Posted: November 1, 2019

City of Trinidad

NOTICE AND CALL OF A MEETING OF THE

TRINIDAD PLANNING COMMISSION

The Trinidad Planning Commission will hold a specially scheduled meeting on
WEDNESDAY NOVEMBER 6TH, 2019, AT 5:00 P.M.
in Town Hall at 409 Trinity Street.

The following items will be discussed:

I. ROLL CALL

II. APPROVAL OF AGENDA

III. ITEMS FROM THE FLOOR

IV. AGENDA ITEMS

Discussion / Decision / Public Hearing / Action

1. General Plan Update: Discussion of (a) Landslide Hazard Assessment and Draft Edwards & Van Wycke Sea Level Rise and Landslide Risk Assessment & Management Plan (b) December 2012 draft Noise and Public Safety Element.

V. STAFF REPORT

VI. ADJOURNMENT

The meeting packets can be accessed at the following link:
http://trinidad.ca.gov/document-library/pc-meeting-packets-2019

PLEASE DO NOT REMOVE OR COVER UP

MEMORANDUM

TO: Trinidad Planning Commission

FROM: Trever Parker, City Planner

DATE: November 1, 2019

RE: General Plan Update Agenda Item - Hazards

One of the tasks under the City's current LCP update grant is to prepare a coastal hazards assessment and an Edwards Street hazards management plan. Because landslides are the primary hazards, that has been the focus of this task, along with considerations for future sea level rise (SLR). Therefore, a Coastal Landslides Hazard Assessment was prepared. That technical report addresses all the bluffs in the City and is included in the packet.

Based on that hazards assessment, staff have developed a draft risk assessment and hazards management plan focused on Edwards and Van Wycke, which is where the primary and most immediate hazards exist. As noted in that report, it is based on the Coastal Commission's SLR Policy Guidance for updating LCPs, so it follows the steps outlined therein. This is very much a draft document and I am seeking input from the Planning Commission and the public. So please come to the meeting with questions and suggestions for improvement. It is also being circulated through City staff. Normally, I would have done that first, but due to the grant timelines, there is not enough time. This document will be used to develop and refine applicable policies in the Public Safety Element and elsewhere in the General Plan/LCP.

Finally, I have included the Draft Noise and Public Safety Element on the agenda. If we get through the two reports, then we can start discussing that draft. It will also provide some perspective on the most current hazards policies that the City has developed.

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1062 G Street, Suite I, Arcata, CA 95521-5800

Reference: 018013A-001

October 18, 2019

Eli Naffah, City Manager
City of Trinidad
409 Trinity Street
P.O. Box 390
Trinidad, CA 95570

Subject: Coastal Landslide Hazard Evaluation, City of Trinidad, California

Eli Naffah:

This report presents the results of SHN's assessment of coastal landslide hazards within the City of Trinidad. This assessment is being provided to inform the city's development of a "Coastal Hazard Management Plan." The intent of this assessment is to characterize landslide hazards along Trinidad's coastline, to identify the exposure of city infrastructure and private properties to these hazards, and to identify alternative mitigation options. We understand that other geologic hazards that may affect the City of Trinidad (active faults, tsunami, sea level rise, and so on) are addressed elsewhere, and additional characterization is not required.

In conducting this assessment, we have completed a thorough compilation and review of published and unpublished geologic literature related to the City of Trinidad and the surrounding area, including focused geotechnical and groundwater investigation reports that provide valuable subsurface data. This work is an extension of SHN's assessment associated with recent landsliding along Edwards Avenue (which required relocation of the Trinidad Memorial Lighthouse), as we previously completed detailed investigation of slope processes and landslide hazards relative to this segment of coastal bluff.

Our assessment is based on existing data; our work scope does not include the collection of additional data.

Geologic Setting

Excellent descriptions of the geology of the Trinidad area have been prepared by geologists from Humboldt State University over many years (Aalto, 1977, 2009; Rust, 1982), and form the basis of this discussion. If additional detail regarding the geologic setting is desired, readers are directed to these definitive references.

Coastal landslide hazards in the Trinidad area are strongly linked to the geologic setting. Bedrock in the area is the Franciscan Complex of late Mesozoic age (~145-100 million years old). The Franciscan Complex is a byproduct of crustal subduction, and is composed of a highly sheared mixture of marine rocks and sediments that were deformed above an oceanic plate that was subducted beneath western North America (Aalto, 2009).

Specifically, the Franciscan Complex rocks in the Trinidad area are referred to as "mélange," a term that describes a chaotic mixture of rootless rock blocks within a matrix of sheared shale and/or serpentinite. Rock blocks, which are of diverse lithologies, may range in size from sand grains to blocks many miles across. Trinidad Head is one of many examples in Trinidad Bay of a large rock block within the Franciscan mélange.

The Franciscan basement rock is overlain in Trinidad, and throughout much of northern Humboldt County, by a series of Pleistocene age marine terraces and their associated "terrace deposits." The terraces form the relatively planar and uplifted surfaces between McKinleyville and Patricks Point. These terraces typically consist of an abrasion platform cut across bedrock, with an overlying veneer of terrace cover sediments consisting of near-shore marine deposits and terrestrial alluvial, colluvial, and eolian deposits. The elevation of the terraces reflects uplift due to regional crustal compression and deformation along a series of northwest-trending active thrust faults; therefore, the terraces increase in age with increasing elevation and distance from the modern coastline. The terrace surface in Trinidad dips gently toward the southwest.

Subsurface investigation at the crest of the coastal bluff along Edwards Street indicates terrace deposits on the order of 40 to 45 feet thick. These terrace sediments consist of fine to medium grained sand with scattered fine rounded gravels; these are interpreted as shallow marine (beach or nearshore) deposits. These materials are weakly cemented and are associated with relatively low dry strength.

Coastal bluffs along Trinidad State Beach and around Trinidad Bay, therefore, expose Franciscan mélange bedrock in the lower part of the slope, the planar erosion surface defining the base of the Pleistocene age marine terrace, as well as the veneer of sandy terrace sediments that form the uplifted coastal plain upon which the town is developed. As the terrace surface dips to the southwest, the coastal bluff along the west side of Trinidad is not as tall as the bluffs along the south side of town, where the bluff height increases steadily toward the east.

Landslide Processes

Because of its chaotic texture and random distribution of rock blocks, landsliding in the Franciscan mélange is highly dependent upon the materials exposed in a slope at a particular site. In general, areas where hard rock blocks are exposed along the coastline are associated with resistant headlands, while areas dominated by mélange matrix and devoid of rock blocks are subject to increasing rates of coastal retreat that results in the formation of coves and embayments.

Where hard rock is present in the Franciscan mélange, mass wasting rates tend to be extremely low, consisting of localized rock falls and debris slides. These tend to occur as rapid failures of loose, weathered rock during earthquakes, or during wet periods when sufficient vegetation develops in an unstable location on a bluff, resulting in a debris slide incorporating vegetation and a shallow veneer of weathered rock. Pampas grass, a common invasive weed along Trinidad area bluffs, is notorious for this condition, as it is shallow-rooted with a massive above-ground crown.

The mélange matrix, sheared mudstone referred to locally as "blue goo," possesses little to no shear strength when wet and is highly susceptible to earthflow type deformation. Active earthflows are common along the coastline; these are particularly evident along Scenic Drive south of Trinidad, where the road bed has been repeatedly deformed by ongoing earthflow movement. Earthflows are slow-moving slides that occur in cohesive materials; they tend to move episodically during periods of increased moisture.

Granular, semi-consolidated marine terrace sediments are subject to rotational type failures and debris slides where exposed in bluffs and along coastal drainages. These are episodic (rapid) failures that occur during earthquakes or during wet periods when the sediments become over-steepened in bluff exposures. Because the marine terrace sediments occur in the upper bluff throughout Trinidad, they tend to fail secondarily following a pulse of earthflow movement in the underlying mélange.

Coastal Bluffs and Landslides in the City of Trinidad

Coastal landslide hazards in Trinidad are associated with unstable coastal bluffs along the western and southern coastlines. Landslide processes along these bluffs are a function of the materials exposed in the bluff face (Franciscan hard rock, Franciscan mélange matrix, or marine terrace deposit), the height of the bluff, the extent of a stable beach that may front the bluff (or not), and the intensity to which the ocean may impact the toe of the bluff slope.

The variety of coastal conditions that may impact landslide processes in Trinidad are described in Aalto (1977), based on the distribution of earth materials along the Trinidad coastline. Franciscan mélange is exposed at the base of all bluffs in the area; therefore, the various scenarios related to bluff stability (or lack thereof) include coastal segments with large rock masses fronting the coast (lowest hazard for bluff landslides and retreat), segments with mélange matrix materials along a coast with a stable beach (moderate hazard), and segments where mélange materials occur along a coast with no beach (highest hazard).

Coastal Bluff Segments, City of Trinidad

For the purposes of this discussion, we subdivide the coastal bluff along the coastline within the City of Trinidad limits into discrete segments (Figure 1). The segments are defined based on the geologic setting, the resultant landslide processes, and the type and degree of the landslide hazard relative to city infrastructure and private property. A summary of the conditions of each bluff segment is presented in Table 1. The bluff segments include the following:

- West Bluff: Trinidad Head to Mill Creek
- South Bluff: Edwards Street segment (Galindo Street to Ocean Avenue)
- South Bluff: Wagner Street segment (Ocean Avenue to Parker Creek)
- South Bluff: Scenic Drive segment (Parker Creek to McConnahas Mill Creek)

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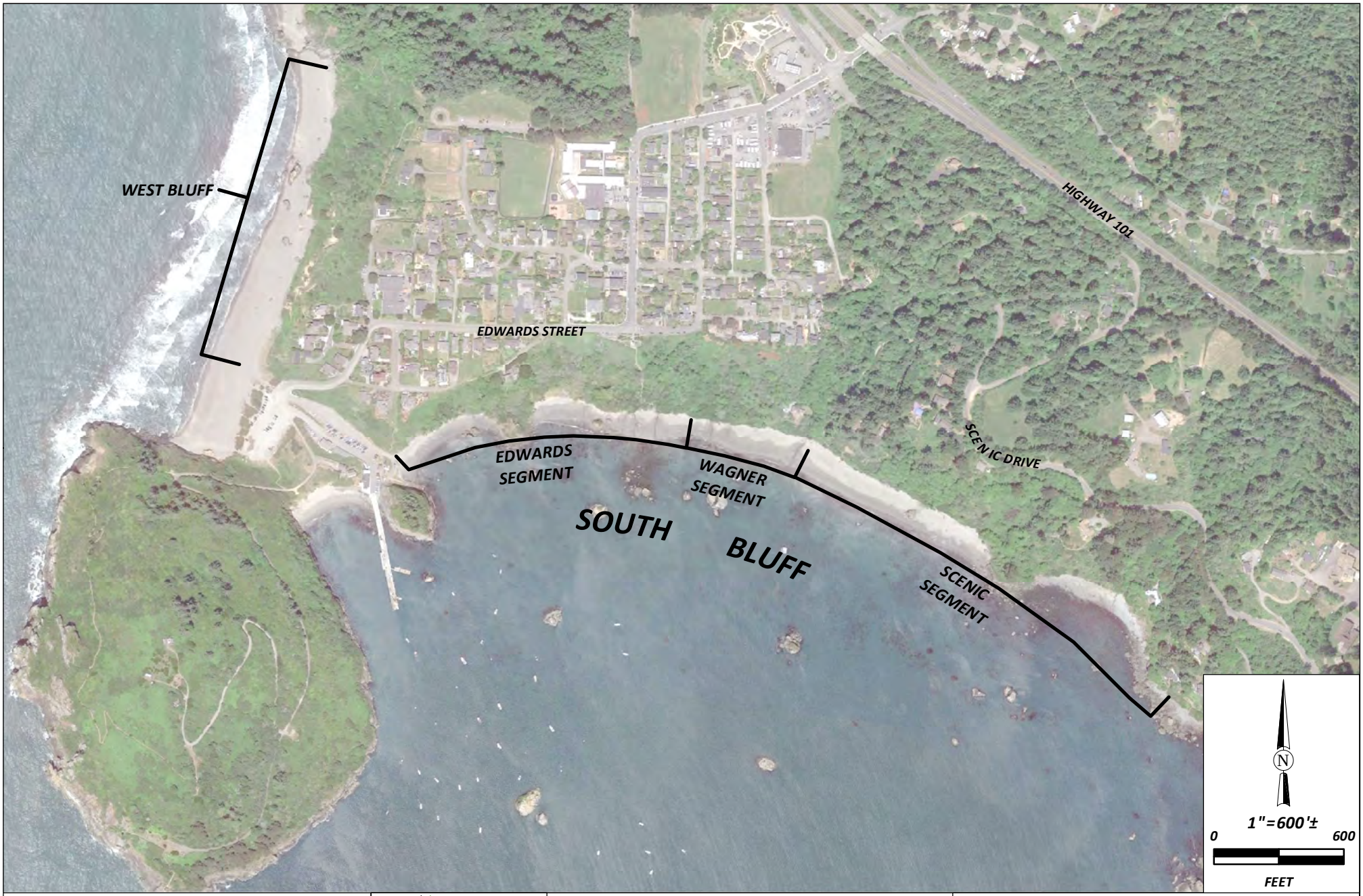

IMAGE SOURCE: GOOGLE EARTH, DATED 5/26/2016

City of Trinidad
Trinidad Coastal Geohazard Assessment
Trinidad, California

Coastal Hazard Segments

SHN 018013.001

October 2019 | Figure1_CoastalHazardSegments | Figure 1

Coastal Hazard Characterization, by Segment

West Bluff: Trinidad Head to Mill Creek

The west bluff extends north from Trinidad Head, along Trinidad State Beach, to the mouth of Mill Creek (Figure 1). The 80- to 100-foot-high bluff along this segment is low relative to bluffs along the southern side of Trinidad. Therefore, the lower part of the bluff face exposes a modest section of Franciscan bedrock, with the veneer of marine terrace sediments exposed across the upper bluff.

The bluff along Trinidad State Beach is fronted by a broad sandy beach that is generally stable, except under the most severe winter conditions. Sand accumulates along this coastal segment due to the backstop effect of Trinidad Head, which impedes sand flow to the south.

Landsliding along the west bluff is most apparent in the marine terrace sediments occupying the upper part of the slope. Arcuate rotational slide scars are present along much of this bluff segment, exposing the yellow-brown terrace sediments. These rotational failures presumably respond to slow changes in the underlying mélange materials that form the lower part of the slope. A single earthflow is present at the northern end of Trinidad State Beach, near the mouth of Mill Creek. Because of the protection from ocean waves afforded by the broad beach fronting this bluff, the rate of geomorphic change along the lower bluff is substantially moderated.

Hazards to Coastal Properties and Infrastructure. Observed rates of mass wasting and bluff retreat in this part of Trinidad are relatively low. Setbacks from the bluff crest to existing city infrastructure (Pacific Court, Ewing Street) are on the order of 140 to 150 feet. These setbacks should provide an adequate buffer such that under current conditions, active landsliding is unlikely to threaten city infrastructure along the west bluff for many decades.

There are four private residential structures west of Pacific Court, with setbacks from the bluff crest ranging from about 50 to 70 feet. These structures are associated with an increased exposure to coastal hazards relative to the nearby city infrastructure due to their proximity to the bluff. Due to the slow retreat rates along this segment of the coastline, however, these structures are associated with a modest exposure to bluff retreat in the near term.

South Bluff: Edwards Street segment (Galindo Street to Ocean Avenue)

The bluff segment along the southern side of Trinidad, extending east from the foot of Galindo Street to the foot of Ocean Avenue (Figure 1), defines the most unstable section of bluff and, therefore, the most problematic, coastal segment relative to potential impacts to coastal properties and infrastructure.

The Edwards Street segment bluff increases in height from about 60 feet at the west end to as much as 150 feet at the foot of Ocean Avenue. While there is a single exposed rock block below Van Wycke Street, much of this bluff segment is devoid of significant rock masses; slope processes are, therefore, a function of the abundance of soft, low strength mélange soils. There is a narrow beach along this segment, as southward sand flow in the littoral zone is blocked by Trinidad Head.

Despite the relatively sheltered conditions in Trinidad Bay, and in the wave shadow provided by Trinidad Head, the ocean is known to encroach on the bluff toe during periods of high winter surf (increasing exposure occurs to the east along Old Home Beach).

Under these conditions, this bluff segment is subject to several large earthflows; at least four areas of distinct earthflow deformation can be identified along this segment (see Figure 2). These unstable areas appear to extend from the slope toe at the back edge of the narrow beach, all the way to the bluff crest; that is, they extend across the entire bluff face. They appear to be deep-seated features, with slide planes many tens of feet deep. These earthflows are active, and most have experienced significant movement over the past several winters (which have been associated with above average rainfall). Recent movement is apparent at the toe of the slope, where the slide masses are encroaching onto the beach, and at the heads of the slides, where steep slopes and recent deformation (differential ground movement, open fissures, for example) is apparent.

The earthflow directly southwest of the foot of Trinity Street and west of the Axel Lindgren Memorial Trail (Figure 2) has experienced significant movement over the past several years. Evidence of renewed slide activity at the head of this slide became apparent as early as 2015, but movement accelerated substantially during the winter of 2017. At that time, nested scarps formed and fissures opened along the head of the broad earthflow, displacing concrete walkways adjacent to the Memorial Lighthouse (which was present at the site until December 2017) and extending into the parking area along the southern edge of Edwards Street. The extent of activity (mapped scarps and fissures) at the head of this slide in early 2017 is shown in Figure 3. A photograph of the lighthouse and adjacent hardscape displaced during the winter of 2017 is included as Figure 4; the extent of encroachment into the parking area along the southern edge of Edwards Street during the winter of 2017 is shown in Figure 5.

In order to evaluate the rate and extent of landsliding along Edwards Street, and to characterize the threat to the lighthouse, a geologic investigation was conducted, including subsurface investigation and placement of slope inclinometers to measure the rate and depth of slide movement (SHN, 2017). That study indicated that movement at the toe of the subject earthflow became apparent as an outwardly convex bulge as early as 1965, indicating a multi-decadal process of progressive movement initiating at the slope toe and slowly migrating up to the head of the slide. Based on the results of that investigation, it was recommended that the lighthouse be relocated away from the active head scarp defining the upper limits of the subject landslide. The lighthouse was ultimately removed from the site, and relocated to the harbor, due to cultural reasons. Slope inclinometers remain in place in this area, and can be accessed for additional slope monitoring in the future. Scarps and fissures along the head of this slide have continued to develop over the past several winters, indicating that deep-seated landsliding remains active and is expected to continue into the foreseeable future.

