1. Project Objectives

This study addresses a potential Class I trail connection from Green Island Road on the west side of Highway 29, along the undercrossing of Highway 29 known as Paoli Loop, to connect to Watson Lane on the east side of the Highway, as illustrated in Figure 1. Through NVTA the City of American Canyon has applied for an OBAG 2 grant for a Class I bike path on Green Island Road and is also studying the Vine Trail alignment on Devlin Road, but the Paoli Loop is a gap in the route study. A peripheral factor is a Caltrans study of the long-term potential to connect Green Island Road east - west to Highway 12.

The objective of the study is to document the conditions and highlight the significant opportunities and constraints along the route and alternative alignments (i.e. where to cross; what side of road to follow), and summarize and compare them to facilitate further discussions, planning, and potentially decisions, and negotiations.

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Figure 1: Study Area and Route
2. Trail Alignment Study by Segment

On April 13, 2018, TrailPeople staff visited Paoli Loop to study current conditions and potential trail alignment, particularly the conditions around the intersections and under the bridge. TrailPeople staff noted and measured the width of existing sidewalks, spaces and other conditions along both sides of Paoli Loop Road. Photos of the Paoli Loop and specific features and conditions help document the alternative alignments. The route description starts at Green Island Road and proceeds counterclockwise around the Loop.

2.1 Paoli Loop Road and Green Island Road Intersection

Near the first segment of the proposed trail along Paoli Loop on the west side south of Green Island Road there is a 30-foot-wide landscaped frontage fronting the Colliers Business Center. Based on the property boundary layer from Napa County GIS data, this landscape frontage is in the public ROW. However, it is not practical to remove the existing walls, lawns, trees and other features to make space for the Vine Trail. The most logical place for a crosswalk on Green Island Road is on the east side of the intersection, to avoid the significant portion of the traffic to/from Paoli Loop that is headed west on Green Island Road.

2.2 Paoli Loop Road Western Portion Connection

There are no sidewalks or other pathway facilities on the west side of this portion of Paoli Loop Road. There are numerous other obstructions in the ROW on the west side of Paoli Loop further south. The less constrained option for this segment of the trail is to use the space on the east side of Paoli Loop Road. There is a continuous space on the east side of Paoli Loop, the southern portion of which has 8 feet of A.C. paving. The space from the 6-foot chain link fence to the back of curb averages about 9.5 feet. Technically the available space for most of the route would meet Vine Trail standards for a 10-foot-wide trail, but with the heavy traffic, including many large trucks, a buffer between the curb and the trail would be highly desirable. The fence is the approximate Caltrans ROW line, so moving the fence to get more space would entail a Caltrans encroachment permit.
Figure 2: Paoli Loop Road and Green Island Road Intersection

Legend

- Caltrans Right of Way
- Property Line
- Existing Constraints
- Ditch
- Embankment
- Wall
- Fences

Paoli Trail Alignment
- Potential Trail Alignment
- Potential Trail Alternate near Railway
- Potential Trail Alternate under Bridge

0 25 50 100 Feet
Further south on Paoli Loop, where the adjacent embankment rises for the overpass, there is a drainage ditch immediately behind the fence. The ditch is 4-5’ wide typically. This ditch flows south to an inlet near the underpass. Because of the constraints of the ditch and adjacent embankment, if the standard 10-foot space for the trail and a desirable 3-foot landscape buffer between road and trail were to be created, a retaining wall would need to be constructed at the foot of the embankment in order to move the trail in.
2.3 Paoli Loop Road Near Overcrossing

Near the overcrossing the 8-foot A.C. surface transitions to a 5’ sidewalk which continues through the undercrossing. Between the sidewalk and the fence there is an average 3’ to 4’ of space which could support widening the sidewalk. Behind the ditch, the slope gets steeper closer to the overcrossing. Near the overcrossing the embankment and the ditch at its’ toe occupy the space that would be needed to create a 10’ wide trail, and a landscape buffer between the trail and the curb. The space between the 6’ chain link fence to the back of curb gradually narrows to 6’ as it gets close to the overcrossing. The sidewalk crosses into Caltrans ROW near the undercrossing, so any modifications would involve a Caltrans encroachment permit.

