NORTH-EAST LOS ANGELES OPEN SPACE

ELEPHANT HILL TRAIL CONCEPTUAL TRAIL DESIGN

April 2017

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RANCHO SIMI RECREATION AND PARK DISTRICT

ELEPHANT HILL

CONTEXT

The project is located within El Sereno and Monterey Hills, neighborhoods of single-family and small multi-family homes on the border of Los Angeles and South Pasadena, along a north-south trending ridge making up the backbone of Elephant Hill. The ridge is indented by several broad swales that drain into the valley bottom to either side of the ridge.

Within Northeast Los Angeles (NELA), a series of hilltop areas extends between the eastern terminus of the Santa Monica Mountains and the southern terminus of the Verdugo Mountains. Many of these hilltop areas have been developed, but several areas remain undeveloped, either by public preservation of open space or privately owned with threat of development. Elephant Hill is one of these areas that remains largely undeveloped and presents an amazing opportunity for preservation.

The Mountains Recreation and Conservation Authority (MRCA) has acquired a series of parcels that traverse the hill from east to west, over approximately 2,000 feet between Pullman Street and Lathrop Avenue.

Within the MRCA-owned parcels are a series of “paper streets” - streets which were previously planned by the City of Los Angeles, but have not been constructed, and are not planned to be constructed. This public land is expected to be utilized in the construction of this trail.

The topography across the MRCA-owned parcels is characterized by steep to steeper slopes with slope gradients ranging from 10% along the valley bottom and rounded ridge top to greater than 45% on the steeper sideslopes. Elevations range from 560’ along the valley bottom to 790’ along the ridge top.

Existing public use is unregulated, and consists primarily of illegal offroad vehicle use and occasional hikers.

Vegetation was historically Coast Live Oak and Walnut Woodlands mixed with Coastal Sage Scrub. Livestock use, development, and fuel modification have impacted habitat quality allowing invasive annuals to out compete native species, yet many habitat remnants remain that provide areas of shady respite, cover, and forage.