Recent movement of the earthflow directly southeast of the foot of Trinity Street, directly east of the former lighthouse setting, has also occurred. Geomorphic evidence of recent movement at the steep head of the slide is apparent, and several displaced survey monuments were documented during the investigations related to the landslide hazard at the former lighthouse location. It appears the Axel Lindgren Memorial Trail follows a narrow resistant ridge over a buried rock block that occurs between these two active slides (see Figure 2).

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IMAGE SOURCE: GOOGLE EARTH, DATED 5/26/2016	SHN	City of Trinidad Trinidad Coastal Geohazard Assessment Trinidad, California	Principal Landslides South Bluff SHN 018013.001
		October 2019 / Figure2_PrincipaLandslides	Figure 2

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IMAGE SOURCE: GOOGLE EARTH, DATED 5/26/2016

City of Trinidad
Trinidad Coastal Geohazard Assessment
Trinidad, California

Site Map Showing Landslide Scarps
Edwards Street Slide, Winter 2017
SHN 018013.001

October 2019 | Figure3_SiteMap | Figure 3

PHOTO LOCATION SHOWN ON FIGURE 3

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SHN	City of Trinidad Trinidad Coastal Geohazard Assessment Trinidad, California	Landslide Deformation Former TML Location, March 2017 SHN 018013.001
	October 2019	Figure4_LandslideDeformation	Figure 4

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PHOTO LOCATION SHOWN ON FIGURE 3

City of Trinidad Trinidad Coastal Geohazard Assessment Trinidad, California		Head of Edwards Street Slide Winter 2017 SHN 018013.001
October 2019	FIgure5_EdwardsStreetSlide	Figure 5

Hazards to Coastal Properties and Infrastructure. Edwards Street, from the foot of Galindo Street east to the foot of Ocean Avenue, follows the crest of the coastal bluff. Therefore, the southern shoulder of Edwards Street traverses the heads of at least three large active earthflows. A fourth area of sliding at the western end of this segment is encroaching on Van Wycke Street, the Van Wycke trail, and residences south of Van Wycke Street.

As described above, recent earthflow deformation just southwest of the foot of Trinity Street encroached into the shoulder along the southern edge of Edwards Street during the winter of 2017. This appears to be the area most likely to experience impacts related to coastal bluff failure and retreat. The deformation at this site is ongoing, as the scarps and fissures defining the head of the slide continue to re-appear (despite being covered during grading at the site). The earthflow movement here appears to be the culmination of an episode of bluff reconfiguration that began in the early 1960s (it is first apparent in a 1965 aerial photograph). The concern at this site is that the previous movement in the underlying Franciscan mélange has developed to the extent that the movement is now translating upward into the veneer of terrace sediments, where rotational type failures are occurring.

There is a high likelihood that in the future, the head of this landslide will encroach into the south (eastbound) lane of Edwards Street. As is typical in these earth materials, and as has been observed at the site, the slope processes that will impact city infrastructure are likely to develop slowly, over a period of several years. Rapid changes are uncommon in this geologic environment (except during large magnitude earthquakes), so the likelihood of catastrophic, rapid slope movement at this location is low. We would expect the southern (eastbound) traffic lane to be impacted first, and this may occur in the relatively near future. We would expect further expansion of the earthflows, such that they will encroach into the north side of Edwards Street (eastbound lane) to be a longer-term scenario unlikely to occur within the next few decades.

Earthflow deformation at the western end of the segment, along Van Wycke Street, has already encroached into the alignment of the Van Wycke trail. Continued movement in this area is inevitable, which will continue to impact this alignment. A plan to stabilize this area to allow re-construction of the Van Wycke trail is discussed below.

There are two private residences along Van Wycke Street that are in close proximity to the coastal bluff at the western end of this coastal segment. The residence just east of the foot of Galindo Street is located within a few feet of the head of an active earthflow. To our knowledge, this condition has persisted with minimal change for several decades. The residence further east, at the eastern end of the Van Wycke trail, is located on a narrow strip of land above a rock block that is present at beach level. Although afforded some protection from the rock block on the beach, earthflows on either side of the residence are progressively encroaching toward the structure. Both of these residences are subject to potential short-term landslide hazards.

South Bluff: Wagner Street segment (Ocean Avenue to Parker Creek)

This bluff segment is associated with similar geologic and topographic conditions as the Edwards Street segment to the west, with the exception of the presence of a low terrace that occurs just above Old Home Beach. This terrace is mapped by Rust (1982) as a "stream terrace" due to its proximity to the mouth of Parker Creek. It was the location of the Tsurai ancestral village, and is currently occupied by a single residence near the mouth of Parker Creek.

The geomorphic impact of the low terrace is to buffer the toe of the earthflow-prone portion of the slope, thus reducing the effects of erosion associated with large ocean waves. Although older, dormant earthflows appear to occur on the slope below Wagner Street, they do not appear recently active, and they do not appear to pose a risk of impacting city infrastructure. From a hazard standpoint, the bluff crest in the area adjacent to Wagner Street does not appear to have been impacted by recent or historic slope movement.

Hazards to Coastal Properties and Infrastructure. Due to the low rate of landsliding along this bluff segment, there is a low potential for city infrastructure to be adversely impacted in the near term. Significant geomorphic change would need to occur before earthflows on this bluff segment encroach substantially toward Wagner Street.

Private residences along the south side of Wagner Street are located near the bluff crest and are within an area that may be subject to short-term landslide hazards. However, because the head of the earthflow below these homes occurs downslope of the Wagner Street trail, and there is a broad, rounded slope crest that affords additional setback from the earthflow, the short-term hazard is relatively low.

There is also a residence near the mouth of Parker Creek, which occurs on the low terrace described above. The base of the slope below this residence has been protected by a series of gabions along the back edge of Old Home Beach. These gabions have apparently been in place for several decades and have successfully impeded significant bluff retreat. The gabions are deteriorating, however, which may increase the rate of bluff retreat in the future.

South Bluff: Scenic Drive segment (Parker Creek to McConnahas Mill Creek)

Southeast of Parker Creek, the coastline is marked by several prominent rock blocks with patches of intervening low-strength mélange matrix. Isolated marine terrace remnants are present uphill of Scenic Drive, but the area is not associated with a continuous, well-defined bluff edge. The variable nature of the substrate along this segment is reflected in the complex coastline, with rocky areas forming headlands and intervening coves occurring where low strength mélange is present. Therefore, the area is subject to highly localized mass wasting conditions, depending on the nature of the subgrade at a particular site. Several residences along this segment occupy the crowns of exposed rock blocks, where the rate of coastal retreat is negligible; these areas may be subject to localized rockfall hazard. Intervening pockets of soft ground, however, are associated with active earthflows that may experience periods of accelerated movement.

Hazards to Coastal Properties and Infrastructure. Roads or water lines crossing active earthflows are subject to deformation; several segments of Scenic Drive within the city limits have been subject to impacts related to the heads of active earthflows. These areas have been repaired with substantial retaining walls. To our knowledge, city infrastructure is limited to a water line beneath Scenic Drive. Therefore, exposure to landslide impacts will be dependent upon the longevity of existing stabilization structures along Scenic Drive.

Roads accessing residences seaward of Scenic Drive appear to be privately owned, and the city is not responsible for maintenance of these areas. There are several residences seaward of Scenic Drive in this area that are built on mélange substrate; several of which are in close proximity to the shoreline. We are aware of landslide-related issues related to earthflow deformation at several of these properties.

Table 1. Summary of Bluff Segment Conditions
City of Trinidad, California

Bluff Segment	Geologic Condition	Landslide Processes	Landslide Hazard Level
West Bluff	• Relatively low bluff • Mélange at base of slope, marine terrace (Qmt) exposed in most of bluff, above mélange • Broad, stable beach	• Primarily rotational slumps in Qmt in upper bluff face, in response to slow changes in lower bluff • Relatively low rates of mass wasting	• Low • 50+ feet to residences, 140+ feet to Pacific Court
South Bluff: Edwards Street segment	• Increasing bluff height to east; therefore, increased exposure of mélange materials beneath Qmt • Few rock blocks; most of slope is low strength mélange matrix • Narrow beach subject to inundation by winter storm waves	• Large, active earthflows consuming most of bluff face; at least four large earthflow complexes are apparent • Slow, multi-decadal process, initiated by undercutting at bluff toe, gradual migration toward head	• High • Recent landsliding has reached the southern edge of Edwards Street. This is expected to continue, and potentially expand into the westbound lane of Edwards Street.

Table 1. Summary of Bluff Segment Conditions City of Trinidad, California

Bluff Segment	Geologic Condition	Landslide Processes	Landslide Hazard Level
South Bluff: Wagner Street segment	• Similar geologic conditions to Edwards Street segment, with exception of low elevation stream terrace south of Parker Creek, just above Old Home Beach • Narrow beach subject to inundation by winter storm waves • Terrace buffers bluff toe from wave erosion, resulting in reduced activity of earthflows on the bluff face (that is, a slower rate of geomorphic change)	• Large, dormant earthflows with reduced rates of mass wasting because of isolation from ocean waves • Seaward edge of low terrace south of Parker Creek, currently protected by degrading gabion baskets, would be subject to wave impacts and localized erosion should the gabions fail or are removed	• Moderate • Wagner Street, and homes on the seaward side of Wagner Street, are located above a broad, rounded bluff crest that suggests significant geomorphic change would need to occur on the adjacent bluff slope before significant retreat occurred • The home on the low terrace above Old Home Beach appears adequately setback from the seaward edge of the terrace, and from descending slopes on the landward side. Continued protection along the seaward edge here is dependent on the continued function of the existing gabions along the back edge of the beach.

Table 1. Summary of Bluff Segment Conditions
City of Trinidad, California

Bluff Segment	Geologic Condition	Landslide Processes	Landslide Hazard Level
South Bluff: Scenic Drive segment	• Mélange exposed along entire coastline below Scenic Drive • Many rocky outcrops; therefore, low strength mélange matrix soils present locally between rocky areas • Narrow beach subject to inundation by winter storm waves	• Localized pockets of low strength mélange soils result in localized, modest scale earthflows. Several larger earthflows adjacent to Scenic Drive have been mitigated with soldier pile retaining walls.	• Moderate to High, depending on site-specific conditions, proximity to rock blocks. Hazard generally elevated for residences on mélange matrix in close proximity to the shoreline.

Mitigation Options

Mitigation of coastal landslides is a challenging endeavor, complicated by the dynamic environment and the strict regulatory setting. In general, the California Coastal Commission discourages slope repairs in coastal settings, including the construction of seawalls, revetments, or retaining structures. As such, the following discussion is tempered by the understanding that the ability to develop many mitigation options may be restricted by the California Coastal Commission.

Mitigation of Large-scale Slides

Based on the geologic conditions and distribution of unstable areas, the primary area subject to possible short-term, large-scale landsliding is along Edwards Street. Here, large earthflows are currently encroaching on the southern shoulder of the roadway, such that additional growth of these slides will begin to impact the traffic lanes.

Headward migration of these slides will be a slow, gradual process that will likely evolve over a several year period. As discussed above, the sliding adjacent to the former lighthouse site at the foot of Edwards Street has developed over several decades; recent activity at the head of the slide has developed over a 4-year period and is ongoing. Therefore, the most likely scenario is slow migration of the head of one of the subject earthflow(s) into the southern (eastbound) travel lane. It appears unlikely the head of the slide would consume both lanes of Edwards Street in the short term.

The primary mitigation to coastal retreat is avoidance. Large coastal landslides are by nature dynamic geomorphic features that are difficult to stabilize; therefore, in almost all cases, it is preferable to just avoid unstable areas along the coastline. In this scenario, where Edwards Avenue may be impacted, it may be necessary to re-route traffic onto Parker Street and close Edwards Avenue between Hector Street and Trinity Street.

A more substantive, engineered approach to stabilizing the bluff crest would entail construction of a "soldier pile and tie-back retaining wall" along the outboard edge of Edwards Street. This type of retaining structure consists of deep soldier piles constructed of vertical steel elements and embedded in stable ground beneath the slide plane, in conjunction with a timber lagging wall, and one or more rows of tie-backs drilled into the hillside. The intent of this retaining wall directly above the subject landslide is to create a barrier to isolate Edwards Street from the slide. The wall would not stabilize the slide itself; we assume the landslide mass below the wall would continue to move and eventually would pull away from the downhill side of the wall. We understand this type of retaining structure (although smaller) is being considered to stabilize the Van Wycke trail corridor.

Construction of a soldier pile retaining wall at the site would be a considerable undertaking that would require the approval of numerous stakeholders. We note the cultural sensitivity along much of Edwards Street, which would complicate the development of a structure of this magnitude. Retaining walls of this type require specialized equipment that must be contracted from out of the area. Costs associated with this type of wall are generally high; cost estimates for the similar, but smaller, retaining wall along the Van Wycke trail may provide useful order of magnitude estimates for cost of the larger structure that would be required along Edwards Street.

Welded wire type retaining walls are another type of structure that may be effective at stabilizing the heads of modest-sized earthflows. This type of wall has been used along Scenic Drive. It consists of a series of inter-connected wire mats that are filled with aggregate. They may be strengthened with tie backs or soil nails.

Other options for mitigating large landslides such as those along Edwards Street are limited. In general, it is not feasible to stabilize such large earthflows. Creation of a buttress at the toe of a large earthflow would need to cover virtually the entire section of exposed mélange soils to be effective, which would require the buttress to extend well beyond the current beach (that is, it would extend into the ocean). We view this alternative as infeasible from a functional, economic, and environmental standpoint.

Other options for retaining and stabilizing soils are inadequate or infeasible for such large earthflows. Soil nails and other stabilization schemes may be effective in localized areas (that is, stabilizing a portion of a large earthflow), but not in large areas, as the subject slide planes may be tens of feet in the subsurface (too deep to effectively stabilize via soil nails).

Mitigation of Small Scale Slides

Smaller, localized failures may be stabilized with smaller soldier pile type walls, conventional retaining walls, mechanically stabilized earth walls, gabions, or other methods, depending on the site conditions. Where a landslide is associated with a shallow slide plane (less than about 10 feet deep) and modest areal extent, it may potentially be stabilized by buttressing at the slide toe (rock buttress, gabion, for example) or by mechanically stabilizing the slide mass (soil nails, for example), depending on a wide variety of site-specific variables. These types of repairs may be suitable for small-scale, residential-scale impacts, or minor disruptions to city infrastructure.

Limitations

This is a generalized assessment of coastal geologic hazards in the City of Trinidad provided for planning purposes. This assessment is based on existing, available data; collection of additional data is beyond the scope of our investigation. The conclusions developed herein are based on current conditions at the time of report preparation. It should be understood that the dynamic geologic conditions along the coast of Trinidad will continue to evolve, and that future planning decisions should be based on future assessment of current conditions.

We hope this assessment provides the information you need at this time. If additional information, or clarification of the information herein, is required, please call our office. We understand that the information in this report will be made available to the public, and we are available to discuss or explain any of the information in this report.

Please call me at (707) 441-8855 if you have any questions.

Sincerely,

SHN

REGISTERED GEOLOGIST
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CERTIFIED ENGINEERING GEOLOGIST
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GDS:ame

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Edwards & Van Wycke Sea Level Rise and Landslide Risk Assessment and Management Plan

The following discussion is based on the Coastal Commission's Sea Level Rise Policy Guidance (November 2018), Chapter 5 – Addressing Sea Level Rise in LCPs. It is also based on the Climate Change Vulnerability Report and Adaptation Response report prepared by GHD in April 2016 and the Coastal Landslide Hazard Evaluation, prepared by SHN in October 2019. This assessment is focused on the Edwards Segment described in SHN report and focused on sea level rise, bluff retreat, and landslide hazards.

Determine range of sea level rise projections relevant to LCP planning area / segment

The Coastal Commission's Sea Level Rise Policy Guidance suggests using the Ocean Protection Council's (OPC) Sea-Level Rise Guidance (2018 Update) projections as the best available science in most circumstances. Rates of sea-level rise (SLR) are not consistent throughout the State. While much of the State is subsiding, which exacerbates SLR, the coastline north of Cape Mendocino (with the notable exception of the Humboldt Bay area) tends to be uplifting, which offsets some of the impacts of SLR. Therefore, a more localized assessment for Trinidad is appropriate if the information is available. GHD prepared a Climate Change Vulnerability Report and Adaptation Response document in April 2016 using the best available science and tailored to local conditions (available at the following link: http://trinidad.ca.gov/document-library/climate-change).

General Plans normally use an approximately 20-year planning horizon. However, for climate change and SLR, it makes sense to consider those impacts further into the future. But after 2100, the data becomes much less reliable, and so has not been considered herein. GHD's data was based on a 2015 report (Northern Hydrology and Engineering – Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling and Inundation Vulnerability Mapping). That report is older than the Coastal Commission recommended OPC guidelines, but more specific to the local area. The projections are fairly similar anyway, though the GHD report did not include the extreme scenarios that are included in the OPC projections. The "low," "projection," and "high" scenarios in Table 1, roughly correspond to the "median" (50% probability that SLR meets or exceeds), the high end of the "likely range" (66% probability that SLR is between) and the "1 in 200 chance" (0.5% probability SLR meets or exceeds) projections in the OPC report for the Crescent City Tide Gauge (Attachment 1). Note that it would not makes sense to use the closer North Spit Tide Gauge, because the area immediately around Humboldt Bay is experiencing substantial land subsidence.

Table 1 – Sea Level Rise Scenarios for Trinidad.

Year	Uplift	Low		Projection		High	
		(cm)	(ft)	(cm)	(ft)	(cm)	(ft)
2030	**0 mm**	**3.9**	**0.12**	**9.9**	**0.32**	**21.3**	**0.70**
	1 mm	2.4	0.08	8.4	0.28	19.8	0.65
	2 mm	0.9	0.03	6.9	0.23	18.3	0.60
	3 mm	-0.6	-0.02	5.4	0.18	16.8	0.55
2050	**0 mm**	**10.9**	**0.36**	**21.4**	**0.70**	**46.2**	**1.52**
	1 mm	7.4	0.24	17.9	0.59	42.7	1.40
	2 mm	3.9	0.12	14.4	0.47	39.2	1.28
	3 mm	0.4	0.01	10.9	0.36	35.7	1.17
2100	**0 mm**	**38.6**	**1.27**	**75.1**	**2.46**	**137.9**	**4.52**
	1 mm	30.1	0.99	66.6	2.19	129.4	4.25
	2 mm	21.6	0.71	58.1	1.90	120.9	3.97
	3 mm	13.1	0.43	49.6	1.63	112.4	3.69

Most of the detailed mapping and SLR modeling tools (e.g. Our Coast Our Future) are not available for our area at this time. FEMA maps show coastal wave flooding, updated in 2017, with base elevations, designated as VE. The VE Flood Zone is defined as: "*Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.*" Also known as a coastal high hazard area, these are areas subject to high velocity water including waves. They are also defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or

greater (FEMA, 2005). FEMA coastal flood mapping is shown in Attachments 2 and 3. And the 2050 high range from GHD's report, and Table 1, is shown in Attachment 4.