There is another segment of 3’ tall feet fence abutting the sidewalk near the undercrossing. Behind the fence the ditch terminates at a drainage inlet that is immediately behind the 5 foot sidewalk. This inlet would have to be enclosed in a pipe in order to create space for a wider trail.

![Photo 10: Existing 5' Pavement near the Bridge](image)

![Photo 11: Existing Ditch by the Sidewalk](image)

![Photo 12: Ditch near the Bridge](image)

![Photo 13: Sidewalk under the Bridge](image)
Figure 3: Paoli Loop Road and Green Island Road Intersection
2.4 Paoli Loop Trail at Overcrossing --Existing Conditions North Side

Under the overcrossing is the most constrained area for the Paoli Loop Vine Trail Alignment Study. Technically, 10-foot-trail can be built the whole way along Paoli Loop Road except for this location where Widening the sidewalk is constrained by the columns supporting the bridge, which are 8’ 6” clear from the back of curb. The columns are at the foot of a steep approximately 2:1 slope. Drainage from the slope runs along the back of the sidewalk through the undercrossing. This would need to be accommodated, perhaps in a grated ribbon drain, in order to provide trail width to the edge of the columns.

The lane width of Paoli Loop Road under the overcrossing is 17’, compared to a typical 12’ wide traffic lane. However, due the relatively tight turns and heavy large truck traffic lane narrowing may not be an option to increase the space for the trail. The overhead clearance under the bridge is approximately 20 feet.
Figure 4: Paoli Loop Road under the Napa Valley Highway Bridge
2.5 Paoli Loop Trail at Overcrossing --Existing Conditions South Side

As with the west side, there is no sidewalk on the south side of Paoli Loop Road. Between the road pavement and the rail is an approximately 37’ space where the Vine Trail could be built. There is a guardrail adjacent to the road pavement under the overcrossing. Behind the guardrail is an embankment, which is an average of 11’ wide and 3’ to 4’6” lower than the road. At the foot of the embankment there is a drain ditch. This leaves about a 20’ space for a trail between the ditch and the first rail. A retaining wall and drain system would probably be required to provide adequate space for the trail.

The rail is actively being used. A fence would be needed to separate the trail from the rail line. An easement from the railroad and from Caltrans would be required.
Figure 5: Paoli Loop Trail Under the Overcrossing — Existing Conditions West
Figure 11: Photo Locations South Side of Paoli Loop Road East
Figure 6: Paoli Loop Trail Under the Overcrossing --Existing Conditions East
2.6 Existing Conditions – Eastern Leg of Paoli Loop Road

On the east side of Highway 29 the 5-foot sidewalk ends near a large concrete-lined drainage channel. The pedestrian space is partially paved with A.C, but it narrows down to 6’ 6” at the corner of the fenced drainage channel. This “pinch point” could potentially be widened by installation of a steel plate supported by a beam over a corner of the channel, including a relocated fence segment.

Further to the north the partially A.C. paved pedestrian space is just under 10 feet, but widening is physically less constrained than on the west side, as there is flat ground between the fence and the drainage channel, but the fence is again the Caltrans ROW line, and this relocation would require an encroachment permit.

The least constrained location for a crosswalk to connect to Watson Lane, the continuation of the route, is on the north side of the intersection, as there is a deep drainage ditch on the southeast corner.

The east side of this segment is constrained as a trail alignment by the ditch at the corner of Watson Lane, by trees and fences farther, south and by a deep ditch adjacent to the fence at the south end.
Figure 14: Paoli Loop Road to Watson Lane Segment

Legend
- Caltrans Right of Way
- Property Line
- Existing Constraints
- Ditch
- Embankment
- Wall
- Fenceline

Paoli TrailAlignment
- Potential Trail Alignment
- Potential Trail Alternate near Railway
- Potential Trail Alternate under Bridge

Figure 14: Paoli Loop Road to Watson Lane Segment
3. Alternative Trail Alignments

There are three trail alignment alternatives for the constrained area at the undercrossing, as discussed below.