Project Area

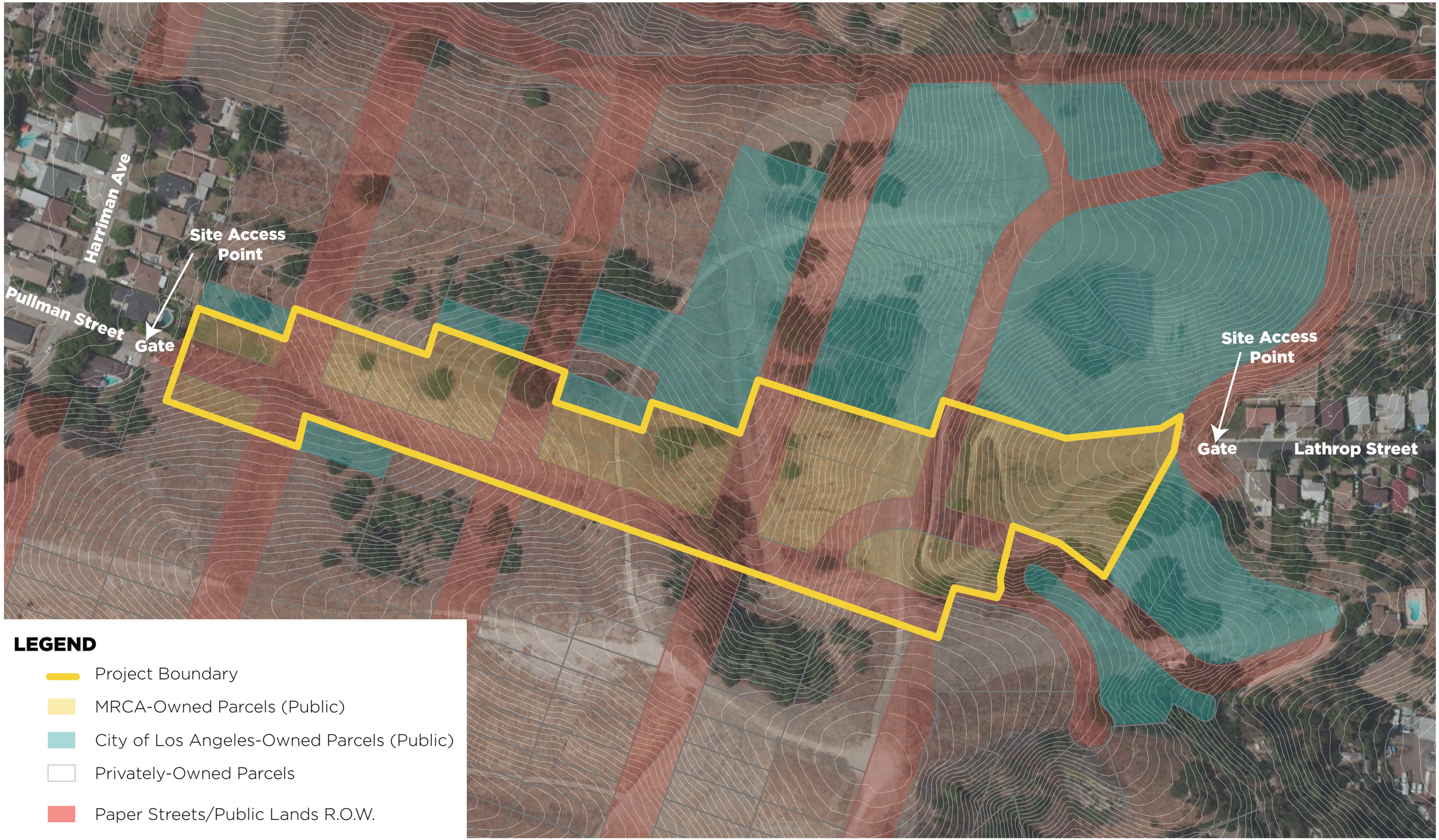
Northeast Los Angeles Hilltop Areas

0 0.5 1 2 Miles

NORTH

GOALS

- Evaluate trail alignments across Elephant Hill that take advantage of property owned by the MRCA, as well as neighboring parcels in cases when doing so significantly improves feasibility.
- Plan for the widest possible range of users and abilities, to include both hiking and bicycling.
- Protect existing native trees.
- Discourage illegal activity on the property.
- Provide sustainable trail designs that require minimal maintenance, resist erosion, do not destabilize existing runoff in the area, and seek to minimize costs through a balance of construction techniques and property acquisition.



LEGEND

- Project Boundary
- MRCA-Owned Parcels (Public)
- City of Los Angeles-Owned Parcels (Public)
- Privately-Owned Parcels
- Paper Streets/Public Lands R.O.W.

0 200 400 800 Feet

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PROJECT SITE OVERVIEW

ELEPHANT HILL TRAIL

SITE CONSTRAINTS

The following is a general discussion of constraints influencing trail alignment and sustainability, such as use conflicts, offsite impacts, and property boundaries.

PROPERTY BOUNDARY AND TOPOGRAPHY

The project is constrained by the narrow 160 to 210 foot width of the MRCA-owned parcels, necessitating more switchbacks or steeper trail gradients than what is generally desirable in order to keep the trail within the MRCA-owned parcel boundary. The constraint of a steep grade and frequent switchbacks will be difficult to mitigate without acquiring additional land.

Topography is characterized by moderate to steep slopes with slopes ranging from 10% along the valley bottom and rounded ridge top to greater than 45% on steeper sideslopes. An 18% to 25% grade exists along the existing dirt road extending from the eastern gate.

STEEP UNSTABLE SLOPES

Portions of proposed trail areas and an existing dirt road cross ground steeper than 65% gradient. These same areas are identified on the Seismic Hazard Zone Map (DMG, 1999) as areas with past or potential instability. We did not, however, observe any evidence of on-site of landslides or instabilities along or in the immediate vicinity of the project area. In general the landslide hazard appears relatively low.

WEST SIDE SWALE

The western side of the project area is characterized by a broad swale draining a roughly 7 acre grassland area. The axis of this swale drains onto the end of Pullman Street and towards the backyard of the residences at 1111 Pullman Street (APN 5306-006-036) and 4456 Harriman Avenue (APN 5306-007-049) located adjacent to the gate (map on page 5 “Site Constraints”). Though there is currently no evidence of flow within the swale, it is known that runoff does occur during large storm events. At the project site about 200 feet of trail located just past the gate can follow an old dirt road located along the bottom of the swale at the swale mouth. Runoff within the swale is likely not a significant constraint to the trail and can easily be prevented from damaging the trail by elevating the trail tread slightly and/or rocking the trail tread. A culvert could also be installed at the location where the trail crosses the axis of the swale.

DOWNSLOPE PROPERTIES: WESTSIDE ENTRANCE

The residence at 1111 Pullman Street is located at the mouth of and in close proximity to the axis of the swale. The location of the property places it at risk for flooding and sedimentation if runoff within the swale were great enough and was able to flow into the back yard. The proposed trail is not expected to increase this risk given the small footprint of the trail and because the trail will be drained with frequent drain dips to prevent runoff from concentrating. As an additional preventative measure, an earthen berm can be constructed at the bottom of the swale to direct runoff away from the residence.

EAST SIDE SWALE

The eastern side of the project area is characterized by a broad swale draining a roughly 6 acre grassland area. The axis of this swale drains onto the end of Lathrop Street and towards the backyards of the residences at 5009 Lathrop Street (APN 5307-004-033) and 5000 Lathrop Street (APN 5307-005-022) (map on page 5 “Site Constraints”). Both of these residences are to the side of the swale and do not appear to be impacted from it. An existing steep dirt road extends up the south side of the swale with the majority of the alignment outside the swale axis.

While there is currently no evidence of flow within the swale, it is likely that runoff does occur during large storm events. Only the lowest portion of the trail where it connects with Lathrop Street is at risk of being impacted by drainage, and only during a particularly large storm event.

DOWNSLOPE PROPERTIES: EASTSIDE ENTRANCE

The residences at 5309 and 5000 Lathrop Street are located at the mouth but outside the axis to the swale. Use of the existing road for trail use is not expected to increase drainage issues over current conditions and could potentially improve conditions if drain dips are installed along the trail.