Identify potential physical sea level rise impacts in LCP planning area / segment.

Riverine Flooding: Trinidad is not subject to riverine flooding.

Saltwater Intrusion: Edwards and Van Wycke Streets do not have water supply aquifers or other resources or infrastructure that is subject to saltwater intrusion

Coastal Flooding: Because Edwards and Van Wycke Streets are built on uplifted coastal terraces, inundation from coastal flooding is not a risk. Also see Attachments 2 and 3. However, the beaches below Edwards and Van Wycke are subject to SLR and coastal flooding and are likely to get narrower into the future (Attachment 4).

Coastal Erosion / Bluff Retreat: Bluff retreat is the primary hazard threatening areas of the City along Edward and Van Wycke Streets. Erosion, bluff retreat and landslides have always been hazards for this area, but SLR is likely to exacerbate the hazard and increase the rate of erosion and therefore landslides and bluff retreat. The Coastal Geologic Hazard Report (SHN October 2019) found that the stretch of bluffs between Galindo Street and Ocean Ave. (Edwards Segment) is at the highest risk of landslide hazards due to the lack of significant rock masses and the relatively narrow beach. Future bluff retreat rates are difficult to estimate, because they tend to occur episodically. In addition, localized geology and bedrock composition greatly influence specific retreat rates.

Overall, most of the available data indicates that Trinidad has not historically been subject to significant bluff erosion. So, while some increased erosion and bluff retreat can be expected, a significantly accelerated rate is not very likely. The USGS National Assessment of Shoreline Change (2006) was completed using actual transects of the coastline. That study found that the majority of beaches in the Klamath region, between the Oregon border and Trinidad, based on 1,430 transects, are actually accreting (gaining). However, the rate of accretion has decreased in recent years, with the number of beaches that are eroding on the increase.

Attachments 5-8 show data from the USGS Coastal Change Hazards Portal illustrating the data from the report described above. The data shows that the shape of the shoreline has changed very little in past 100+ years. It actually appears to be wider now than it was in the pervious surveys. However, that could be a function of the tide level when the lines were drawn. Also note that the green line (1920's) looks to be offset to the west; if it were adjusted slightly to the southeast, it would line up very well with the yellow line (1850's). The other three figures show that the likelihood of rapid shoreline retreat or advance is extremely low in this area, with a greater than 99% chance of stable change between

Trinidad and Patrick's Point. However, from about Moonstone south, there is an increased chance of both rapid retreat and rapid advance.

Finally, several bluff retreat analyses have been performed in the Trinidad Area, particularly on the Edwards Street stretch of bluff. A report prepared in 2016 for the rebuild of the residence at 20 Scenic Drive estimated average bluff retreat from 1851 to present to be 0.12 feet per year. Notably, retreat was not measurable based on the aerial photo analysis. However, reports of significant erosion after the 1982/83 El Nino event were used to determine this average rate of erosion, but all of the erosion actually occurred within the timespan of a few months. A similar report prepared for construction of a new residence at 670 Edwards…*(I am working on obtaining a copy of this report.)*

Assess potential risks from sea level rise to coastal resources and development in LCP planning area / segment.

The following resources may be potentially impacted by SLR to the extent that it will increase erosion, bluff retreat and landslides. As suggested in the Coastal Commission Sea Leve Rise Policy Guidance, the risks to each resource are broken down by exposure (e.g. will SLR impacts affect the resource/development?), sensitivity (e.g. to what degree or how easily is the resource affected by SLR impacts?), adaptive capacity (e.g. how easily can the resource successfully adapt to SLR impacts?), consequences (e.g. what are the economic, ecological, social, cultural and legal consequences?) and land use constraints (e.g. should the types and intensities of land use be altered to minimize hazards and protect coastal resources?).

<u>City Infrastructure:</u> City infrastructure includes Edwards and Van Wycke Streets. Water and stormwater infrastructure, along with other utilities are included within these rights-of-way. In addition, Edwards Street provides the only vehicular access to Trinidad Harbor and the primary access to Trinidad State Beach. Edwards and Van Wycke also provide pedestrian access along the coastline to the Harbor.

Exposure
Edwards and Van Wycke Streets and the utilities located within those rights-of-way are already exposed to coastal landslide and erosion hazards. SLR will increase the existing exposure to the extent that it increases erosion, bluff retreat and landslides. The large, active slide just to the west of Trinity Street has already affected parking along the south side of Edwards. The southern travel lane is likely to be impacted within the next several years. Utilities are mostly located in the north lane of Edwards, except between Hector and upper Van Wycke, where they are also located in the south lane.

Much of the Van Wycke Street right-of-way has already been lost to an ongoing earthflow. The trail that crosses the area has recently been closed due to public safety concerns and likely already encroaches on private property to the north. Utilities also existing within the

area. A City water line has already been shut off due to the potential for breakage. A stormwater line also crosses through the area.

Sensitivity
Areas outside of the two active slide areas are not considered at immediate risk. However, any of the existing earthflows could become active again due to especially wet conditions, an earthquake or toe erosion.

Adaptive Capacity
The adaptive capacity of City infrastructure varies with location. Currently, Edwards Street provides the only vehicular route to the Trinidad Harbor. The road has little adaptive capacity and can't be relocated due to adjacent development. Access to the Harbor could be rerouted to Parker Street and Hector Street. However, the stretch between Hector and upper Van Wycke cannot feasibly be rerouted. East of Trinity, traffic could be rerouted around West St. and Ocean Ave. to provide access to Wagner St., but there are two driveways providing access to residences on Edwards, one of which has no other street access. The feasibility of moving water and stormwater lines and other utilities, most of which are located in the north lane, has not been assessed.

Van Wycke does not provide continuous vehicular access but provides the only access for several residences. (The trail is discussed further below.) Van Wycke contains City utilities, including water lines and a storm drain. The water line is part of a redundant loop, and so has already been shut off to prevent risks from potential breakage. Water service is still being provided to all adjacent residences, but water pressure in that neighborhood has been impacted and may not meet fire flow requirements. The storm drain has no capacity to be rerouted, because it is gravity flow. The stormwater cannot be routed further down the hill, because a new discharge to the Trinidad Head ASBS would be prohibited, or prohibitively expensive. And discharging the stormwater to the hillside would create unacceptable erosion potential. The stormdrain pipe could potentially be supported by an above-ground structure that would span the gap being created by the active landslide. It could also possibly be moved upslope for a short distance if the landowners are willing to grant the City an easement or to sell a portion of their property.

Consequences
The loss of Edwards Street between Hector and Van Wycke would mean the total loss of vehicular access to the Trinidad Harbor Area, a critically important coastal-dependent resource. Loss of Edwards Between Hector and Ocean would likely be an inconvenience to drivers. It could also mean the total loss of access to one residence. It would also result in significant expenses to reroute utility lines. The feasibility and consequences of relocating those facilities has not been analyzed.

The loss of Van Wycke Street could result in the loss of access to several residences (up to four) and one vacant residential parcel. It would also result in the loss of a public trail (see

more below). The loss would also result in the need to reroute utilities, which could be a significant expense and could impact how well those services flow. Because the storm drain cannot be rerouted, the loss of Van Wycke could have significant consequences to the City's ability to deal with the stormwater.

Land Use Constraints
This section of Edwards and Van Wycke Streets are both confined on the south side by unstable coastal bluffs and on the north side by relatively dense residential development. Very little vacant land remains on the landward sides. In addition, at least a dozen adjacent residences were constructed prior to the Coastal Act as can be seen on a 1974 aerial photo (Attachment 9).

Trails and Public Access: In addition to the local pedestrian access provided along Edwards and Van Wycke, Edward Street, between Ocean and Galindo, is part of the California Coastal Trail. Official City trails that occur within or adjacent to the Edwards Street study area include the Parker Creek Trail, Old Wagon Road Trail, Galindo Street Trail, and the Van Wycke Trail, as well as access along the beach.

- CA Coastal Trail – This trail is vulnerable to the extent that Edwards is vulnerable, namely between Ocean Ave. and the intersection with upper Van Wycke.
- Parker Creek Trail – This trail is actually outside of this study area but is an important part of the network of coastal access trails that cross the study area. The Parker Creek Trail forms the boundary between the Wagner and Scenic bluff segments. It provides beach access from near the main commercial part of town, behind Saunders' Shopping Center. There have been localized erosion and slumping issues with this trail, but no large-scale problems. Failure of the culvert on the lower section caused a large sinkhole to open and temporarily close the trail in 2016, but the culvert and sinkhole have since been repaired.
- Old Wagon Road Trail (Wagner Street Trail) – This trail connects Edwards Street with the Parker Creek Trail. It was the subject of litigation between the City and a property owner for many years and is now subject to the terms of a settlement agreement. Although geologic stability was one of the primary issues involved in the litigation, the Coastal Geologic Hazards Assessment found this to be a relatively stable area due to a lower coastal terrace below the bluff that protects the toe from wave action.
- Axel Lindgren Memorial Trail – This is the primary trail to Old Home Beach (formerly Indian Beach). Much of it follows an historic Yurok trail. It is located along a relatively stable ridgeline. A geotechnical analysis in 2012 found a buried seastack below this location, which likely contributes to the relative stability. However, portions of the trail have experienced instability. The top of the trail was recently rerouted to its more stable traditional location. However, the bottom of the trail is at substantial risk of wave action that causes damage each winter.
- Van Wycke Trail – This trail connects Edwards Street to the Galindo Street Trail and spans the unpaved section of the Van Wycke Street right-of-way. This unpaved section is currently at substantial risk from a landslide and has been closed to protect public

safety. The City has obtained grant funding to repair the trail with a soldier-pile retaining wall, but the final design and permitting have yet to occur.

- Galindo Trail – This trail connects lower Van Wycke Street with the Harbor Area and forms the western boundary of the study area. The trail ends in the Harbor parking lot, just above Launcher Beach. This trail is generally stable, but local tribal groups have requested that the trail be closed due to the presence of graves nearby.
- Beach Access – The City's circulation map shows a continuous trail along the shoreline starting at the base of the Galindo Trail and continuing east and southeast to the City limit. However, there are currently several rocky points that do not provide easy access along the shoreline, particularly during higher tides. One is the rocky point below the Van Wycke Street Trail and others exist on either side of McConnahas Mill Creek.

Exposure

Trails and public access are already exposed to coastal landslide and erosion hazards. SLR will increase the existing exposure to the extent that it increases erosion, bluff retreat and landslides.

Sensitivity

The bases of the Parker Creek and Axel Lindgren Memorial Trail are particularly exposed. The Van Wycke Trail as well as lateral access along the beach are also at risk. However, access along the beach will not be significantly impacted in the short term. The highest risk is at the two active landslides that are impacting the Van Wycke Trail and Edwards Street near the intersection with Trinity.

Adaptive Capacity

In general, trails can often be repaired and or rerouted as needed in response to sea level rise impacts.

- The CA Coastal Trail can be rerouted (or stabilized) with Edwards Street.
- Although the Old Wagon Road Trail is not at immediate risk, it has little adaptive capacity, because it is located along a narrow strip between the edge of the bluff and residences located to the north.
- The base of the Parker Creek Trail is not very steep due to the low terrace in that location, and so periodic repairs would be expected to be reasonable.
- The base of the Axel Lindgren Memorial Trail is already quite steep. Continued erosion exacerbated by SLR could steepen the trail to the point that it can't be repaired and still maintain public safety. However, the base of the trail could be rerouted in one direction or the other or utilize switchbacks to reduce the steepness.
- The Galindo Street Trail is not at substantial risk, but the lower half could potentially be rerouted if necessary.
- The Van Wycke Trail could potentially be moved upslope if there are willing landowners; it could also be stabilized with a retaining wall. The trail could also potentially be rerouted to Edwards Street, but the feasibility of creating equivalent pedestrian access is questionable, because constructing pedestrian improvements on

Edwards is likely to result in the loss of parking or require significant cutting into the northern bank and construction of retaining walls.
- If the beach is lost due to SLR and the bluffs not being able to naturally retreat, then the access along the beach will be permanently lost.

Consequences
There are substantial risks to the ease of access and the number of public access points in the City. Periodic temporary trail closures for repairs are likely to become more frequent, particularly at the bases of the Parker Creek and Axel Lindgren Memorial Trails. Some trails or segments may need to be rerouted, but the pedestrian experience would be altered, for example by being further from the coast and being within a vehicular roadway. If the bluffs are not allowed to retreat with SLR, the lateral access along the beach could eventually be lost, particularly during high tides or large wave events.

Land Use Constraints
Like the streets, trails tend to be constrained by adjacent development. Trails can be moved around on the bluff faces, because those areas are designated as open space. Consistent with the Coastal Act, the City has requirements for easements along trail routes as part of development approvals. These can also be required for redevelopment and additions, but the opportunities are reduced due to the lack of vacant lots.

Private Development: There are more than a dozen homes built along Edwards and Van Wycke prior to the passage of the Coastal Act (based on 1974 aerial photo). In general, these property owners have some inherent right to build protective structures even if they impact coastal resources. Several of these homes have been rebuilt or expanded since, but the City doesn't have provisions to add conditions prohibiting shoreline/bluff protection structures for redevelopment, but the Coastal Commission may have additional guidance. Several homes have also been built around this area since the Coastal Act, and now most of the lots are built-out. The private properties along Edwards and Van Wycke are all landward of the City's rights-of-way except for two homes (861 and 723 Van Wycke), both of which were already in existence by 1974.

Exposure
The two structures that are seaward of Edwards and Van Wycke are already exposed to coastal landslide and erosion hazards. SLR will increase the existing exposure to the extent that it increases erosion, bluff retreat and landslides. In addition, the leachfields for the two homes that are just above the actively failing section of Van Wycke are also potentially at risk from the same active slide that is impacting the trail.

Sensitivity
Because most residential development is landward of City streets, it has a low sensitivity in the short-term. If City roadways and infrastructure are threatened, then these residences will be more at risk. However, the two homes that are seaward of the public rights-of-way

are at higher risk and therefore more sensitive. Although they are not immediately adjacent to active earthflows, they are adjacent to historic earthflows that could become more active as a result of SLR.

Adaptive Capacity
Protecting City infrastructure would also serve to protect the residences located landward of them. Several residences, including the two seaward of City rights-of-way, were in place by 1974, so predate the Coastal Act, and therefore have some right to build protective structures. Opportunities for managed retreat should be further investigated but may be limited due to Trinidad's small size and lack of suitable vacant lots.

Consequences
Residential structures could become uninhabitable should enough bluff retreat occur. In that case, a plan for removal of the structures would be needed. Even before the structures themselves are threatened, their leachfields, often located downslope of the house, may become unusable, which could also make the structures uninhabitable; advances in treatment system options may prolong their life.

Land Use Constraints
Most of the land seaward of Edwards and Van Wycke is zoned Open Space or Special Environment. Most of the parcels landward of those streets is zone Urban Residential. However, there are very few vacant lots left in this area. One of the vacant lots is just north of Van Wycke and very near the active slide in that location. There are two more vacant lots located north of existing residences. There are some vacant residential lots south along Scenic Drive and east of the freeway up Berry Road.

<u>ESHAs and Environment:</u> Parker Creek and its associated riparian habitat form the approximate boundary between the Wagner and Scenic bluff segments, so is not actually within the Edwards segment that is the focus of this document. Intertidal habitat is located along the coastline below the bluffs. Some habitat surveys have occurred within the project area, and coastal bluff scrub environmentally sensitive habitat area dominated by coastal brambles vegetation community has been observed in multiple locations on the bluffs. However, much of the vegetation exhibits characteristics of past disturbance and there is a substantial presence of invasive species. No special status species have been observed, though Humboldt mountain beaver, which is currently under status review, is known to exist on these slopes.

Exposure
Sensitive habitat that may be located on the bluff faces is already exposed to coastal landslide and erosion hazards. SLR will increase the existing exposure to the extent that it increases erosion, bluff retreat and landslides.

Sensitivity
Coastal scrub and bramble are quick growing and adapted to disturbed environments, including landslides. There is similar habitat that is less impacted by invasive species in nearby locations, including within Trinidad State Beach.

Adaptive Capacity
This habitat is likely to grow back quickly if additional land movement occurred. It may even "ride out" a slow-moving earthflow. However, the habitat could be impacted if invasive species move into disturbed areas. ESHA habitat on this bluff could be improved with removal of invasive species.

Consequences
Due to the adaptability of this habitat types, and the fact that it is locally common, no significant consequences are expected.

Land Use Constraints
For its size, Trinidad has a relatively high percentage of open space and native habitat. Areas of substantial habitat include Trinidad Head, Trinidad State Beach and the bluff faces. However, other than those areas, there is limited space for native habitats within the City.

Cultural Resources: Most of the study area is known to be culturally significant and sensitive. The Yurok village of Tsurai was located on the terrace below Wagner Street, but the entire study area was utilized by the traditional occupants. Earth flows and toe erosion have been known to expose cultural resources and even human remains. The Yurok Tribe, Trinidad Rancheria and Tsurai Ancestral Society all have an active interest in this area. Much of the Edwards and Wagner bluff segments are also encumbered by an easement for public access and cultural resources protection that is held by the Coastal Conservancy.

Exposure
Cultural resources that are located on the bluff are already exposed to coastal landslide and erosion hazards. SLR will increase the existing exposure to the extent that it increases erosion, bluff retreat and landslides.

Sensitivity
Cultural resources have a high degree of sensitivity. In addition to SLR, they are at risk from erosion and any other type of ground disturbance, including construction of shoreline protective structures, and burrowing animals. However, protective structures could serve to protect remaining cultural resources from further disturbance.

Adaptive Capacity
Cultural resources have little adaptive capacity. In general, the Yurok Tribe prefers items that have been exposed to be reburied in an appropriate location.

