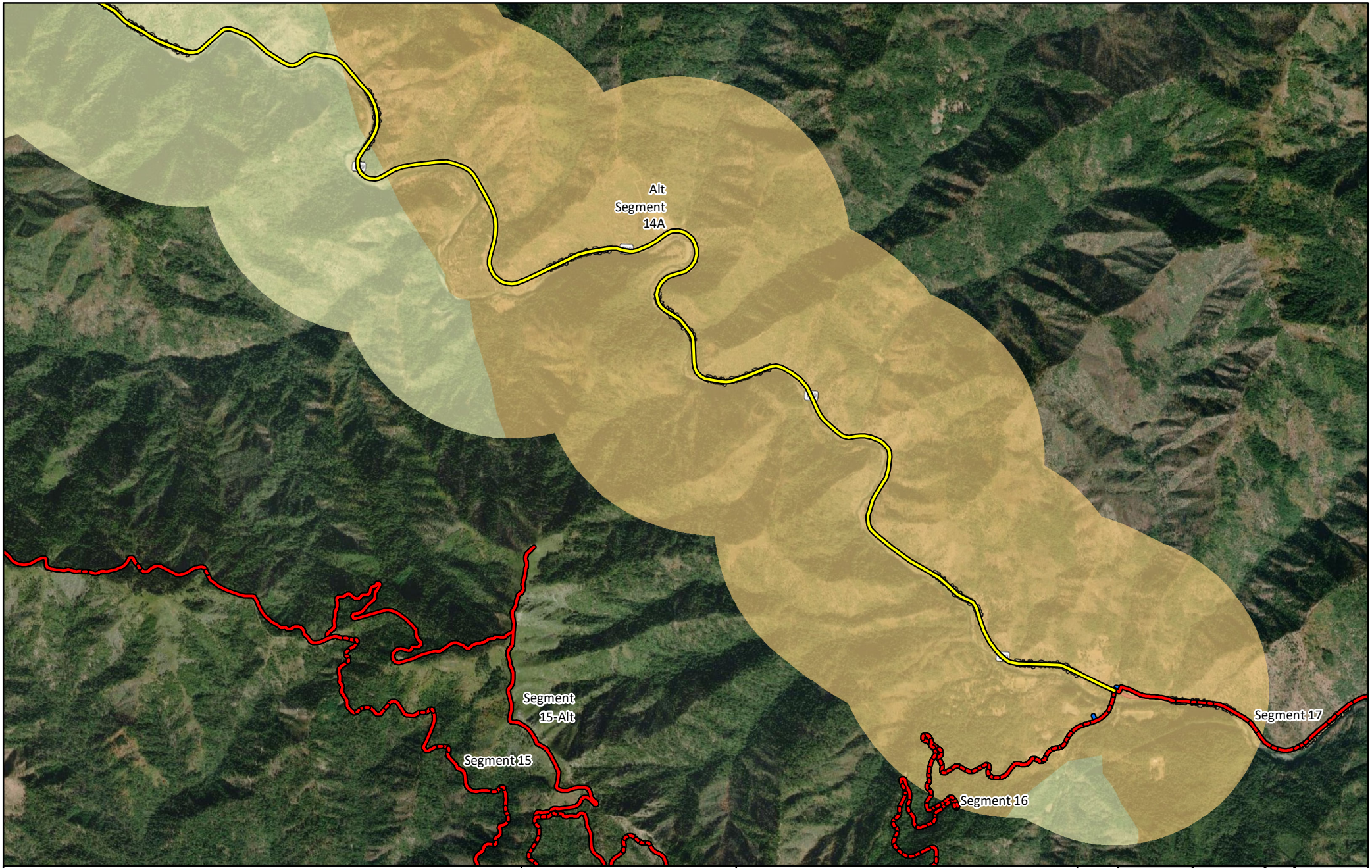

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scale in miles

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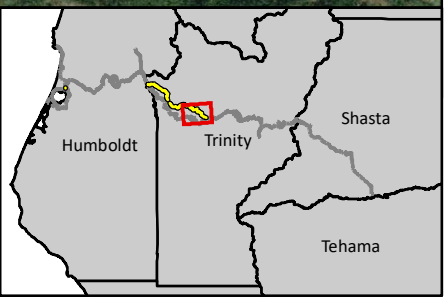

Appendix: Paleontological Potential Map, Digital 299 Broadband Alternatives, Humboldt, Trinity, and Shasta Counties, California