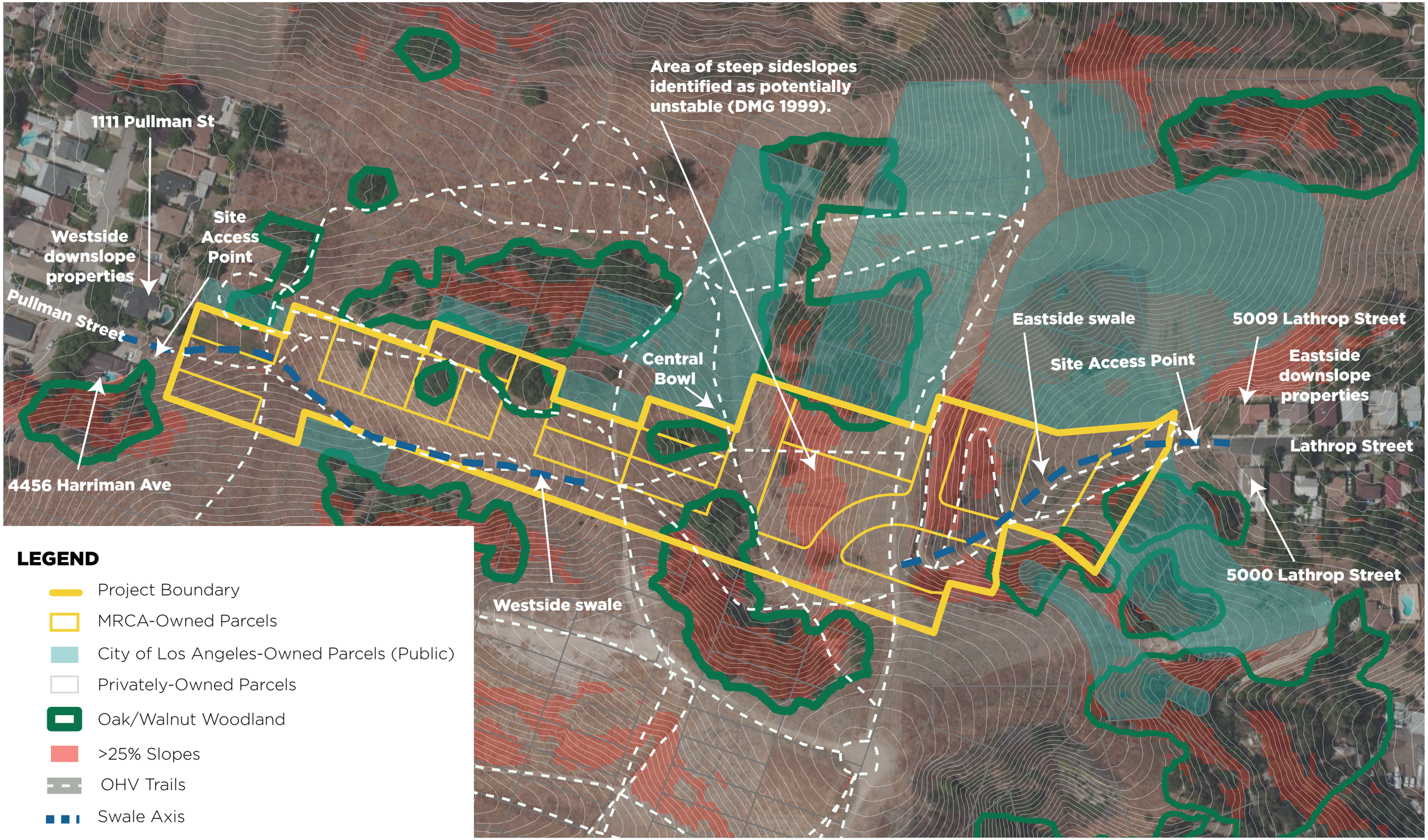
OHV USE

There is a great deal of evidence of OHV use on and adjacent to the property. Activity appears on established dirt roads that are used for fire control and property maintenance, and also on more informal and opportunistic routes that extend directly up the sides of hills or down the bottom of swales. Many of these routes are steep, with slopes greater than 20%, and are poorly drained. It is our understanding that efforts have been made to prevent unauthorized OHV use but it is expected that such use will continue.

OHV use can significantly impact the use and condition of any trail. Potential trail layout will need to consider impacts from OHV use and be designed accordingly. This includes avoiding alignments in close proximity to established OHV routes, even if unsanctioned, and areas where OHV use might be tempted to extend down the trail. The proximity of potential trail alignments to established OHV trails may encourage further misuse of the site. Existing OHV trails should be decommissioned and revegetated once the site has been secured from OHV access from all access points. Otherwise, any new nonmotorized trails constructed would likely see even greater trespassing from OHV’s.

GEOLOGY AND SOILS

Though soils can be a significant factor in trail sustainability, they do not appear to be a significant constraint at Elephant Hill. There do not appear to be any significant constraints from geology that may affect any potential alignments on the site.



LEGEND

- Project Boundary
- MRCA-Owned Parcels
- City of Los Angeles-Owned Parcels (Public)
- Privately-Owned Parcels
- Oak/Walnut Woodland
- >25% Slopes
- OHV Trails
- Swale Axis

0 200 400 800 Feet

NORTH

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SITE CONSTRAINTS

ELEPHANT HILL TRAIL

BEST PRACTICES GUIDING TRAIL ALIGNMENT AND DESIGN

The success of a trail depends not only on its ability to be constructed, but on its ability to remain functional with minimal ongoing maintenance. A sustainable trail is one that can be maintained for its designated use without off-site impacts and without undue financial, material, or labor burdens. Principal factors that generally influence trail sustainability from a location and design standpoint include trail geometry (steepness and orientation), drainage provisions, geology and soils, and intended use.