Consequences
Cultural resources, including human remains, could become exposed at higher rates due to SLR induced erosion. Resources that are exposed are at risk of damage from wave action and other natural processes, and they are also exposed to theft. Shoreline protection structures could serve to help stabilize and protect remaining resources but could also cause disturbance during construction.

Land Use Constraints

Identify LCP adaptation strategies to minimize risks.

There are clearly two locations with the most significant short-term risks due to active earth movement. These are on Edwards Street, just west of the intersection with Trinity St., which constitutes the head of an active landslide. The other is on the Van Wycke Trail / upper Van Wycke Street, about half-way between Edwards and Galindo, which is also at the head of an active landslide. However, similar situations are likely to come up in the future, and more frequently, as erosion is exacerbated by SLR. Therefore, the decisions made on these two current situations should be made in a larger context, because they may have implications for future landslide hazards.

<u>Edwards & Trinity Street Slide</u>
There are really only two feasible options – managed retreat and stabilization with a large retaining wall.

Managed Retreat
The outcome of this option would be to let the slide continue naturally, at least in the short-term, and manage the impacted resources to accommodate the slide. This slide is impacting, or likely to impact, an approximately 150 to 200 ft. stretch of Edwards just west of the intersection of Trinity Street. The intersection with Trinity could be impacted as well, but the Hector Street intersection is not expected to be impacted by this slide. The slide has already significantly impacted improvements located seaward of the developed street. And it is likely to continue to impact this area, with most movement occurring in the winter. But the rate of movement will depend on factors such as amount of rainfall and the intensity of wave action; an earthquake could significantly accelerate slide movement.

Some managed retreat activities have already occurred. The Trinidad Memorial Lighthouse, concrete access ramp, the western access to the ALM Trail, and the associated parking area were impacted starting in 2016. The TML and associated improvements were removed and or relocated in 2017 and 2018. The parking area was reconfigured from perpendicular parking with six spaces to parallel parking with three spaces. This could be considered the first step in adaptive management and retreat.

The next step would be to continue to monitor Edwards Street and determine trigger point(s) for the next course of action. City data shows the water and stormwater lines to be located along the northern edge of Edwards in this area. At the eastern edge of Hector, the lines then cross into the southern lane of Edwards, but that is outside of this slide section. At some point, the southern (uphill) lane of Edwards would be permanently closed. The pavement would have to be removed and the site remediated. Potentially, some amount of parking could be retained in a portion of the south lane until another trigger point is reached. Although the northern lane currently accommodates downhill traffic, from a circulation standpoint (opting for right-hand turns rather than left turns across traffic lanes), uphill traffic would likely continue to use Edwards Street. Downhill traffic would be rerouted to Parker Street and Hector Street and then back on to Edwards Street outside of the slide area.

If the slide continues to advance, the City will have to consider whether adaptive management is still a feasible option given constraints such as utilities located within the northern portion of Edwards Street and the capability of Parker Street and Hector Street to accommodate the traffic loads. This will require further study and analysis.

Stabilization

The other primary option for this slide is stabilization to protect existing infrastructure. As described in the geologic assessment prepared for the slide and the hazards assessment, this would most likely consist of a moderately-sized soldier pile retaining wall, similar to the one currently proposed for Van Wycke, but larger. Most other types of retaining walls would not be larger enough or deep enough to protect critical infrastructure. However, even a large wall would not stabilize the entire slide, it would only stabilize the upper portion, including Edwards Street. The lower portion of the slide would continue to move.

The stabilization option would protect certain resources, but impact others. One of the primary impacts to coastal resources from construction of such a retaining wall would be the potential to lose the beach over the long-term, and the associated public access along the shoreline, because the bluff can't retreat to accommodate SLR. Because a retaining wall would only stabilize the top of the slide, the lower portion would continue to contribute sand to the littoral system. And as the toe continues to erode and reach an equilibrium, lateral beach access would likely still be maintained for many years, even with expected SLR. Due to the height and location of the retaining structure, it would not be likely to impact ocean currents or sand movement. However, it would have aesthetic impacts. It could also eventually reduce the sand supply in the localized area, which could also negatively impact beach width. And if sea level continues to rise, the beach could be inundated if it is not able to adapt.

<u>Van Wycke Trail</u>

Because this is a smaller slide, there are more options for stabilization. However, the preferred option has already been determined to be a soldier pile retaining wall due to its

expected length of life and therefore cost-effectiveness. The same potentially negative impacts for the larger slide on Edwards at Trinity can also occur with this proposal. However, sand supply impacts would be expected to be very localized, because Launcher beach is in a relatively protected location, and sand movement is restricted by Little Head and the rocky point to the east. Public access is also somewhat less of a concern, because the rocky point to the east already restricts lateral access, and access to the beach will continue to be provided from the Harbor. In addition, public access along the Van Wycke Trail, which would otherwise likely be lost, would be preserved.

Managed retreat may not be a feasible option for this location for a variety of reasons. The City is looking into moving the trail upslope as far as possible in the failing section. However, that would involve privately owned property, and would not necessarily avoid the need for a retaining wall. It would not make much economic sense for the City to spend a lot of money to buy property or easements if the slide is just going to continue to encroach on the new trail in the short-term.

In addition, the Coastal Act may require that equivalent public access be provided if access is lost. The City is preparing an alternatives analysis for this trail and addressing the slide. Preliminary results indicate that it may not be feasible to provide equivalent pedestrian access on Edwards, at least not in terms of reducing impacts. It would be difficult to create pedestrian access along Edwards that is separated from vehicles, likely requiring significant soil disturbance, construction of more retaining walls, and loss of parking.

Further, the two houses above the failing section of trail (797 and 807 Edwards), and the house located seaward of Van Wycke (723 Van Wycke), which is threatened by the slide from the west, were constructed prior to passage of the Coastal Act; they were all in existence on a 1974 aerial photo. That means that they have some right to build protective structures themselves, even if those structures negatively impact coastal resources. Because the leachfields serving those homes are located on the lower portion of the property, in the area above the failing slope, almost as soon as the trail and right-of-way are completely lost, those leachfields will be threatened. Therefore, if retaining structures are likely to be built here anyway, then it may be better to stabilize the trail in its current location, rather than constructing an alternative access along Edwards.

<u>Edwards and upper Van Wycke Earthflow</u>

The area below the intersections of Edwards with Hector and Van Wycke includes another earthflow that is not currently active. A moderate slide occurred in 2005 as the result of excess saturation caused by flushing an adjacent fire hydrant at the end of an unusually wet spring. Although the slide continued all the way down to the beach, it was narrow and surficial, only affecting the uppermost 3 to 6 feet of soil. As a result of the slide, a 20-ft. long, 14-ft. high welded wire wall was installed to protect the slope just below the uppermost portion f Van Wycke St., which had been over-steepened by the slide.

The approximately 100 ft. stretch of Edwards between Hector and upper Van Wycke is particularly critical, because it provides the only vehicular access to Trinidad Harbor. It is hemmed in on the south by the bluff and on the north by residential development. In addition, this section of Van Wycke provides the only access to the residence at 723 Van Wycke. There are no possible alternative routes to the harbor that bypass this section of Edwards or to the residence at 723 Van Wycke. And there is essentially no potential to move Edwards northward, away from the bluff, due to existing residential development. In addition, both water and stormwater lines are located within the southern traffic lane in this section of Edwards, making critical infrastructure more vulnerable.

Both homes located north of Edwards in this section (586 Hector St. and 730 Edwards St.) were in existence prior to passage of the Coastal Act (they can be seen on a 1974 aerial photo). Both have been added onto since that time (2017 and 1991 respectively), but there were no mechanisms in place to consider the inclusion of potential conditions to accommodate northward movement of Edwards, and the existing configuration provides little space for such action. 723 Van Wycke was also in existence prior to the Coastal Act.

It appears that the only option for maintaining access to the Harbor if and when this slide reactivates and starts to encroach on this section of Edwards Street would be to stabilize it, since managed retreat is not a feasible option. This would likely involve a substantial retaining wall, with the type and size depending on the slide action.

<u>Eastern Edwards</u>
The earthflow and street configuration in this location, between Trinity St. and Ocean Ave. are similar to the section between Trinity and Hector, except that the slide is not currently actively moving. The water line in this section of Edwards dead ends prior to Ocean Ave., so is not part of a loop. Therefore, it may be easier to relocate this section of water line. However, other utilities would have to be investigated as well. Two of the homes fronting Edwards in this section (560 and 540 Edwards) were constructed prior to the Coastal Act and have driveways off Edwards near the middle of this section. And the one in the middle (540) has no other street access. Therefore, maintenance of access to these residences would also have to be a consideration.

<u>Other Bluff Segments</u>
Although this report does not address the other three bluff segments as defined in the Coastal Landslide Hazard Evaluation – West Bluff, Wagner Segment and Scenic Segment – considerations for the Edwards Segment analyzed herein should be made in the larger context of City-wide bluff issues.

West Bluff
The West Bluff has a wide beach and the bluff is not as high. In addition, development does not encroach up to the edge of the bluff like it does on the Edwards Segment. This area is not expected to be impacted by landslides or SLR in the short-term. Only four

homes, one of which existed in 1974 and one vacant, residentially zoned parcel exist near the bluff edge. Otherwise, State Park property provides a buffer between the bluff and adjacent development. This section is important for pedestrian public access, along the beach as well as coastal trails. However, it does not provide critical access to a particular location such as the Trinidad Harbor. In addition, City infrastructure in this area is minimal, mostly providing services to individual homes. There are some vacant parcels in this area, and the City should consider adopting policies and/or regulations addressing development in hazard areas that may be applied to these parcels in the future. Similarly, the City needs to develop policies and/or regulations for existing development in potential hazard areas.

Wagner Segment

This is the shortest segment and provides a transition between the Edwards Segment and the Scenic Segment. Although this segment is considered relatively stable due to the existence of a low terrace that protects the taller bluff behind, it has been the subject of significant litigation regarding its stability. And a significant narrowing of the Wagner Street Trail, which used to be a roadway, appears to be well-documented. On the other hand, the Tsurai Village site was located on the lower terrace for generations. And the lower terrace is now protected somewhat by a series of gabion walls. There are eight homes located on the top of the bluff, just behind the trail. There is one vacant parcel on the north side of Wagner, but there are no other vacant developable parcels in this area. And there is also a lack of substantial City infrastructure. Wagner Street is partially public and partially private. A single, un-looped water line serves the residences on Wagner, and there are no City stormwater lines. Regulations or policies to address existing development in potential hazard areas would be beneficial for these blufftop parcels.

Scenic Segment

This segment is characterized by much less dense development and larger parcels than the other bluff segments. It is also characterized by large rocky outcrops that provide localized stability. But there are also areas of notable instability. There is not as much public access in this segment, and most of the land is privately owned. Lateral access along the beach is inconsistent due to the rocky outcrops. The Parker Creek Trail forms the northern boundary of this segment, and the Groth Lane Trail provides access to the Parker Creek Trail from Scenic Drive. The City has also tentatively designated potential future public access from Scenic to the coast alongside McConnahas Mill Creek. The Trinidad Coastal Land Trust is also considering the development of another public access trail from Scenic Drive to Parker Creek. There are a number of homes, some of which pre-date the Coastal Act, and several vacant residential parcels along this segment. However, it is unknown how many of those may be subject to potential hazards over the short or long term. City infrastructure consists of a Scenic Drive and a water line that runs under a portion of the street. Future instability will likely need to be addressed on a case-by-case basis, likely based on policies and regulations developed as part of this process.

Conclusions

SLR is likely to exacerbate landslide hazards, but bluff retreat is not expected to significantly increase in the Trinidad area. The Edwards Segment of bluff, as defined in the Coastal Landslide Hazard Evaluation, is the bluff section in the City that is most at risk from landslide hazards in the short-term. Unfortunately, this is also the most critical stretch of bluff in terms of infrastructure and resources. And due to existing development, which is relatively dense with few vacant lots, there is minimal potential for adaptive management and managed retreat. Therefore, eventually a choice will have to be made between protecting existing development, infrastructure and trails verses the potential loss of the beach and public access along it. Maintaining access to the Trinidad Harbor Area will be a significant consideration, as will the feasibility of moving existing utilities. Private property owners' rights to protect their property and takings issues will be another consideration.

In the larger setting of the area from Moonstone Beach to Patrick's Point, and even north and south of that, there is a substantial amount of public access and sparsely developed coastline with more potential for adaptive management and retreat to be employed compared to Trinidad and its dense development and critical infrastructure. And the Edwards Segment is a very small portion of that entire coastline. Therefore, in that larger context, and considering the important of the existing infrastructure and trails, the lateral access along the beach may be less critical.

DRAFT

Attachment 1

APPENDIX 3:

Sea-Level Rise Projections For All 12 Tide Gauges

TABLE 1: Projected Sea-Level Rise (in feet) for Crescent City

Probabilistic projections for the height of sea-level rise shown below, along with the H++ scenario (depicted in blue in the far right column), as seen in the Rising Seas Report. The H++ projection is a single scenario and does not have an associated likelihood of occurrence as do the probabilistic projections. Probabilistic projections are with respect to a baseline of the year 2000, or more specifically the average relative sea level over 1991 - 2009. High emissions represents RCP 8.5; low emissions represents RCP 2.6. ***Recommended projections for use in low, medium-high and extreme risk aversion decisions are outlined in blue boxes below.***

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)					H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE		1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...		5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
				Low Risk Aversion		Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.1	0.0 -	0.3	0.4	0.5	0.8
	2040	0.3	0.1 -	0.4	0.6	0.9	1.4
	2050	0.4	0.2 -	0.7	0.9	1.5	2.3
Low emissions	2060	0.4	0.1 -	0.7	1.0	1.8	
High emissions	2060	0.6	0.2 -	0.9	1.3	2.1	3.3
Low emissions	2070	0.5	0.1 -	0.9	1.3	2.4	
High emissions	2070	0.8	0.4 -	1.2	1.7	2.8	4.5
Low emissions	2080	0.6	0.1 -	1.1	1.6	3.1	
High emissions	2080	1.0	0.5 -	1.6	2.2	3.7	5.9
Low emissions	2090	0.7	0.1 -	1.3	1.9	3.9	
High emissions	2090	1.2	0.6 -	2.0	2.8	4.7	7.4
Low emissions	2100	0.7	0.1 -	1.5	2.3	4.8	
High emissions	2100	1.5	0.7 -	2.5	3.4	5.9	9.3
Low emissions	2110*	0.8	0.2 -	1.5	2.4	5.3	
High emissions	2110*	1.5	0.9 -	2.5	3.4	6.2	11.0
Low emissions	2120	0.8	0.1 -	1.7	2.8	6.3	
High emissions	2120	1.8	1.0 -	3.0	4.1	7.4	13.1
Low emissions	2130	0.9	0.1 -	1.9	3.2	7.3	
High emissions	2130	2.1	1.1 -	3.4	4.8	8.7	15.3
Low emissions	2140	1.0	0.1 -	2.2	3.6	8.4	
High emissions	2140	2.3	1.2 -	3.9	5.5	10.1	17.8
Low emissions	2150	1.0	0.0 -	2.4	4.2	9.6	
High emissions	2150	2.6	1.3 -	4.4	6.2	11.6	20.6

**Most of the available climate model experiments do not extend beyond 2100. The resulting reduction in model availability causes a small dip in projections between 2100 and 2110, as well as a shift in uncertainty estimates (see Kopp et al. 2014). Use of 2110 projections should be done with caution and with acknowledgement of increased uncertainty around these projections.*