3.1 At Overcrossing – Alternative 1, North Side

The first option is to climb up on the slope. The trail would start to climb from 60' to the column and will gradually go up for 5' to 8'. The trail would be built on slope behind the columns under the overcrossing. A retaining wall would need to be built against the slope. The trail gradually goes down on the other side of the overcrossing and merge with the existing sidewalk on the eastern leg of Paoli Loop Road.

This option provides a 10-foot-trail with a gentle 1:10 to 1:12 slope under the bridge. The trail is well separated from the traffic. However, this alternative is very costly due to the need for retaining walls. A Caltrans encroachment permit would be required.
Figure 8: Paoli Loop Vine Trail Under the overcrossing –Alternative 1 East
3.2 At Overcrossing – Alternative 2, North Side

The second option is to widen the existing sidewalk. The existing sidewalk from the first column to the last column is 50’ in length, 5’ in width. It would be widened to 8’ wide with a ribbon train on the side. Other segments of sidewalk are less constrained and could be widened to 10’ wide with a ribbon drain. Although there is a 50’ segment that’s only 8’ wide, the trail could still support the functionality of a multi-use trail.

Figure 9: Paoli Loop Vine Trail Under the overcrossing –Alternative 2 West
Figure 9: Paoli Loop Vine Trail Under the overcrossing –Alternative 2 East
3.3 At Overcrossing – Alternative 3, South Side

The third option is to use the south side of Paoli Loop Road. A 10’ trail could be built along the rail line with retaining walls and drainage improvements.

Assuming the constraints for locating a trail along the west side of the road required the location of the trail on the east side of the Loop to the north, a crosswalk would be needed near the corner. Due to similar constraints on the east side of the eastern leg of the Loop, another crosswalk would be required east of the overcrossing.

These crosswalks would have short sight distance from the undercrossing, and visibility would be further reduced by the heavy truck traffic.
Figure 13: Alternative 3 - Trail on South Side at Undercrossing, East
3.4 Alternative: Widen Trail into the Caltrans ROW

Any work in the Caltrans right-of-way will require an encroachment permit, and the more significant the encroachment and modifications are the more challenging it is to obtain the permit. But the benefits of a wider trail buffered from the heavy traffic may warrant the effort. For most of the route on the west leg and on the east leg there are no physical obstructions – the fence would just have to be relocated. But closer to the undercrossing on the west leg the embankment and associated drainage ditch occupy the space where the trail could be widened. One alternative to create space for the trail would be to construct a retaining wall – probably strongly reinforced concrete approximately 3 to 4 feet high – along the toe of the embankment.

Another alternative, illustrated in Figure 14, is to construct a concrete V-ditch near the toe of slope to intercept to runoff from the embankment and direct it to the nearby storm drain. The trail itself could drain to the buffer, which could feature a vegetated swale to intercept and percolate the runoff.
3.5 Alternative: Move Paoli Loop Road West 5 feet

An alternative to getting into the Caltrans right of way on the western leg of the Loop was identified by the Vine Trail Engineering Committee. This would avoid the need to move the fence and construct a retaining wall at the toe of slope to allow relocation of the ditch to create a wider buffered trail.

The alternative is to move Paoli Loop Road west approximately 5 feet. This would require the reconstruction of curbs and gutters on both sides of the road; driveways on the west side; relocation of drain inlets and connections, patching of asphalt, and re-striping.

The west side of west leg of Paoli Loop features numerous trees, shrubs and utility facilities. Many shrubs and utility facilities are located within 5 feet of the curb. These constraints increase toward the north end of the road.

The realignment could potentially only involve the portion opposite the highway embankment and ditch, as shown in Figure 14. According to an example Geometry Design Guideline1 a road transition length of 102 feet of road is required to create the transition for a 5 foot offset. The overall length of road that need to be reconstructed would be over 600 feet. An encroachment permit from Caltrans would still be needed to widen the trail to the north.