TRAIL GRADE

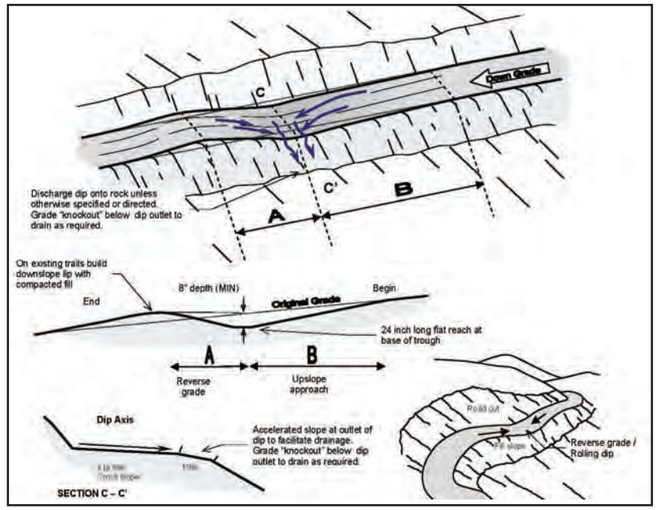
For long-term sustainability, a trail should have a sustained gradient of less than 12%, though short segments of up to 15% to 20% are acceptable. Note that bike routes with grades steeper than 15% are often difficult to travel uphill. The proposed trail alignments have been laid out to minimize trail grades steeper than 12%.

FALL-LINE ORIENTATION

For long-term sustainability, a trail should avoid a fall line orientation, which is a route that drops directly down the hillside. Fall-line trails follow the same path that water flows, thereby focusing water down their length resulting in segments that are difficult, if not impossible, to drain. In general, trails should have a gradient no steeper than 1/2 the native sideslope gradient. An exception to this rule is for hill climb trails, which are stabilized with hardened steps or stairs.

TRAIL DRAINAGE

One of the most important considerations for sustainable unpaved trails is maintaining natural drainage patterns. The trail will need to be drained by drain dips (reverse grade dips or rolling dips) installed at frequent (100 to 175 foot) spacings. The larger (deeper) the dip the longer the life expectancy. These dips prevent water from concentrating on the trail, and also force water from the trail frequently, preventing concentrated flows that can erode the trail surface.



SWITCHBACKS

To the extent feasible, trails should be laid out to avoid or minimize switchbacks as users often “cut” the switchback which can lead to erosion problems. This is especially true in open grassland areas, such as Elephant Hill, where up and downslope legs of switchbacks can be clearly in view of one another. This is further compounded where the switchbacks are proposed on steeper side slopes (<40%) resulting in the two legs of the switchback being stacked on top of one another.

Where switchbacks are required, a broad climbing turn is preferred over of a tight switchback as these tend to drain better and are not as frequently cut off. Where possible the turn should be made around vegetation to create an “anchor point” and to block the visibility between the two legs of the trail.

STEEP UNSTABLE SLOPES

In order to prevent erosion and to ease passage by visitors, trails should avoid crossing steep unstable slopes wherever possible.

SWALES AND VALLEY BOTTOMS

In general, trails routed along valley and swale bottoms can be difficult to drain and thus tend to be wet and subject to getting muddy and rutted; for this reason these areas should be avoided.

OHV USE PREVENTION

OHV use can significantly impact any trail and therefore trail layout will need to consider ways to discourage potential OHV encroachment onto trails designed for hikers and bicyclists. Strategies include avoiding alignments in close proximity to established OHV routes and areas where OHV use might be tempted to extend down the trail. Where unable to avoid OHV routes, physical barriers, trail width, and the spacing of drain dips can also be used. The proximity of potential switchbacks to established OHV trails may further encourage misuse of the proposed trail alignments and/or result in trail damage.

PROPOSED TRAIL ALIGNMENTS

The following trail alignments are based upon the site and property constraints and the trail design guidelines discussed on the previous pages. Due to the constrained nature of the properties owned by the MRCA, adjacent paper streets have been considered in the development of trail alignments. The construction of trails and support facilities on these paper streets will require coordination with the City of Los Angeles.

SEGMENTS

The proposed trail is divided into three segments, each with a unique set of challenges and a set of alignment alternatives to address them. These alternatives are discussed in greater detail on the following pages.