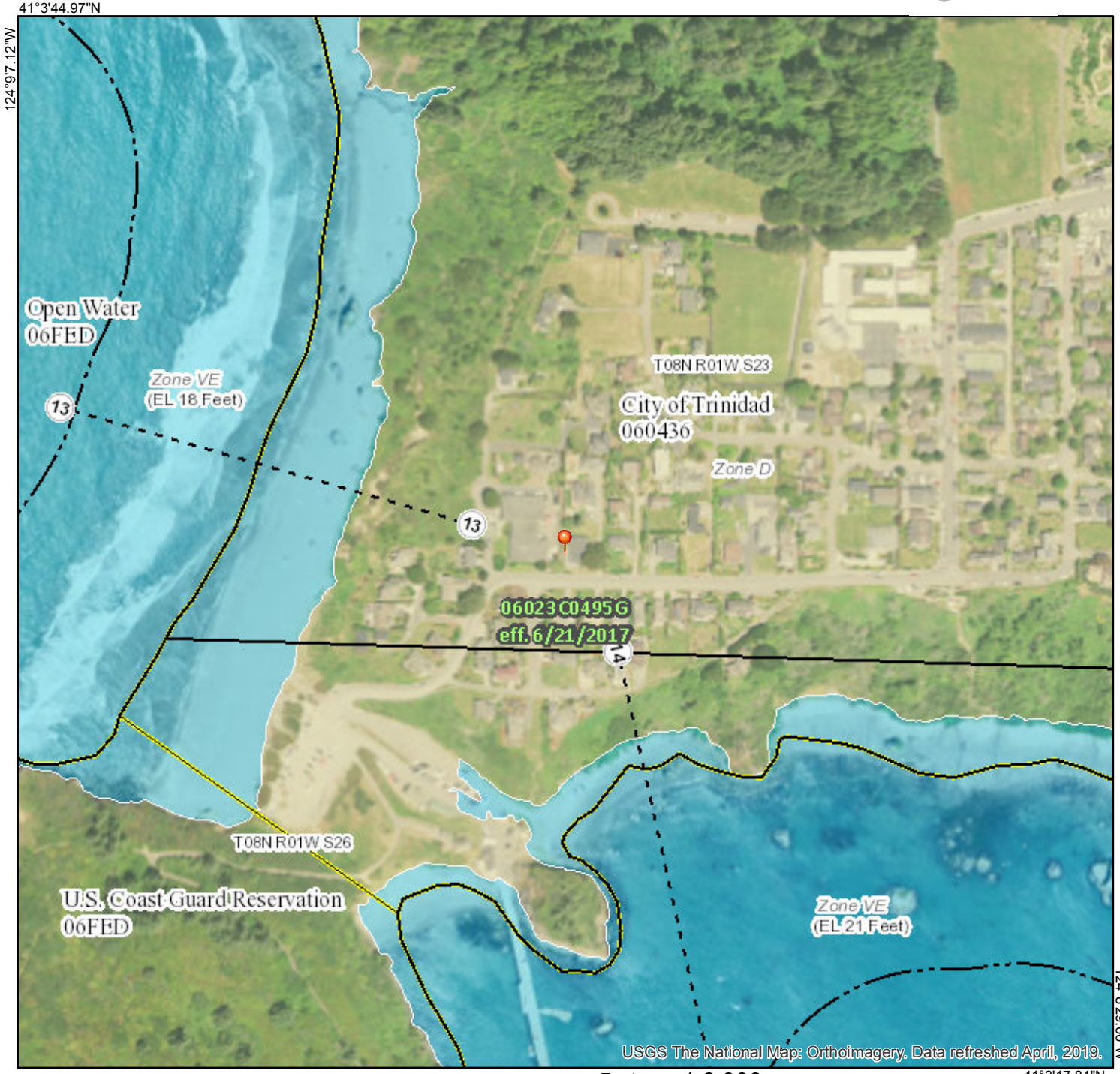
National Flood Hazard Layer FIRMette

Attachment 2

FEMA

41°3'44.97"N

124°9'7.12"W



124°8'29.66"W

41°3'17.84"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

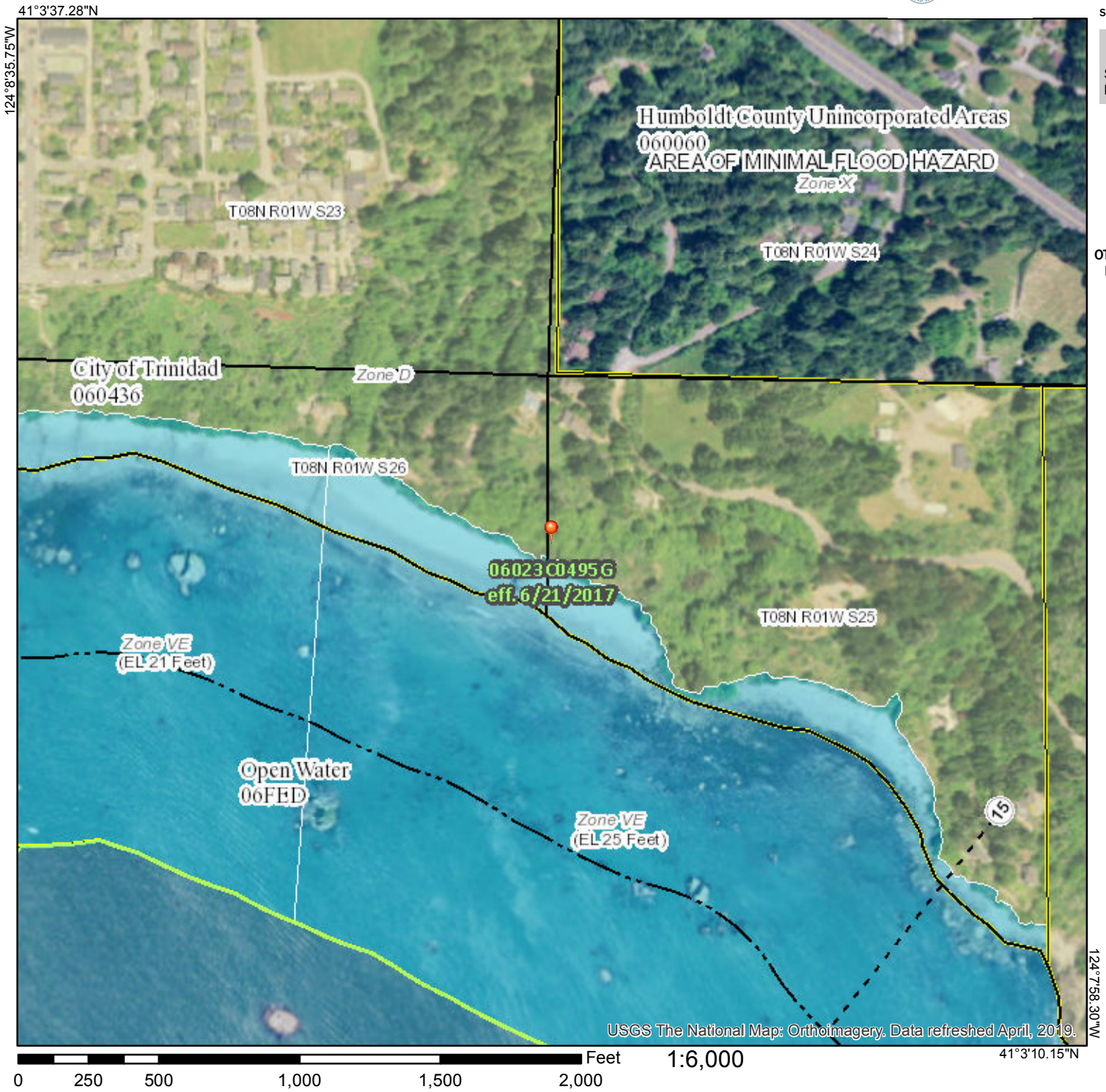
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/21/2019 at 5:26:35 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

Attachment 3

FEMA



0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
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- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
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- Digital Data Available
- No Digital Data Available
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N

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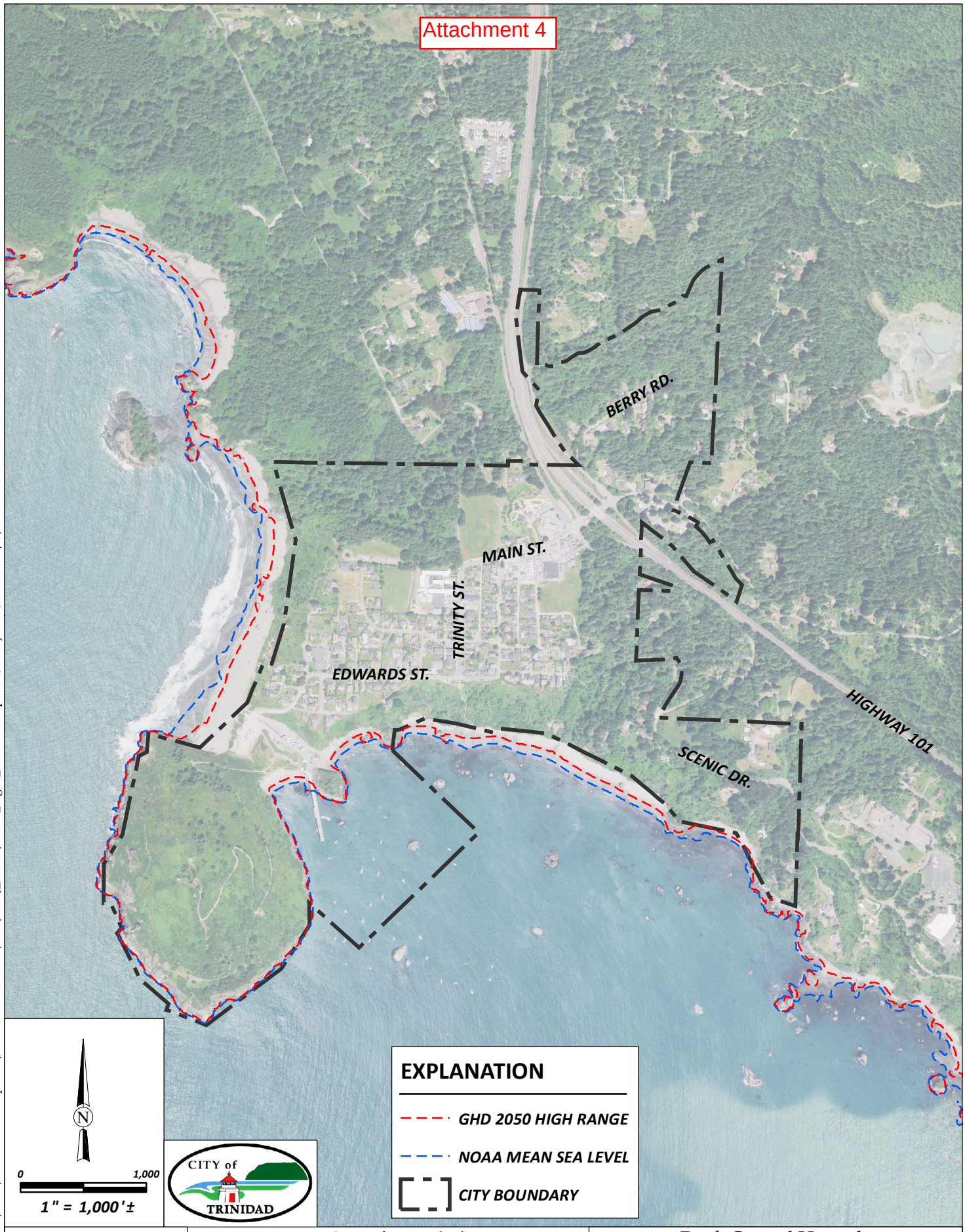
Attachment 4



City of Trinidad
Trinidad LCP Update
Trinidad, California

Draft Coastal Hazards

SHN 016118.002

November 2019 | LCPU_Fig18_HazardsMap | Figure 18

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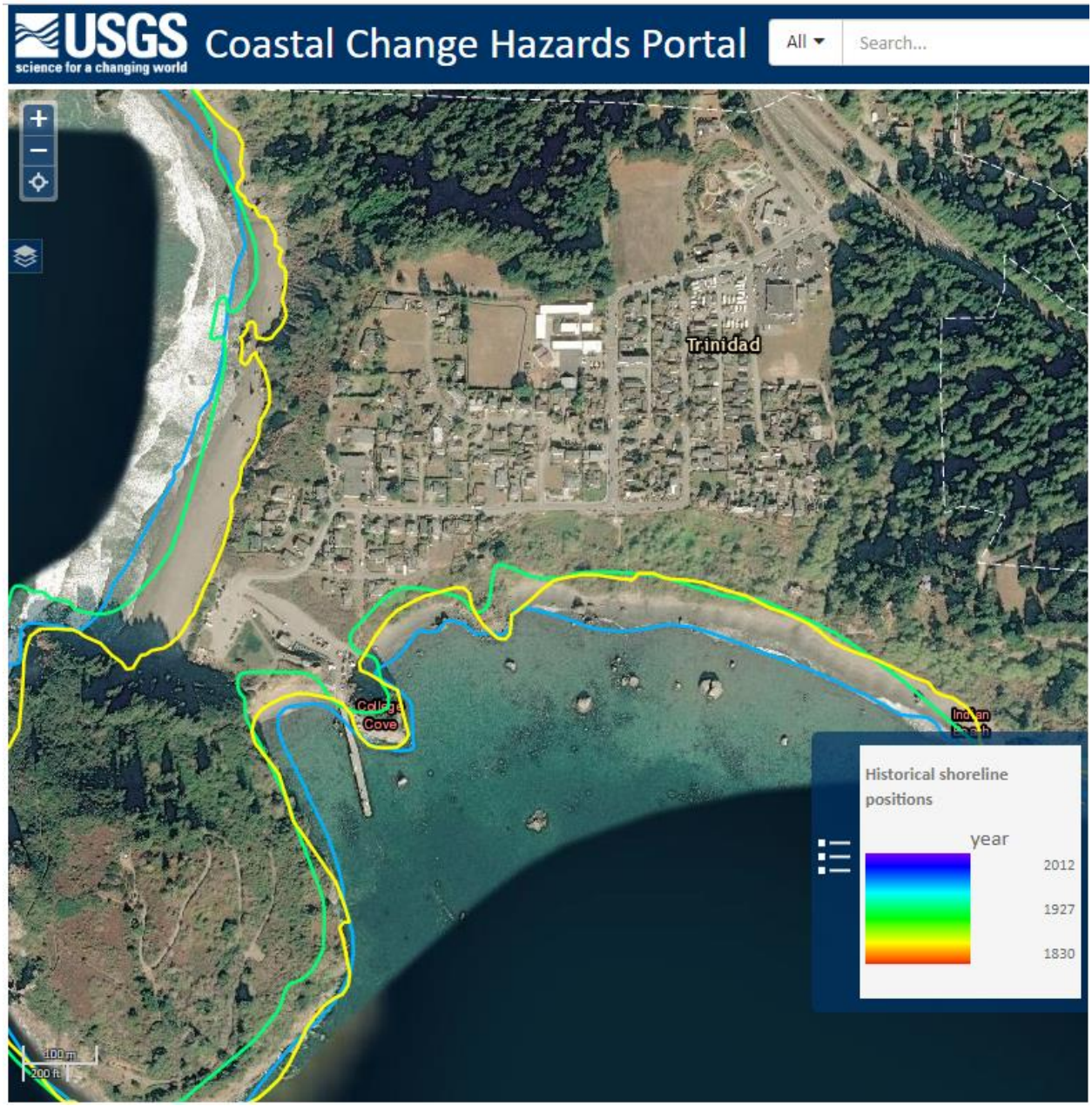
Attachment 5



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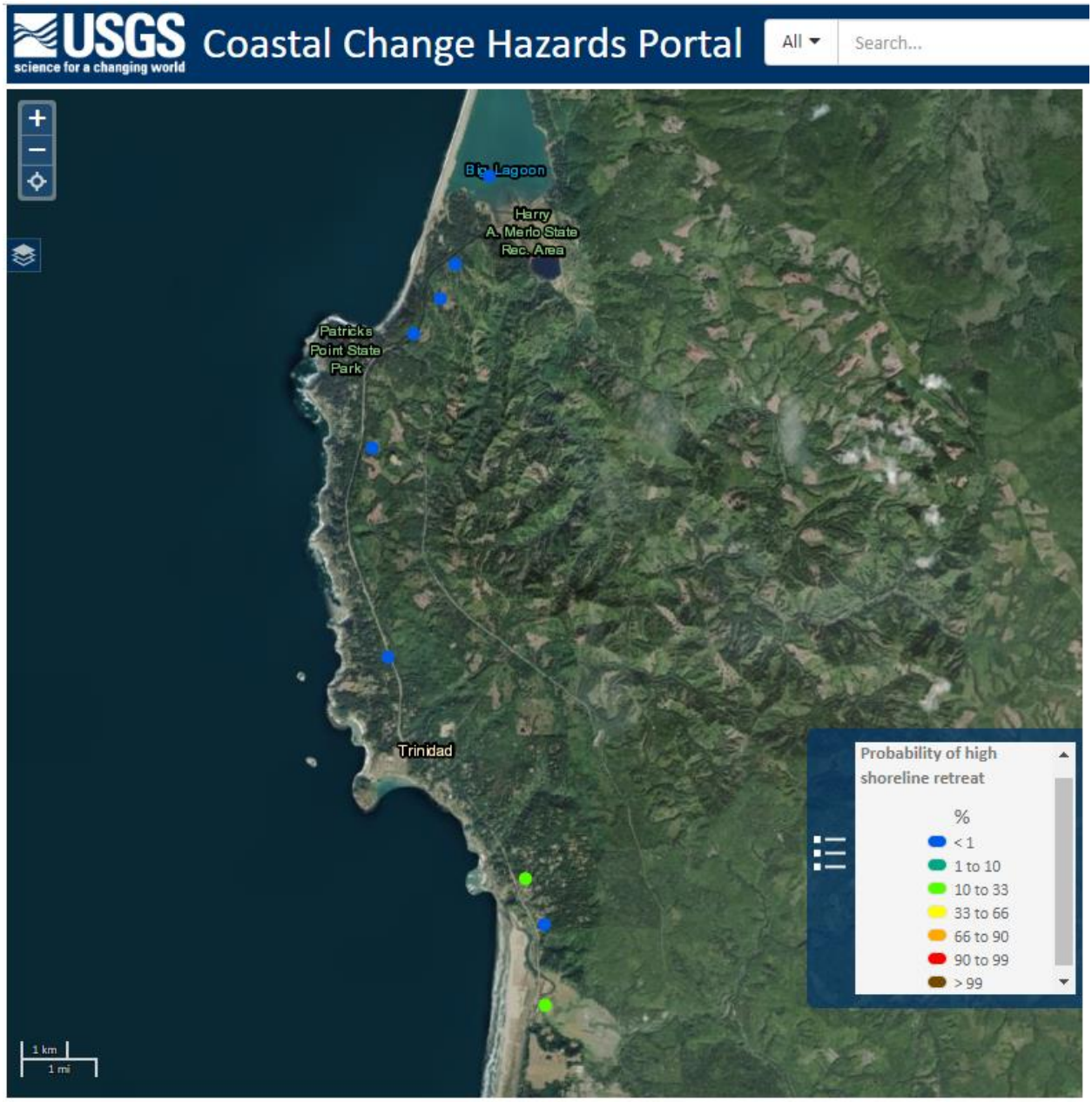