Figure 15: Alternative – Move the Paoli Loop Road west for 5 feet.

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1 Geometry Design Guidelines from City of San Jose : \[ L = \text{Horizontal Distance (ft)} \times (\text{Posted Speed, or 85th percentile Speed (mph)})^2 / 60. \]
Figure 16: Illustration of Moving Paoli Loop Road West for 5 feet

Need to cut down trees, relocate utility facilities, and remove existing landscape on the west side.
3.6 Alternative: Build a Trail Undercrossing

An alternative to following the Paoli Loop Road sidewalk under Highway 29 was identified by the Vine Trail Engineering Committee. This was to build a trail undercrossing of Highway 29 that would be a short cut between the west leg of Paoli Loop and Watson Lane. All of the construction would be within the Caltrans right of way, requiring an encroachment permit.

The minimum clear height for such a trail structure would be 10 feet, and Caltrans might require that it be higher. There is over 20' of elevation to the roadway at the location where the undercrossing is envisioned.

An approximately 30' pedestrian bridge, would be needed to cross the concrete channel opposite Watson Lane.

Figure 17: Alternative – Build a trail undercrossing

Legend
- Caltrans Right of Way
- Property Line
- Ditch

Envisioned Improvements
- Envisioned Trail Undercrossing
- Envisioned Pedestrian Bridge
- Envisioned Short Bridge over Ditch
4. Conclusions

1. **Western Leg West Side.** There are too many constraints on the west side of western leg of Paoli Loop Road to construct a trail there. Also, a crossing of Green Island Road to the east of the intersection with Paoli Loop would avoid a significant amount of traffic, further supporting an alignment on the east side.

2. **Western Leg East Side.** There is an existing space for the trail, and portions of pavement, on the east side of western leg of Paoli Loop Road. The average distance between the fence and the back of curb is 9'6". However, due to the heavy traffic, including many trucks, a vegetated buffer (approximately 3' wide) between the trail and the road curb would be highly desirable. A Caltrans encroachment permit would be needed. Relocation of the fence would be simple on the northern half of this leg, as the adjacent land is level. On the southern portion construction of a concrete V-ditch to intercept the runoff from the embankment, and filling of the existing ditch could make space for the trail and the buffer, if this was an acceptable solution to Caltrans. The alternative for relocation of Paoli Loop 5 feet to the west does not seem feasible given the extent of reconstruction required, and the increasing constraints to widening on the west side moving north along this segment.

The alternative of the short cut tunnel is an interesting idea that would avoid having to deal with the current constrained undercrossing. This would be an expensive project and Caltrans’ reaction and requirements would be important considerations.

3. **Under the Bridge.** The portion under the bridge is the most constrained area. There are three alternatives at this location. A Caltrans encroachment permit would be needed for any of them.
   a) Option 1 is to widen the existing 5 foot sidewalk to an 8’ path, which would require placing the existing drain inlet on the west side in a pipe and covering, and building a ribbon drain along the north side. Potentially the trail could be widened to 10’ by taking 2’ from the adjacent 17’ wide lane.
   b) Option 2 is to route the trail behind the columns, potentially including climbing up on the slope. This would require the construction of a large (up to 10’) retaining wall.
   c) Option 3 is to route the trail on the south side, which would require constructing a retaining wall for the existing embankment and relocating the existing ditch at the toe of slope. However, due to the constraints for connecting trail segments on the west and east side of the undercrossing, two road crossings would be needed to connect to a trail on the inner part of the Loop, and these would have poor sight distance.

The most feasible option appears to be Option 1.

4. **Connection North to Watson Lane.** The east side of eastern leg of Paoli Loop Road is constrained by ditches, trees and a fence. There are not many physical constraints on the west side of eastern leg of Paoli Loop Road except for the telephone poles on the sidewalk. Physically it would be easy to create a wider trail with a buffer, except on the southern portion the “pinch point” at the drainage channel would require a partial bridge or similar covering. Any of these improvements would require a Caltrans encroachment permit. The best crossing location at the Watson Lane and Paoli Loop Road intersection is the north side.