WESTERN SEGMENT

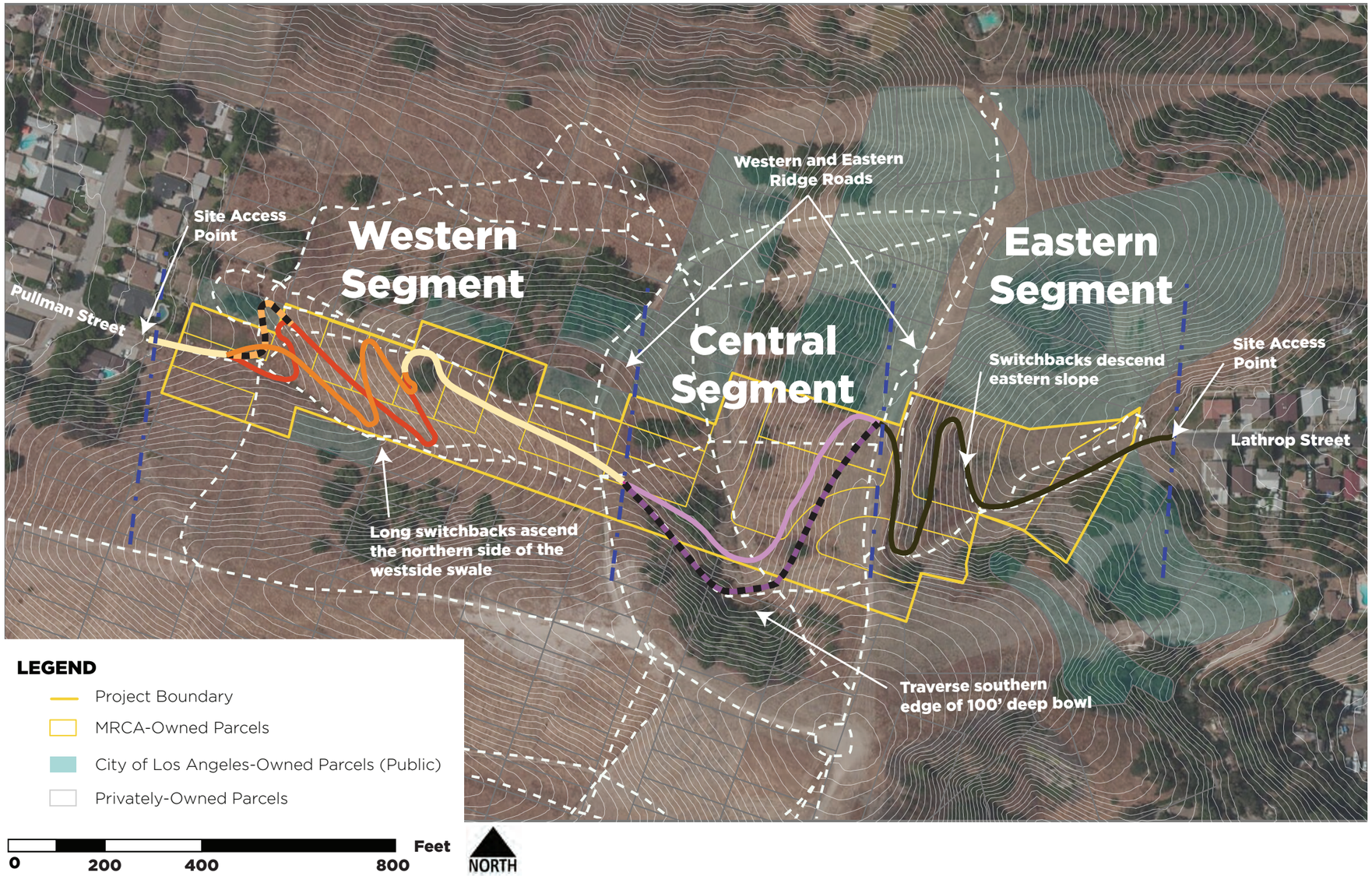
This segment begins at the western entrance to the site, at Pullman Avenue, and continues uphill to the existing dirt road along the western ridge at the top of the site.

CENTRAL SEGMENT

Existing between the two ridge roads that cross the site, this segment traverses the greatest elevation change in the project area: a 100-foot deep bowl.

EASTERN SEGMENT

The East Segment descends steeply from the easterly ridge road, down a series of switchbacks to the eastern edge of the site at Lathrop Street.



WESTERN SEGMENT: SEGMENT A

The western segment will extend from between 1,180 and 1,270 feet from the west entrance off Pullman Road, switchbacking up 20% to 45% gradient side slopes on the side of a broad swale (western swale) before reaching the top of a spur ridge near the center of the property. The majority of this alignment will be new trail construction.

The principal constraint is the narrow width of the MRCA-owned property, requiring the trail to make several switchbacks if a sustained 12% grade is to be achieved. Secondary constraints include swale drainage, OHV use, and general trail aesthetics.

Three potential trail alignments were identified. Of the three alternatives evaluated, Alternatives A1 and A2 are located entirely on MRCA-owned property or City paper streets; Alternative A3 extends onto a downslope private property for a short distance. Alternative A3 is preferred since it provides a better alignment with lower grade and fewer tight switchbacks.

It should be noted that all three alternatives have the same constraints at the entrance, namely erosion and drainage issues associated with the trail alignment being restricted to the fall-line orientation within the swale. This configuration cannot be avoided without placing several tightly spaced switchbacks within the narrow mouth of the swale; such switchbacks would be frequently cut and as such are not considered sustainable. Erosion and drainage control measures can be taken to minimize the impact to the trail and adjoining properties.

ALTERNATIVE A1: MRCA-OWNED PROPERTY

This alignment is entirely on MRCA-owned property or City paper streets. The trail climbs at an average sustained grade of 12% to 14% with 4 relatively tight switchbacks. The principal constraint with this alternative is tightness of the switchbacks, which 1) may lead to people bypassing them and 2) are less aesthetically pleasing than trails with fewer broad switchbacks. Lastly, due to the common overlap with OHV trails in the vicinity, the Alternative A1 alignment and its switchbacks may be more subject to damage from OHV use than other alignments.