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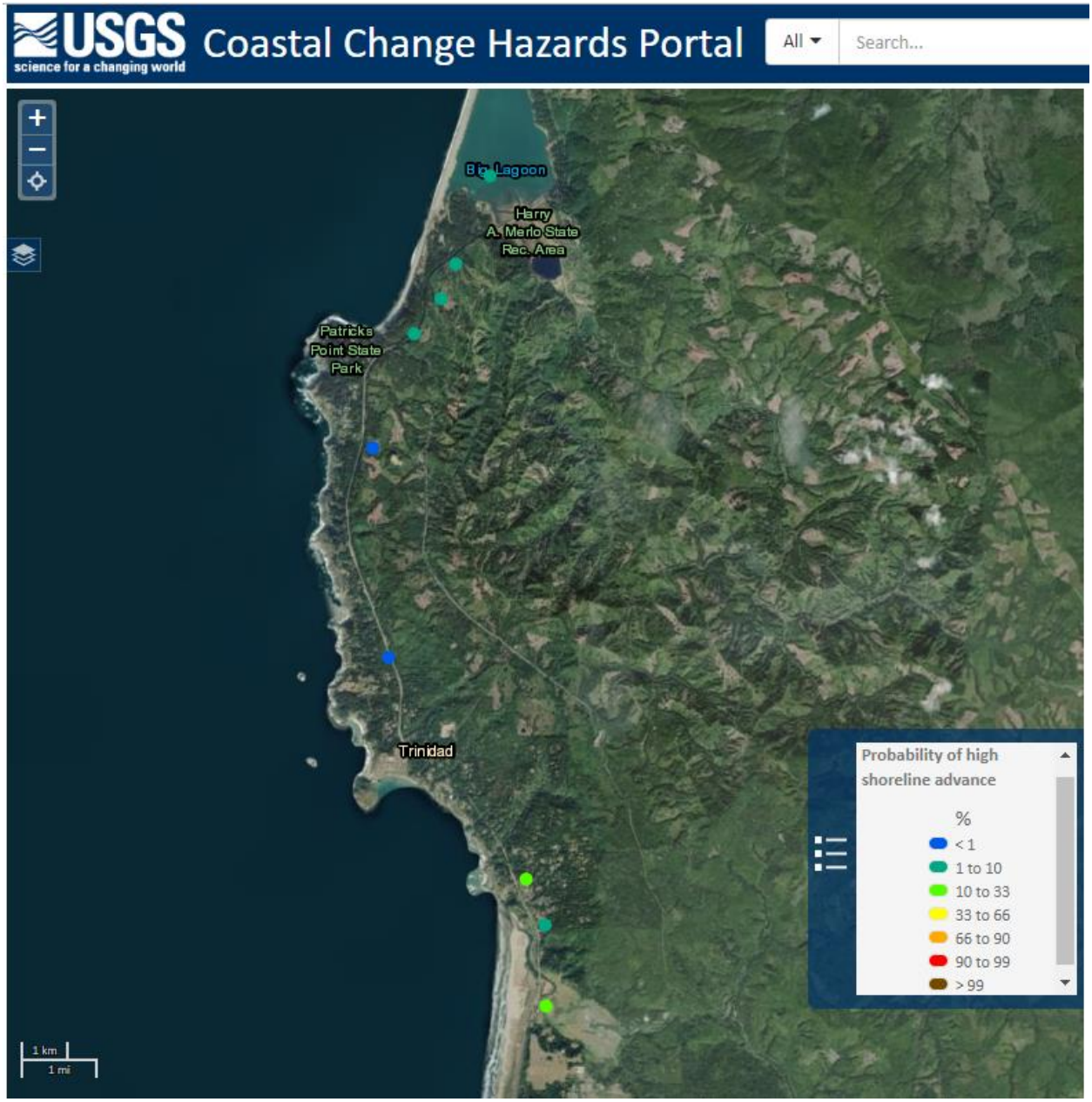

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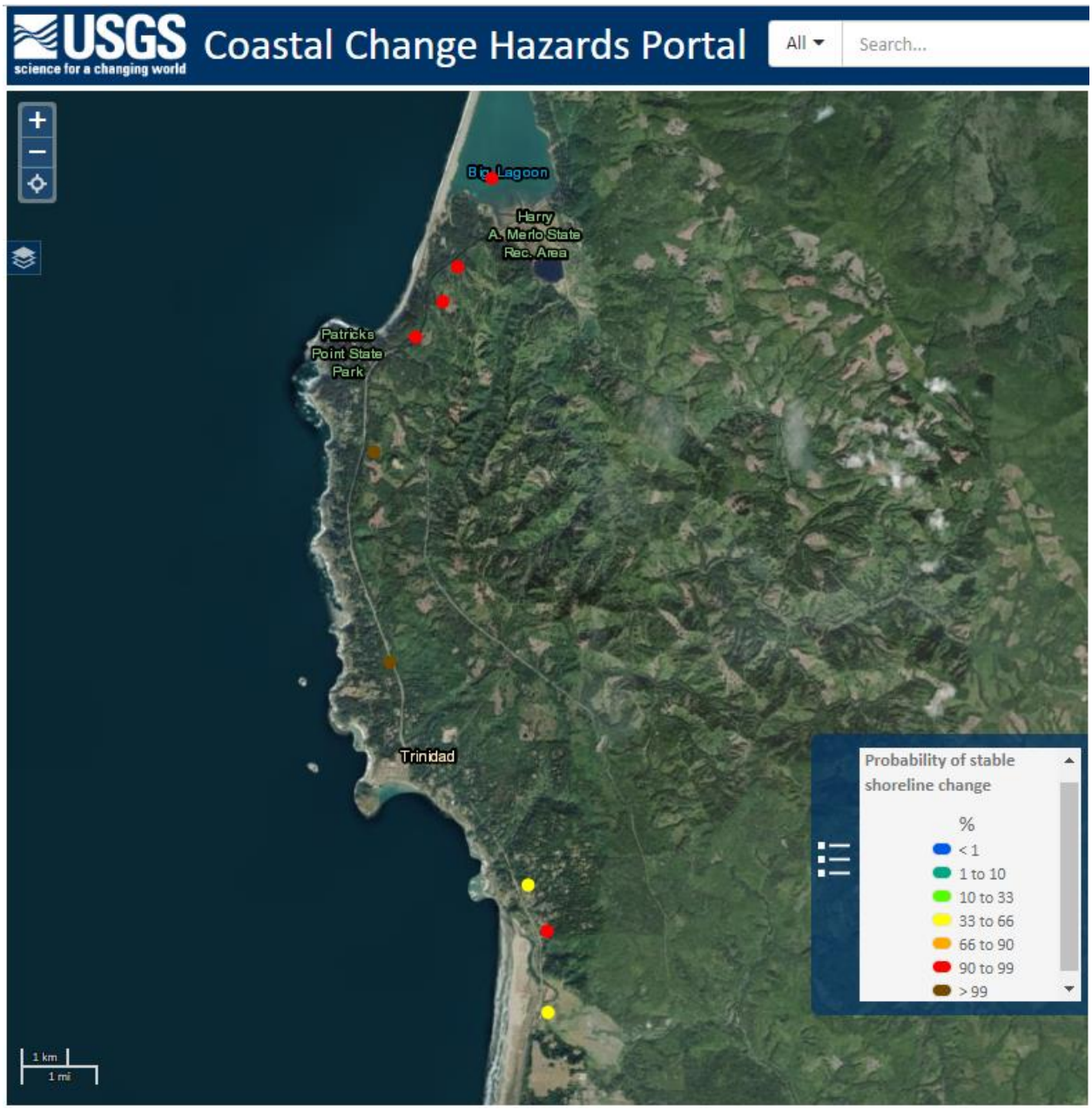

Attachment 9

NOISE & SAFETY ELEMENT

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A. PURPOSE

The Noise Element is one of the seven required elements of a general plan. “The purpose of the noise element is to limit the exposure of the community to excessive noise levels and that the noise element must be used to guide decisions concerning land use and the location of new roads and transit facilities since these are common sources of excessive noise levels” (Governor’s Office of Planning and Research, State of California General Plan Guidelines, October 2003, p. 87). State law specifically requires that the noise element show noise contours for highways and freeways, and primary arterials and major local streets, and “include implementation measures and possible solutions that address existing and foreseeable noise problems, if any” (Government Code Section 65302(f)).

The Safety Element is another of the seven required elements of a general plan. “The aim of the safety element is to reduce the potential risk of death, injuries, property damage, and economic and social dislocation resulting from fires, floods, earthquakes,

landslides, and other hazards. The safety element must identify hazards and hazard abatement provisions to guide local decisions related to zoning, subdivisions, and other entitlement permits" (Governor's Office of Planning and Research, State of California General Plan Guidelines, October 2003, p. 90).

B. NOISE ELEMENT

1. Noise Environment

Trinidad is a small community with minimal traffic and noise pollution, and the intent of the residents is to maintain those characteristics. Appropriate standards for maximum short-term noise levels vary with the type of land use and time of day. Acceptable daytime levels in industrial and commercial areas are typically based on a combination of health and nuisance considerations and typically do not exceed 85 dBA. In residential areas, standards are typically set to avoid the perception of nuisance, such as noise levels that block normal conversation. Noise level above 66 dBA requires raised voices to be heard at a distance of three feet. Indoor noise levels between 50 and 60 dBA can disturb sleep.

Other than Highway 101, other factors that influence the noise levels in Trinidad are low flying coast guard helicopters, emergency sirens, and on-site construction. Between wind and waves, Trinidad also has some substantial natural contributors to ambient noise levels. Noise can also come from private residences, commercial areas, tourists, etc. Excess noise complaints can be made to the proper authorities. Implementation measures and possible solutions include, but are not limited to: restricted operating hours, protective building design, and installing sound barriers.

Existing Conditions

Traffic Noise

Traffic noise depends primarily on the speed of traffic and the percentage of truck traffic. The primary source of noise from automobiles is high-frequency tire noise, which increases with vehicle speed. In addition, trucks and older automobiles produce engine and exhaust noise, and trucks generate wind noise. Trinidad is primarily affected by Hwy 101, only a small portion of which runs through City limits. Differences in elevation can amplify or dampen noise levels; for example, noise from a thoroughfare in a trough or valley between residential areas will be reflected upward and focused while noise from an elevated thoroughfare may dissipate. On flat ground, a buffer (such as a sound wall or dense vegetation) will greatly reduce noise escaping to surrounding areas. Background studies for the Humboldt County General Plan update indicate that Hwy 101 noise in the Trinidad area is not an issue; the highest noise levels are through Arcata, Eureka and McKinleyville, which all have substantially higher Average Daily Traffic Counts (ADTs), generally at least double. According to personal communication with CalTrans personnel in January 2001, the Highway 101 intersection noise contour is far below the threshold that would necessitate a noise reduction project.

City streets do not have high levels of traffic, and cars are generally moving at speeds less than 30mph. Trucks do have to drive through town to make deliveries to the harbor area, utilizing Main, Trinity and Edwards Streets.

Aircraft Noise

The California Division of Aeronautics is in charge of enforcing airport noise regulations for all airports within the state. The noise standards require that no residences, schools, hospitals or places of worship be within a Noise Impact Area. The California Airport Noise Standards (California Code of Regulations, Title 21) Division 2.5, Chapter 6, Section 5012 of Title 21 establishes that 65 dBA CNEL is the acceptable level of aircraft noise for persons living near an airport. Airport noise studies are performed for the Arcata Airport Master Plan, and the most recent study indicates that airport noise is not an issue in Trinidad. Aircrafts do occasionally fly over Trinidad, but their impact is minimal.

Stationary Noise Sources

On May 16 and August 23, 2012, City of Trinidad staff took noise readings at specific locations to address noise-compatible land use regulations. Planning staff informally surveyed community members and City employees to determine stationary noise sources in town in order to determine the most appropriate points to take noise readings. The results (Table NO-1) indicate that Trinidad does not have many substantial noise sources. In addition to Hwy 101, the main sources of noise are equipment such as refrigeration units by the market, the gas station and the marine lab. Other substantial noise sources include tourists, wind and waves. Note that the following noise readings were taken on an unusually calm days for wind and waves, though the lack of excess noise in the readings makes the readings more accurate. The results and locations are also presented in Figure 16.

On May 16 and August 23, 2012, City of Trinidad staff took noise readings at specific locations to address noise-compatible land use regulations. Planning staff informally surveyed community members and City employees to determine stationary noise sources in town in order to determine the most appropriate points to take noise readings.

Sensitive Receptors

Sensitive receptors are those that are most affected by noise. The California *General Plan Guidelines* lists schools, churches, convalescent homes, and sensitive wildlife habitat as sensitive receptors that should be identified in the General Plan. Residential areas in general are also noise receptors and must be considered in land use planning and noise generators. Other than residential areas, Trinidad has few sensitive receptors; these include Trinidad Elementary, and two churches, all of which are located near the central part of the town.

Table NO-1: Trinidad Noise Readings

City of Trinidad Noise Readings

		Reading (dB)		
Station	Time	Average	Max	Notes
May 16, 2012				
corner of Frontage Rd & Westhaven Dr	4:59pm	66	73	
Murphy's Market (@ refrigeration units)	5:05pm	80		
Murphy's Market (50 ft south)	5:07pm	59		
View Ave, southwest (kitty-corner) of Murphy's Market	5:06pm	55		
Ocean Avenue (AT&T substation)	5:10pm	40		multiple bird species chattering
Lighthouse, located on Edwards St (1° collector)	5:15pm	48		wind calm; ocean flat
Marine Lab (at the pumps)	5:20pm	63		pumps humming
State Beach (parking lot)	5:24pm	60		light wind
Seascape Restaurant	5:27pm	53		low tide; no waves; wind <5
Chevron Station (refrigeration unit)	5:35pm	55	60	max included car noise
Chevron Station (50 ft from propane tank)	5:37pm	64		
Patricks Point Dr (recycling area)	5:43pm	60	70+	max occurred during recycling activities
August 23, 2012				
State Beach (parking lot)	6:22pm	65		high tide; ocean 5-10
Trinidad Head - NOAA station (southern)	6:44pm	67		no wind
Trinidad Head - NOAA station (southern) @ 15ft	6:45pm	48		no wind
Trinidad Head - NOAA station (northern)	6:51pm	43		no wind
Trinidad Head - cellular facility (@ gate)	6:47pm	45		no wind

Noise and Land Use Compatibility Guidelines

The California *General Plan Guidelines* include guidelines for noise-compatible land use. The existing General Plan contains a table, Noise and Land Use Compatibility Guidelines, that is consistent with the current state guidelines. The following table addresses acceptable exterior/interior levels for stationary sources to assess impacts of new development or new sources of noise onto adjacent uses:

Table NO-2: Land Use Noise Compatibility Matrix

NOISE LEVEL PERFORMANCE STANDARDS FOR NEW PROJECTS AFFECTED BY OR INCLUDING STATIONARY SOURCES						
Land Use	**Exterior**			**Interior**		
Noise Level Description	7AM-7PM	7PM-10PM	10PM-7AM	7AM-7PM	7PM-10PM	10PM-7AM
Residences, Transient Lodging, Commercial, Nursing Homes						
Hourly L_{eq}	55 dB	50 dB	45 dB	45 dB	40 dB	40dB
Maximum	75 dB	75 dB	70 dB	65 dB	65 dB	60 dB
Auditoriums, Theaters, Libraries, Schools, Churches						
Hourly L_{eq}	55 dB	55 dB	50dB	40 dB	40 dB	40dB
Maximum	75 dB	75 dB	50dB	60 dB	60 dB	60dB

NOTE: L_{eq}= The energy equivalent level, defined as the average sound level over time on the basis of sound energy. dB-Decibel= A unit used to express the relative intensity of a sound as it is heard by the human ear.

2. Noise Element Policies

Goal NO-1: **Regulate noise based on zoning and activity while protecting the quality of life of residents, visitors and wildlife of Trinidad**

NO-1.1 Existing and potential incompatible noise levels in problem areas shall be reduced through operational or source controls where the City has responsibility for such controls. Land use planning, subdivision review, building code enforcement, and other administrative means shall be utilized as needed.

NO-1.2 New projects in the Mixed Use/downtown area, through site design and the use of the best available building technology, shall minimize the potential noise conflicts between commercial and residential uses.

NO-1.3 Noise created by new or proposed stationary noise sources or the expansion or alteration of an existing use shall be mitigated so as not to exceed noise level standards in Table NO-1 at adjacent land uses.

NO-1.4 The City shall identify and evaluate potential noise problem areas on a continuing basis.

NO-1.5 New development shall be designed and constructed to meet levels listed in chart.

> *Program NO-1.5.1* Consider applying noise standards to residential units in the Zoning Ordinance.

NO-1.6 The City shall lessen noise increases along the city's arterial and collector roads through project design of streets (including providing buffers to the extent feasible and screening), coordination of routing, and other traffic control measures if needed. (city of seal beach)

NO-1.7 Back-up generators are a pronounced source of noise. Generator noise shall be determined and included in the City Noise Ordinance.

NO-1.8 Noise from quarries and associated truck traffic shall also be included in the Noise Ordinance.

C. SAFETY ELEMENT

1. Safety Environment

California has a beautiful natural environment. Unfortunately, the spectacular natural features also present Californians with many potential natural hazards. Like much of the rest of the state, the Trinidad is susceptible to earthquakes, fires, landslides, and other natural disasters.

According to Government Code § 65302 (g), a Safety Element is for the protection of the community from any unreasonable risks associated with the effect of seismically-induced surface rupture, ground shaking, ground failure, tsunami, slope instability, subsidence, liquefaction and other seismic hazards, flooding, wildland and urban fires.

A report entitled "Environmental Conditions and Constraints" (Environmental Research Consultants) dated May 1976 identified such hazards and incorporated their analysis into the General Plan policies. Geologic conditions have not changed over the intervening years, though our knowledge about them has increased. For this General Plan update, two additional related reports were prepared: (1) Geologic and Seismic Characteristics of Trinidad (Kristen Martin, Streamline Planning Consultants, 2007); and (2) Soil Characteristics of the Trindiad Area, CA (Sam Polly, Streamline Planning Consultants, 2009) In addition, multiple, site specific geologic studies have been done since that time. There is no indication that more data is necessary. Changes to the existing General Plan consist primarily of including updated information (such as identification of the Alquist-Priolo Special Study Zone) or policies that improve the notification and restricts development to address these issues.

Earthquakes

A portion of the Trinidad area lies within a Special Study (Fault Rupture) Zone, as designated by the State Division of Mines and Geology under the Alquist-Priolo Act of 1972 (Fig. 9a). The zone encompasses about 60 acres, or 19% of the land within City limits. The purpose of the Zone is to ensure that local development patterns do not create seismic hazards; any new development of structures for human occupancy would be required to undergo a geologic study before a building permit would be issued. According to the Alquist-Priolo Act, no buildings may be constructed within 50 feet of any active fault in the zone. Trinidad is affected because there has been development within the boundary of the Alquist-Priolo zones. Much of the undeveloped land also falls in or near this zone. There are two fault zones within Trinidad shown on Fig. 17, the Trinidad head fault zone and the Anderson Ranch fault zone. The City has developed a list of parcels located in the Alquist-Priolo zone to use during the review of development proposals and/or become part of overlay zoning.

The current Uniform Building Code (UBC) released by the California Building Standards Commission put Trinidad in "zone 4," which has the highest standards for earthquake safety. The UBC sets standards for the seismic design of all structures in volume 1, chapter 16, division 3, sections 1624 through 1634, including "zone 4" properties. The

City continues to utilize the most recent standards and version of the UBC for the building permit process.

Ground shaking

Ground shaking is not an earthquake itself but the land's response to the readjustment of the strain in the earth's crust. Earthquakes originating inside or outside a planning area may cause ground shaking within that area. The degree of hazard depends on the severity of the shaking and the susceptibility of the buildings to damage. The severity of the shaking and the susceptibility of the buildings to damage, in turn, depend on geologic materials and structural conditions. Therefore, local geologic conditions such as depth to bedrock and groundwater, as well as building height and the type and age of construction, all affect the degree of hazard.