ALTERNATIVE A2: MRCA-OWNED PROPERTY

This alignment is also entirely on MRCA-owned property but is better laid out with fewer tight switchbacks. The main issue with this alignment is towards the westside entrance, where tight stacked switchbacks and a steeper grade (up to 15%) is required to avoid extending onto adjoining property. As with Alternative A1, the tight switchbacks are prone to enhanced erosion due to people bypassing them. However, this alignment is more aesthetically pleasing and has less overlap with OHV trails in the vicinity.

ALTERNATIVE A3: MIXED MRCA-OWNED PROPERTY AND PRIVATE PROPERTY

This alternative is the same as A2 except that approximately 80 feet of the trail is routed across an adjoining property (APN 5306-006-913) to reduce the trail grade and to broaden the switchback in that area.

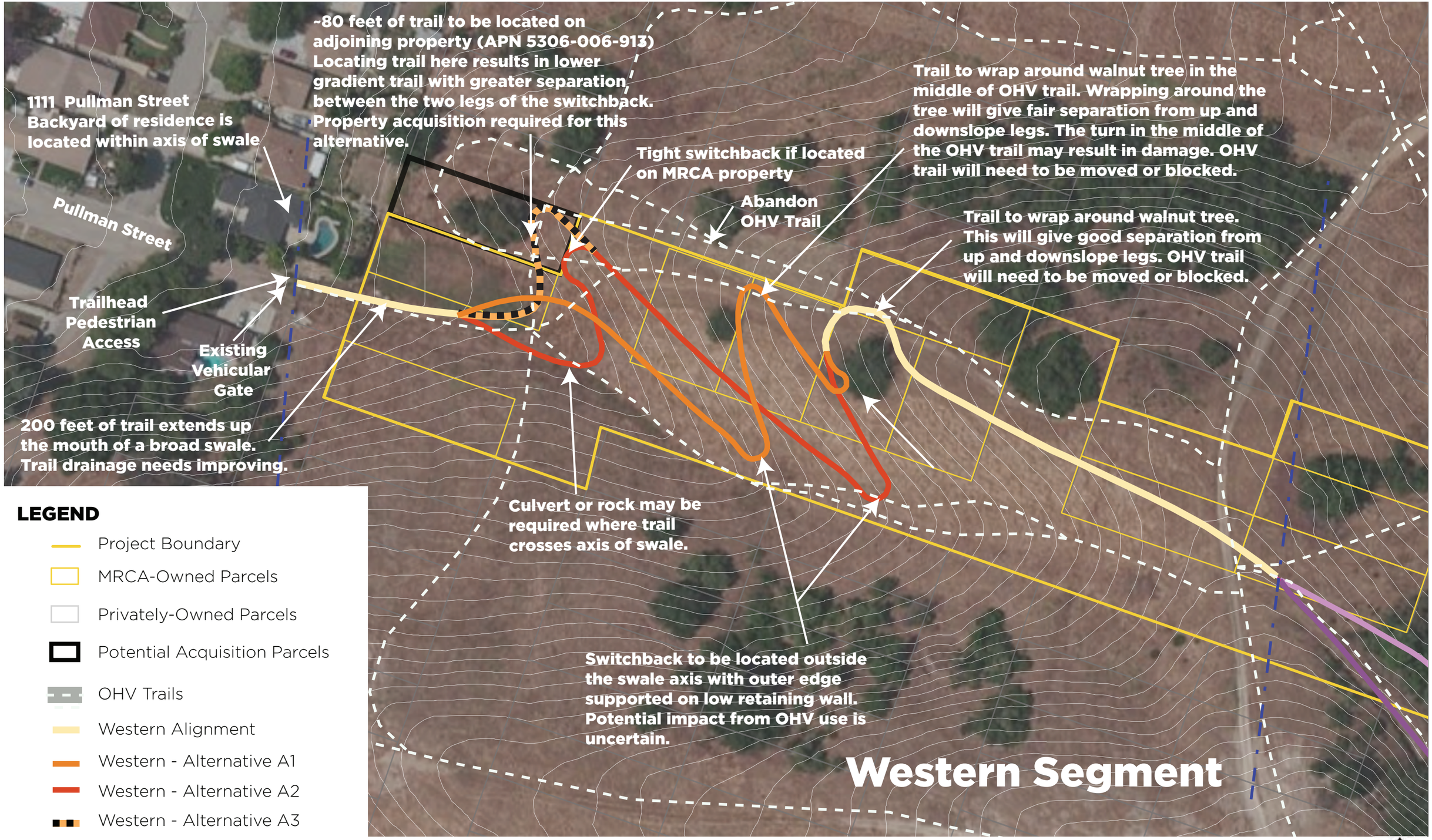
Alternative A3 is the preferred alignment due to the fewest and least tight switchback configuration. This makes for the most aesthetically pleasing alignment and reduces the amount of maintenance associated with tight switchbacks that are commonly bypassed. Furthermore, this alternative has the lowest consistent trail grade of 12%, and limited overlap with OHV trails in the vicinity.

Cost of A3 is highest due to acquisition of property. Construction costs for all three alternatives are otherwise similar with no significant difference.

TABLE 1: WESTSIDE TRAIL SEGMENT

SUMMARY OF CONSTRAINTS

CONSTRAINT	ALTERNATIVE A1 MRCA-Owned Property	ALTERNATIVE A2 MRCA-Owned Property	ALTERNATIVE A3 (Preferred) Mixed MRCA- and Privately-Owned Property
Property Boundaries	Low Constraint Located on MRCA-owned property or City paper streets.	Low Constraint Located on MRCA-owned property or City paper streets.	High Constraint 80 feet of trail extends off property and onto APN 5306-006-913.
Trail Grade and Orientation:	Low Constraint 12% to 14% sustained grade. Avoids fall line orientation.	Moderate Constraint 12% sustained grade with short 15% gradient segment. Avoids fall line orientation.	Low Constraint 12% sustained grade. Avoids fall line orientation.
Trail Drainage:	Low Constraint Mitigated with frequent drain dips	Low Constraint Mitigated with frequent drain dips	Low Constraint Mitigated with frequent drain dips
Switchbacks:	Moderate To High Constraint Four switchbacks. Three will be tight and prone to being bypassed or "cut-off" leading to potential erosion. Three may also be subject to impact from OHV use. Alignment is less aesthetic that the others.	Moderate Constraint Four switchbacks. Two will be tight and prone to being bypassed or "cut-off". Two may also be subject to impact from OHV use.	Low to Moderate Constraint Three switchbacks. Two will be moderately tight to tight and prone to being bypassed or "cut-off" leading to potential erosion, but less in comparison to Alt 1 and 2. Two may also be subject to impact from OHV use though again less than Alt 1 and 2.
Westside Swale:	Low to Moderate Constraint Trail may need to be elevated and rocked to control erosion and wet conditions.	Low to Moderate Constraint Trail may need to be elevated and rocked to control erosion and wet conditions.	Low to Moderate Constraint Trail may need to be elevated and rocked to control erosion and wet conditions.
Downslope Properties:	Low to Moderate Constraint Downslope property in axis of swale and in worst case scenario could be subject to flooding. Proposed trail will not increase this risk if properly drained.	Low to Moderate Constraint Downslope property in axis of swale and in worst case scenario could be subject to flooding. Proposed trail will not increase this risk if properly drained.	Low to Moderate Constraint Downslope property in axis of swale and in worst case scenario could be subject to flooding. Proposed trail will not increase this risk if properly drained.
OHV use:	Moderate Constraint Three switchbacks may be subject to impact from OHV use. Trail offset from swale bottom. The overall trail alignment does not encourage OHV use.	Moderate Constraint Two switchbacks may be subject to impact from OHV use. Trail offset from swale bottom. The overall trail alignment may encourage OHV use.	Moderate Constraint Two switchbacks may be subject to impact from OHV use. Trail offset from swale bottom. The overall trail alignment may encourage OHV use.
Steep unstable slopes:	Low Constraint	Low Constraint	Low Constraint
Geology and Soils:	Low Constraint	Low Constraint	Low Constraint



LEGEND

- Project Boundary
- MRCA-Owned Parcels
- Privately-Owned Parcels
- Potential Acquisition Parcels
- OHV Trails
- Western Alignment
- Western - Alternative A1
- Western - Alternative A2
- Western - Alternative A3

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WESTERN SEGMENT

ELEPHANT HILL TRAIL

CENTRAL SEGMENT: SEGMENT B

Two potential trail alignments are identified for the central segment of the Elephant Hill trail. Alternative B1 is located entirely on MRCA-owned property or City paper streets while Alternative B2 extends onto two upslope private properties for a short distance. Alternative B2 is preferred, as it follows an existing road, has a slightly lower gradient, and avoids steep sideslopes.

CENTRAL SEGMENT ALTERNATIVE B1: MRCA-OWNED PROPERTY

This alignment is entirely on MRCA-owned property or City paper streets and is the shorter of the two alternatives. From the west the trail descends into the axis of the swale at an average sustained grade of 12% through a grove of trees, and is routed just downslope of the existing road. The main constraints on this segment are impacts to the grove of trees (mixed but primarily non-native) and that trail construction may undercut the existing upslope road, making it impassable. If this road is dispensable then this is not an issue.

At the swale axis the trail will cross a steep OHV trail. Continued unauthorized use of this trail is likely as long as OHV access exists to the property.

After crossing the swale the new trail will need to climb at a 12% to 15% grade across 50% to 65% gradient sideslopes before reaching the ridge top. The steep sideslopes are identified on the Seismic Hazard Zone Map (DMG, 1999) as areas with past or potential instability. Though slopes are steep, we did not observe any landslides or instabilities along or in the immediate vicinity of the proposed trail alignment.

CENTRAL SEGMENT ALTERNATIVE B2 MIXED MRCA- AND PRIVATELY-OWNED PROPERTY

This preferred alternative is located on better ground upslope of alignment B1 but will need to cross 140 feet of private properties (APN 5307-003-024 and possibly APN 5307-003-024).

The first 400 feet of trail follows an existing dirt road that is in good condition; 140 feet of which is located on two adjoining properties (it may be possible to reroute a short segment of trail downslope to have it only cross one property). After crossing a swale a new trail will need to climb at a 12% grade across mainly 50% gradient slopes before reaching the ridge top. This alignment avoids most of the steep slopes that B1 needs to cross.

This also makes for the lowest impact and most aesthetically pleasing alignment and reduces the amount of maintenance associated with the potentially unstable sideslopes. It will also be less expensive to construct.