The earthquake hazard maps are not forecasts of the ground shaking that will occur in specific earthquake scenarios. However, they can be used to generally identify those areas which are most and least susceptible to violent ground shaking. Series of maps at a scale of 1:24,000 show regulatory zones around surface traces of active faults in California and are produced under the authority of the Alquist-Priolo Earthquake Fault Zoning Act for planning and controlling construction in these zones. Other scenarios and information are available at Earthquake Shaking Potential for California (California Geological Survey) 2008 which shows the relative intensity of ground shaking and damage in California from anticipated future earthquakes. Trinidad has been mapped in a region that is near major, active faults and will on average experience stronger earthquake shaking more frequently than several other areas in California. This intense shaking can damage even strong, modern buildings.

Unstable Slopes/Landslides

According to the Slope Stability Geologic and Seismic Characteristics of Trinidad Background Report (Streamline Planning, 2007), much of the area along the sea cliffs and coastal streams is unstable or of questionable stability. These and other unstable areas have been designated as Open Space or Special Environment on the previous Land Use Map and have been similarly designated.

Figure 9a illustrates the conditions of slope stability within and around Trinidad. The City transferred this information to its data base and developed a list of parcels that fall in the "questionable stability and unstable zone" category. This has been used during review of development proposals and will become part of overlaying zoning. Review of development proposals by qualified professionals is required by Zoning Ordinance provisions.

Unstable areas that were once designated Resource Production are now Special Environment (SE). SE designations and zoning requirements control development and other activities on in areas affected by hazards or environmental sensitive areas.

Steep slopes and unstable geologic material create erosion and landslide hazards in some of the Trinidad area. Coastal bluffs are especially subject to these hazards due to

continuous wave erosion. Development should be located far enough from the edge of the bluffs so that structures are not in danger of being undercut by wave activity in the design life of the project. Development should also be restricted in areas dominated by the Franciscan Complex, as these clay-rich materials are susceptible to earth flows and debris flows.

The *Geologic & Seismic Characteristics of Trinidad, CA* (Streamline Planning Consultants, 2007), states that slope failures triggered by ground shaking are likely to occur in areas where the water table is high and steep slopes exist, such as along terrace margins and road cuts. Any of the landslide types described under "stability characteristics" can be caused or accelerated by seismic shaking. According to the Division of Mines & Geology "*Planning Scenario in Humboldt and Del Norte Counties for a Great Earthquake on the Cascadia Subduction Zone*" (1995), which does not provide a detailed damage assessment for Trinidad, most of Highway 101 in Humboldt County would be closed for at least three days under a great earthquake scenario. It is reasonable to assume that landslides would be responsible for closing the portion of highway that runs through Trinidad.

Surface Rupture

Surface rupture commonly occurs during earthquakes in California because the earthquakes originate near the earth's surface. Ground on one side of the fault moves relative to ground on the other side, and any structures built across the fault trace will be deformed or destroyed. Displacement can be vertical, horizontal, or a combination of both. Displacement may vary from a few inches to several feet.

Erosion

As previously mentioned, the Franciscan bedrock that underlies Trinidad is composed of pieces of relatively resistant rock within a matrix of sheared, unstable material. Area geology is characterized by outcroppings of this material, especially at the coastline, and by the poorly consolidated alluvial deposits that cover the surfaces of the marine terraces. These different materials are subject to erosion and various types of slope failure.

Erosion of coastal bluffs is a concern because the coastline is continuously eaten away by ocean waves, particularly at high tide and during the winter storm season. In addition, sea level may be rising at an approximate rate of 1 mm per year, thus intensifying the effects of wave erosion (Streamline Planning Consultants, 2007). Evidence of past cliff retreat is seen in areas such as College Cove. This small bay was "carved" out of weak Franciscan matrix material, and according to aerial photographs, the shoreline retreated at a rate of 0.4 m per year between 1942 and 1974. Cliff retreat has also been documented as actively occurring at the Tsurai Village site located in the City of Trinidad in the Engineering Geologic Assessment of the Tsurai Village (LACO Associates, 2004).

Tsunamis and Seiches

Tsunamis (earthquake induced surges of ocean water) are a possible hazard in the Trinidad area. The Humboldt County coast is well known for frequent earthquakes due to the proximity of the Cascadia Subduction Zone. Areas less than 20 feet above Mean Lower Low Water*, except lands devoted to harbor improvements and public access facilities, have been designated as Open Space or Special Environment to reduce or prevent damage to from tsunamis. *Tides are most commonly *semi-diurnal* (two high waters and two low waters each day), and the two low waters on a given day are typically not the same height (the daily inequality), comprising the *higher low water* and the *lower low water*.*

Flood Hazards

The only flood hazard zone available is mapped by the County. This zone is located on Mill Creek on the eastern edge of the City boundary. The area extends about 1,640 feet up Mill Creek from its intersection with Highway 101 and 350 feet downstream from the intersection. FEMA did not map flood areas for Trinidad because its steep slopes render the risk of flooding is generally nonexistent. FEMA and the City of Trinidad have an agreement that flood insurance is unnecessary in this area, and thus Trinidad and its surrounding State beaches are not included on the National Flood Insurance Maps. Though no flood zones are mapped in Westhaven, some areas may have potential for flooding, but it would probably be more related to a storm drainage issue. For further information, flood zones can be viewed on County of Humboldt's web GIS portal (gis.co.humboldt.ca.us/).

Fire Hazards

Trinidad is susceptible to wildfires, urban fires, and wildland-urban interface fires where the two areas meet. The California Department of Forestry and Fire Protection (http://www.fire.ca.gov/fire_prevention/fhsz_maps/fhsz_maps_humboldt.php) has mapped areas of significant fire hazards, ranging from moderate to very high, and based on fuels, terrain, weather and other relevant factors. The eastern portion of the City of Trinidad—mostly along Westhaven Dr.—and the eastern rim of the Trinidad Planning Area boundary have a high fire rating. A vast majority of the rest of the Planning Area has a moderate fire rating (Fig. 18). An alternate fire rating map exists in the Humboldt County Master Fire Protection Plan, August 2006, which is being used as the basis for the Humboldt County General Plan, and those zones are also mapped in Figure 18.

The City of Trinidad is built out and natural conditions exist primarily on the edges and bluffs. Westhaven has extensive tree, brush and grass cover and this vegetation coverage—combined the influence of wind and steep slopes—contribute to the fire hazard probability, but the relative humidity of the area is a lessening factor. The majority of Open Space zones within the City limits are not mapped at all on CAL FIRE's fire hazard map, but a small section of the Open Space zone and the entirety of the Special Environment zone are mapped with a high fire risk on the County's fire plan maps.

The Pacific Ocean to the west and the street grid in Trinidad act as a fire break within City limits. Highway 101, Scenic Road, and Westhaven Road are the major roads that contribute to fuel breaks within the Planning Area. The major fire breaks tend to run north to south, but smaller, secondary roads and streets run west-east and have the ability to break fire paths.

For the 9.9 square miles of the Trinidad Planning Area, there are two volunteer fire departments—one in Trinidad proper and the other in Westhaven. CalFire is also stationed on Patrick Point Drive and they respond to emergencies like wildland and structure fires, floods, earthquakes, hazardous material spills, and medical aids. Mutual aid agreements exist between all of the stations, continuing the agreement from the 1980s generated from a fire in Trinidad State Park that threatened residences along Underwood Drive.

Structural Fires demand immediate response from a combination of onsite and Fire Department resources in order to minimize injury and damage. Fire suppression devices such as extinguishers and sprinklers are important for initial response, reduce fire insurance premiums, and satisfy operations requirements for certain types of businesses. These devices are encouraged in new and renovated non-residential buildings and in all residential structures with more than four units, even when not required by fire and building code. Buildings near forested areas should consider using materials such as non-flammable perimeter vegetation and roofing material to prevent exposure to wild land fires. The City and Trinidad Volunteer Fire Department should continue to take an active role in reviewing new development for compliance with fire safety standards.

The City will continue to incorporate requirements to ensure that driveways, turn-arounds and other access ways have sufficient state-standard width, vertical clearance, and turn-around space for fire-fighting vehicles (osfm.**fire**.**ca**.gov/). Roadways should have an all-weather surface. Road grades should not exceed the Fire Department's maximum slope standards for emergency access. The City should maintain fire hydrant space so that no residential structure is more than 500 feet from a hydrant and no commercial structure is more than 300 feet from a hydrant. Each hydrant should have adequate fittings and be capable of providing adequate water flows to meet Fire Department standards. All buildings should have adequate lighting, street numbering, and access to ensure rapid response.

The City's water supply is provided via Luffenholtz Creek and stored in two 150,000 gallon redwood tanks as part of the filtration process. Based on the *Evaluation of Luffenholtz Creek Diversion Capacity – Trinidad Water System & Proposed Moss Minor Subdivision Project* by LACO Associates in 2009, the available creek flows in Luffenholtz Creek exceed the average and maximum day demands of the Trinidad water system. The evaluation also reported that the City also uses less than 75% of the water available during dry weather flows, implying that there is an adequate supply or storage of water for fire suppression needs. Turbidity is an issue, however. Trinidad's water treatment plant cannot process raw water during periods of elevated turbidity.

Prolonged elevated turbidity can impact the City's water supply and water reserves for emergency fire suppression (*Trinidad-Westhaven Integrated Coastal Watershed Management Plan (ICWMP),* City of Trinidad*,* May 2008). The City is currently working on developing plans and obtaining funding to improve the existing water system to address the concerns noted above, particularly because turbidity standards have increased. Future water supply needs are already assessed for development in the City, especially because it is built out, but proposed subdivision projects in the Planning Area require a water supply assessment.

Westhaven has its own water supply. The Westhaven Community Service District (WCSD) is the second largest water supplier in the Trinidad Planning Area and obtains its water from local springs and a groundwater well (City of Trinidad, *Trinidad-Westhaven Integrated Coastal Watershed Management Plan (ICWMP)* (May 2008))Water is stored in a 100,000 potable water storage tank used to supply the entire water system. The Westhaven Fire Department draws water from that supply and thus far, the water supply has been more than adequate for fire suppression needs to date.

Hazardous Materials

State of California legislation AB294B (Tanner) and Government Code Section 41500 et seq. requires that cities adhere to countywide hazardous waste management plans and apply local implementation of applicable actions of the County plan in the General Plan.

There are several sources of hazardous materials that can affect Trinidad. Fuel oil spills are a constant threat from towing, parking and operation of fleet vehicles, visitor/ resident/patron parking and delivery vehicles. Business and household hazardous waste has a tendency to accumulate in and around residential areas in the form of cleaners, solvents, lubricants, paints, and adhesives. Machinery/appliance leaks from businesses or construction sites can potentially be uncontained. If these materials are not properly disposed of or recycled they present a serious threat to the health and well-being of the residents and the environment.

The State Water Resources Control Board (State Water Board), under its Resolution No. 74-28, designated certain Areas of Special Biological Significance (ASBS) in the adoption of water quality control plans for the control of wastes discharged to ocean waters. Areas to the north and south of Trinidad Head were designated as ASBS because of the fluctuating presence of bull kelp beds, *Nereocystis luetkeana*. Since 1983, the California Ocean Plan has prohibited the discharge of both point and nonpoint source waste to ASBS. The Trinidad Pier was constructed in 1946 and its Douglas-fir piles were treated with creosote and the decking was pressure treated. Creosote is composed of a mixture of chemicals that are potentially toxic to fish, other marine organisms and humans. Since construction, the pier has deteriorated, leaching chemicals into the water. However, the pier location is not listed on the current Hazardous Waste and Substance Site List at the Department of Health and Human Service, Agency for Toxic Substances & Disease Registry, or by the California Department of Toxic and Substance Control, Hazardous Waste and Substance Site List. The pier is also currently being rebuilt (2012) and will combat chemical leeching by

being constructed of cast-in-steel-shell (CISS) concrete piles and pre-cast concrete decking, respectively.

Air Quality
Emissions of pollutants from motor vehicles, industrial uses, and other sources can be injurious to people's health. Policies and programs to protect the City's air quality are included in the Circulation element.

2. Disaster Preparedness

California State Law requires that all cities and counties adopt a Comprehensive Emergency Plan. The purpose of this plan is to outline policies and procedures with respect to significant events occurring within or threatening the community which would require the deployment of extraordinary resources for the protection of life and property.

The City has an adopted *City Emergency Plan.* The purpose of this plan is to ensure that the City will be prepared to respond effectively in the event of emergencies to save lives, restore and protect property, repair and restore essential public services, and provide for the storage and distribution of medical, food, water, shelter sites, and other vital supplies to maintain the continuity of government.

State Highway 101 to the north and south, Westhaven Drive to the east and south, and Patrick's Point Drive to the north are considered evacuation routes from the planning area in the event of a major disaster. Due to the slippage potential on Scenic Drive, this road is considered only as a last resort. Stagecoach Road is not recommended for designation due to its narrow width. Trinity Street, Edwards Street, and Main Street are essential to through-City evacuation. These routes should be kept passable in major emergencies recognizing that the type and location of the disaster will determine which routes will be most needed and available for use. There are no evacuation route signs, but in the event of an emergency, Trinidad's small size makes for an obvious flow of traffic out of town.

Trinidad's street pattern is adequate for emergency vehicle access. Most streets and alleys can accommodate large emergency vehicles and have done so to date. Streets such as Pacific and Azalea are being updated in 2012 to accommodate emergency vehicles.

Since serious flooding to the north (Big Lagoon, Klamath River) and south (Little and Mad Rivers) of the planning area can effectively cut off vehicle access, large vacant lands should be designated for points of refuge or as emergency helicopter landing areas. Further, the City should coordinate its disaster preparedness planning with surrounding jurisdictions for mutual assistance.

Training in the Standardized Emergency Management System (SEMS) implementation, is necessary to receive reimbursement from the State of California for disaster response related costs. This training includes instruction about the Incident Command System (ICS), which is used to manage emergency incidents or non-emergency events.

The applications for the incident command system (ICS) include:

- Fires, hazardous materials (HAZMAT), and multi-casualty incidents.
- Multi-jurisdiction and multi-agency disasters.
- Wide area search and rescue missions.
- Pest eradification programs.
- Oil spill response and recovery incidents.
- Single and multi-agency law enforcement actions.
- Air, rail, water, and ground transportation accidents.
- Planned events (celebrities, parades, concerts).
- Private sector emergency management programs.
- State or local major natural hazards management.

Adequate shelter and continued operation of essential services, including communications, medical treatment, water delivery, fire and police services, and key transportation facilities are vital for responding to emergencies. These facilities and services need to be located and designed to withstand disaster impacts and have backup systems, such as emergency generators and water storage (including private and open water sources), that allow for their continuous operation during emergencies. These critical facilities should not be located in areas with high physical hazards. Critical facilities should be designed to be functional at peak capacity, following a magnitude 7.7 earthquake.

The Humboldt County Sherriff's Office is contracted with the City of Trinidad for police response. A possible constraint to police response may lie in adequate staffing to meet the response needs of both the existing and future population. Police response can be and is assessed at contract renewal dates.

Tsunami signs have been approved by the City for installation. Other safety hazards in the home and unpreparedness for an earthquake or other disasters can all be reduced by providing information to the general public. Hazard reduction information is particularly effective when presented in the schools. Public safety officials should continue to work with school administrators to ensure that this important information is reaching students and that frequent fire drills are conducted to illustrate appropriate disaster response at school.

3. Safety Element Policies

Hazards & Safety Policies

GOAL SAF-1: Reduce and minimize impacts of development on bluff tops and shoreline features and other areas that can contribute to hazardous conditions.

SAF-1.1 New development shall: (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard; and (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction

of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.

SAF-1.2: All ocean-front and bluff top development shall be sized, sited and designed to minimize risk from wave run-up, flooding, and beach and bluff erosion hazards, and avoid the need for a shoreline protective structure at any time during the life of the development.

SAF-1.3 Limit development on the bluff face and within the bluff retreat setback because of the fragility of this environment and the potential for resultant increase in bluff and beach erosion due to poorly-sited development.

SAF-1.4 Require that development in areas with identified slope stability constraints to be subject to supervision and certified by a geologist, geotechnical engineer, or engineering geologist to eliminate or minimize hazards.

SAF-1.5 Land divisions, including subdivisions, lot splits, lot line adjustments, and conditional certificates of compliance which create new shoreline or bluff top lots, shall not be permitted unless the subdivision can be shown to create lots which can be developed without requiring a current or future bluff or shoreline protection structure. No new lots shall be created that could require shoreline protection or bluff stabilization structures at any time.

SAF-1.6 Minimize, to the maximum feasible extent, alterations to cliffs, bluff tops, faces or bases, and other natural land forms in the Coastal Zone. Permit alteration in landforms only if erosion/runoff is controlled and either there exists no other feasible environmentally superior alternative or such alterations re-establish natural landforms and drainage patterns that have been eliminated by previous development activities.

SAF-1.7 Coastal bluff management considerations address vegetation management, scenic vistas, trail maintenance, and unauthorized activities such as ‘piped discharges’ of stormwater runoff, disposal of grass and yard wastes over the bank, carving into bluff faces and trespassing on sensitive areas. Public education, combined with ordinance provisions, is the best method for addressing these concerns.

SAF-1.8 City and County Zoning Ordinances should require a use permit for timber harvesting (as defined in the Forest Practices Act) within or nearby unstable lands or lands of questionable stability.

Goal SAF-2: Reduce the risk of loss of life, personal injury, and damage to property resulting from seismic hazards.

SAF-2.1 The City shall utilize its Alquist-Priolo (Fault Rupture) Study Zone to identify parcels that must comply with the provisions of the State Alquist-Priolo Act and comply with conditions of project approval to mitigate for potential seismic hazards for structures.

Program SAF-2.1.3 Monitor and review existing critical, high priority buildings to ensure structural compliance with seismic safety standards.

Program SAF-2.1.4 Provide information to the public on protection or damage reduction from earthquakes.

SAF-2.2 Continue to comply with State law regarding reinforcing unreinforced masonry structures.

SAF-2.3 Require professional inspections of site development during construction on those sites specified in soils, geologic, and geotechnical studies as being prone to moderate or high levels of seismic hazard.

Program SAF-2.2.1 Require monitoring, repair, stabilization, or avoidance of active or potentially active landslides, areas of soil creep, or areas with possible debris flow as a condition of project approval.

SAF-2.4 Structures, septic tank systems, access roads, and driveways shall not be located on unstable lands, as defined by the Soils Limitations Map (Fig. 9). Structures, septic tank systems and driveways should only be permitted on lands of questionable stability (or when outside the City within 100 feet upslope of unstable lands or lands of questionable stability) if analysis by a registered geologist, or civil engineer with soils expertise indicates that the proposed development will not significantly increase erosion, slope instability or sewage system failure.

SAF-2.5 Volunteer Fire Department personnel, the California Department of Forestry, and the City and County Building Inspectors should warn property owners to inspect flues and chimneys for damage after moderate and large earthquakes prior to their use. Occupied structures that appear to have been seriously damaged should be inspected and evacuation required if they are found unsafe and until such time that the problem has been remedied.

SAF-2.6 Minimize development in areas subject to tsunami.

SAF-2.7 Except for existing harbor and public access facilities and shoreline protection structures, no new permanent structures shall be located less than 20 feet above Mean Lower Low Water.

SAF-2.8 Review development proposals to ensure that new development is not in an area subject to tsunami damage and if such development is otherwise allowable that it is designed to withstand tsunami damage.

Program SAF-2.8.1 Identify and map potential tsunami inundation zones for land use planning.

Program SAF-2.8.2 Review and update tsunami preparation response policies/practices to reflect current inundation maps and design standards, and submit these updated policies to the Coastal Commission for certification.

Program SAF-2.8.3 Allow the necessary testing to ensure the tsunami siren and other public hazard warning technology is properly functioning.

Program SAF-2.8.4 Develop a local response plan and/or participate in any regional effort to develop and implement workable response plans for distribution of information on tsunami alerts, watches, and warnings, to appropriate emergency responders and City personnel.

Program SAF-2.8.5 Develop and implement a tsunami educational program for residents, visitors, and people who work in the susceptible areas.

Goal SF-3 Reduce the risks from flooding.

SAF-3.1 Ensure adequate standards for development in the 100-year floodplain.

Program SAF-3.1.1 Maintain and update as necessary the zoning and building code standards and restrictions for development in identified floodplains and areas subject to inundation by a 100-year flood.

Program SAF-3.1.2 Ensure all development in flood prone areas meet Federal, State, and local requirements.

SAF-3.2 Continue to maintain effective storm water flood drainage systems and regulate construction to minimize flood hazards.

Program SF-3.2.1 Create a Storm Drain Master Plan.

SAF-3.3 Require, as determined by City staff, analysis of the cumulative effects of development upon runoff, discharge into natural watercourses, and increased volumes and velocities in watercourses and their impacts on downstream properties. Include clear and comprehensive mitigation measures as part of project approvals to ensure that new development does not cause downstream flooding of other properties.

Goal SAF-5 Reduce fire hazards.

SAF-4.1 To ensure urban fire safety, the City shall enforce the Uniform Building and Uniform Fire Codes (UBC & UFC) currently in effect.

SAF-4.2 Upgrades to the City's water supply system shall consider needs from future abatement purposes. Other sources of water, including open-water areas, should

be identified for fire-fighting personnel. Fire hydrant spacing and other safety features shall be considered in review of new development projects.

SAF-4.3 Review all development proposals for fire risk and require mitigation measures to reduce the probability of fire.

SAF-4.4 Continue to implement an effective and environmentally-sound vegetation management and weed abatement program.

Goal SAF-5 Protect life and property from adverse effects of the transportation, storage, treatment, and disposal of hazardous materials.

SAF-5.1 Manage activities within the City that transport, use, store, or dispose of hazardous materials in a responsible manner which protects public health and safety.

SAF-5.2 Promote the availability of safe and legal options for the management of hazardous wastes generated by businesses, households and construction sites within the City.

SAF-5.3 Promote community education and understanding of sound management practices for the storage, handling, use, and disposal of hazardous household materials.

SAF-5.4 Enforce the requirement that industrial facilities and construction sites have adequate Hazardous Materials Handling and Spill Response Plans to ensure that the goals of pollutant control are consistent with the City's public safety needs and the General Plan's water quality objectives.

<u>Emergency Preparedness & Services Policies</u>

Goal SAF-6 Ensure emergency preparedness.

SAF-6.1 Maintain an updated Emergency Plan.

SAF-6.2 New and renovated structures, as well as streets, driveways, and alleyways, shall be designed to provide adequate entry and exit by emergency vehicles and personnel. This includes visible street numbering, emergency vehicle turn-arounds, accessible building entry points and stairways, lighting, and interior evacuation routes.

> *Program SAF-6.2.1*: Establish an emergency evacuation route system that assesses and indicates street identification, street widths, and grade standards for the evacuation route system for all hazards.

SAF-6.3 Work with Green Diamond Resource Company, or the current owner of the timberland to the east of the City, to provide access to residents to logging roads as an alternative route to Hwy 101 in the case of an emergency that compromises Hwy 101. (CIRC-1.9)

Goal SAF-7 Maintain effective police services.

SAF-7.1 Consider the impacts on the level of police services of large development proposals in the environmental review and planning process. (City planning suggestion)

SAF-7.2 Utilize shared resources to provide/improve police response. (ft bragg)

Program SAF-7.2.1: Periodically review police needs in the City.

Goal SF-8 Maintain an effective medical emergency response system.

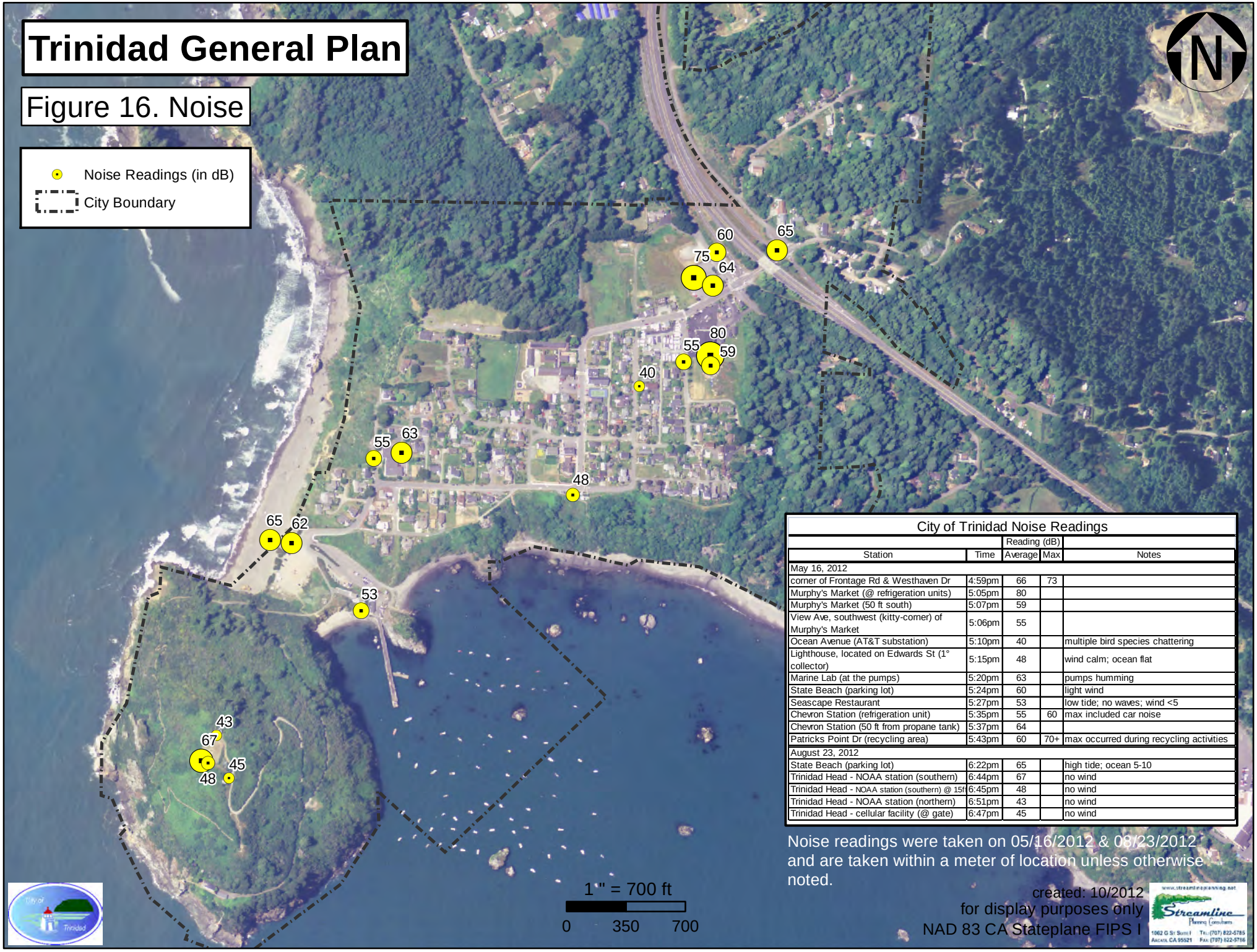
SAF-8.1 Ensure that residents are provided the shortest response time available for emergency medical response.

Program SAF-8.1.1 Periodically review the emergency medical response system.

SAF-8.2 The City shall maintain a mutual aid agreement with CalFire to ensure rapid response to wildland fires within the Trinidad Planning Area.

Trinidad General Plan

Figure 16. Noise



City of Trinidad Noise Readings

Station	Time	Reading (dB) Average	Max	Notes
May 16, 2012				
corner of Frontage Rd & Westhaven Dr	4:59pm	66	73	
Murphy's Market (@ refrigeration units)	5:05pm	80		
Murphy's Market (50 ft south)	5:07pm	59		
View Ave, southwest (kitty-corner) of Murphy's Market	5:06pm	55		
Ocean Avenue (AT&T substation)	5:10pm	40		multiple bird species chattering
Lighthouse, located on Edwards St (1° collector)	5:15pm	48		wind calm; ocean flat
Marine Lab (at the pumps)	5:20pm	63		pumps humming
State Beach (parking lot)	5:24pm	60		light wind
Seascape Restaurant	5:27pm	53		low tide; no waves; wind <5
Chevron Station (refrigeration unit)	5:35pm	55	60	max included car noise
Chevron Station (50 ft from propane tank)	5:37pm	64		
Patricks Point Dr (recycling area)	5:43pm	60	70+	max occurred during recycling activities
August 23, 2012				
State Beach (parking lot)	6:22pm	65		high tide; ocean 5-10
Trinidad Head - NOAA station (southern)	6:44pm	67		no wind
Trinidad Head - NOAA station (southern) @ 15ft	6:45pm	48		no wind
Trinidad Head - NOAA station (northern)	6:51pm	43		no wind
Trinidad Head - cellular facility (@ gate)	6:47pm	45		no wind

Noise readings were taken on 05/16/2012 & 08/23/2012 and are taken within a meter of location unless otherwise noted.

created: 10/2012
for display purposes only
NAD 83 CA Stateplane FIPS I

Trinidad General Plan

Figure 17. Geologic Stability

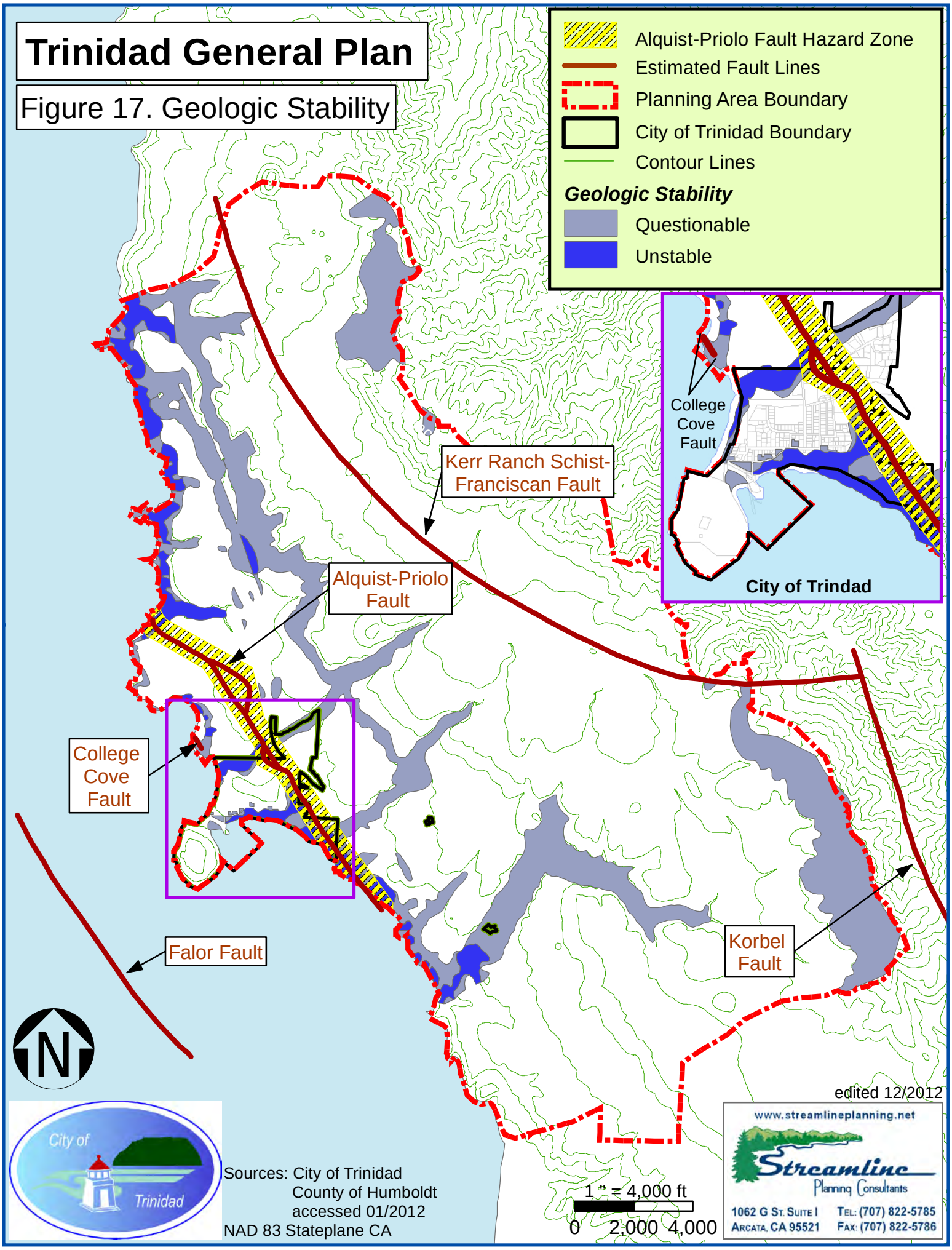


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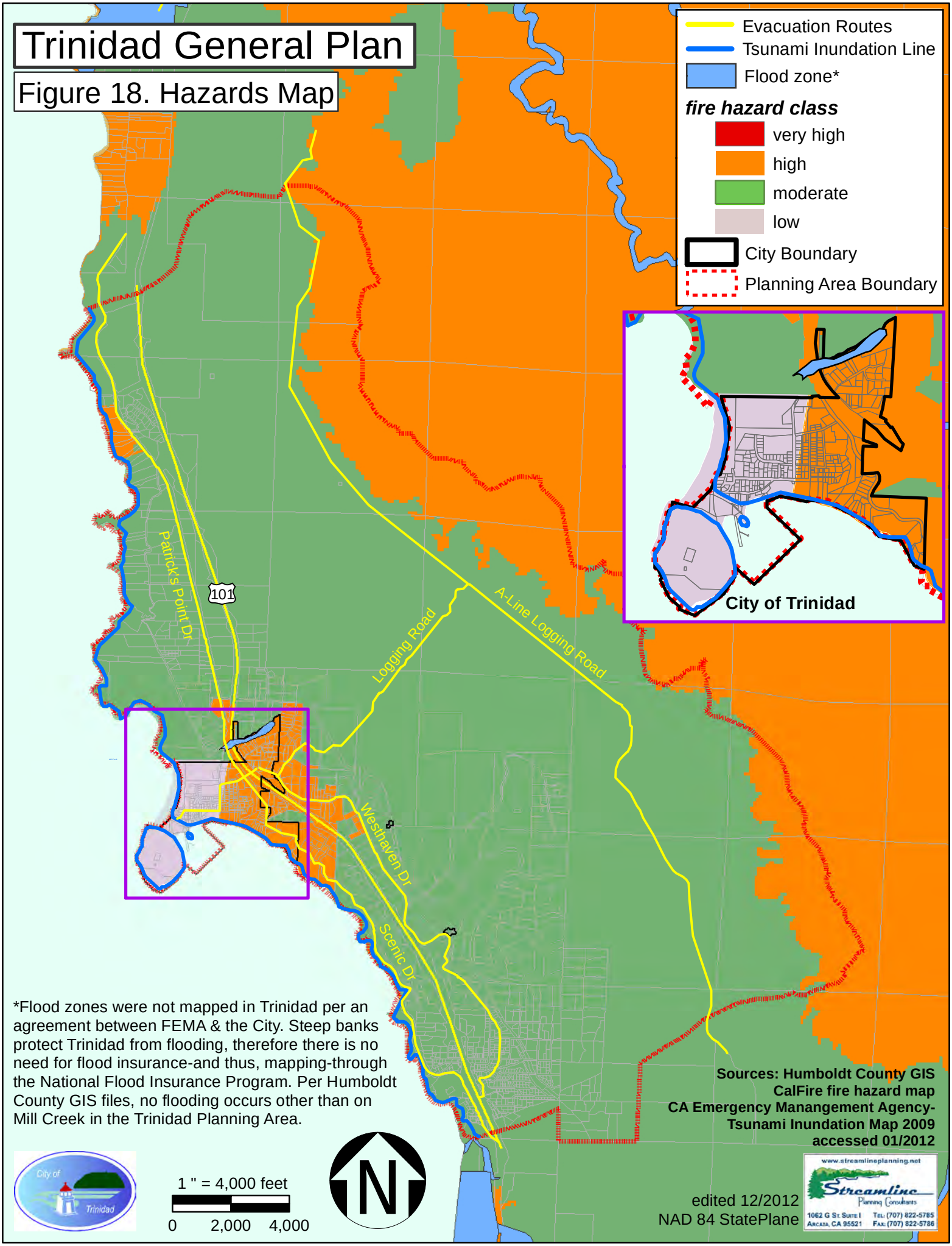
Figure 18. Hazards Map



*Flood zones were not mapped in Trinidad per an agreement between FEMA & the City. Steep banks protect Trinidad from flooding, therefore there is no need for flood insurance-and thus, mapping-through the National Flood Insurance Program. Per Humboldt County GIS files, no flooding occurs other than on Mill Creek in the Trinidad Planning Area.