As with Alternative B1, measures should be taken to discourage future use by OHV, including abandoning the existing fall-line OHV trail running down the centerline of the swale.

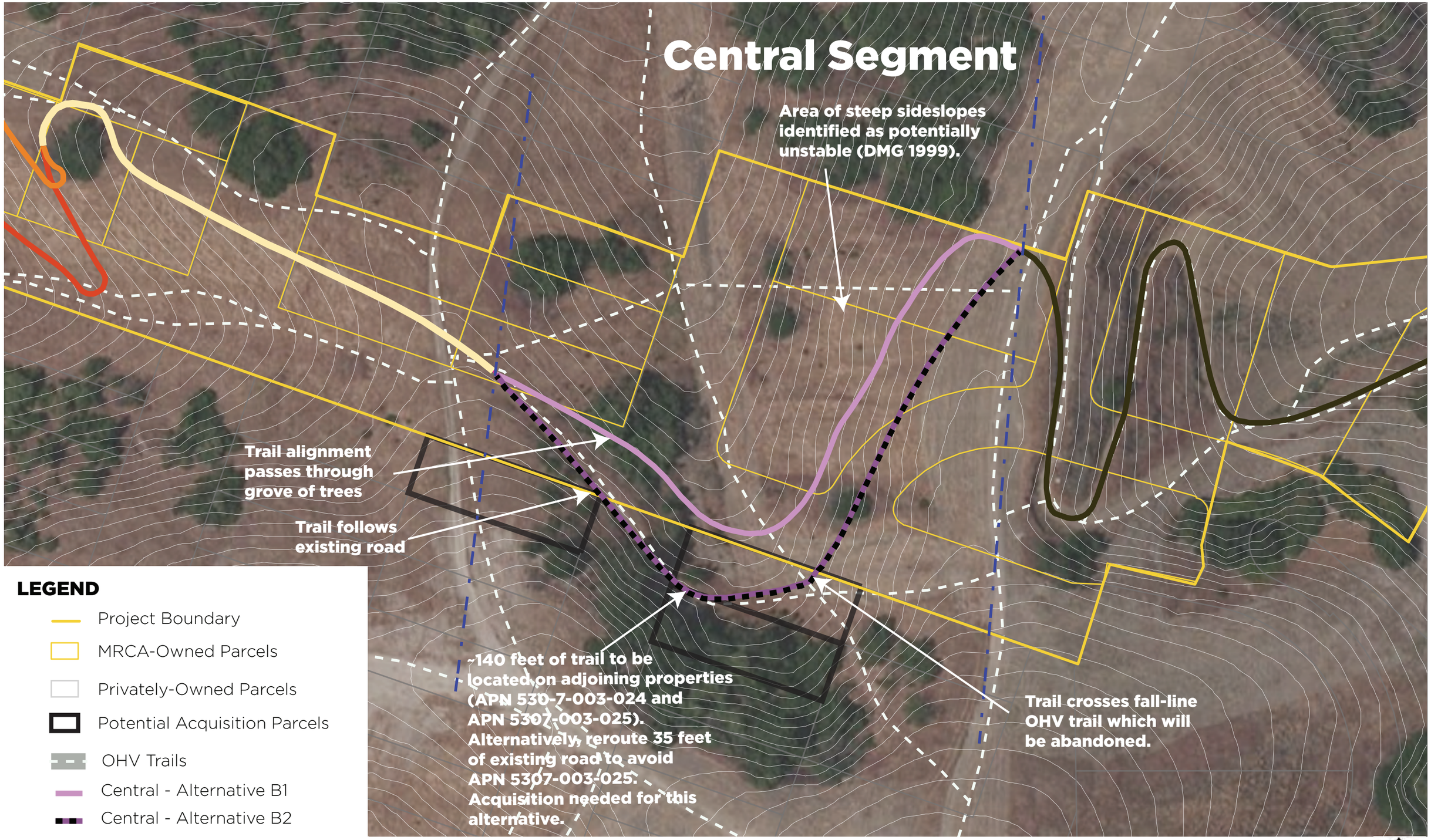
Cost of B2 is highest due to acquisition of property. Both alternatives have similar construction costs with no significant difference.

TABLE 2: CENTRAL TRAIL SEGMENT

SUMMARY OF CONSTRAINTS

CONSTRAINT	ALTERNATIVE B1 MRCA-Owned Property	ALTERNATIVE B2 (Preferred) Mixed MRCA- and Privately-Owned Property
Property Boundaries	Low Constraint Located on MRCA-owned property or City paper streets.	High Constraint 80 feet of trail extends off MRCA-owned property and onto APN 5306-006-913.
Trail Grade and Orientation:	Low to Moderate Constraint 12% to 15% sustained grade. Avoids fall line orientation.	Low Constraint 12% sustained grade. Avoids fall line orientation.
Trail Drainage:	Low Constraint Mitigated with frequent drain dips	Low Constraint Mitigated with frequent drain dips
Steep unstable slopes:	Moderate Constraint Trail crosses 65% gradient sideslopes at slightly high risk for instability. No landslides observed, however.	Low Constraint Trail crosses more stable 50% gradient sideslopes upslope of Alignment B1.
OHV use:	Moderate Constraint The overall trail alignment does not encourage OHV use.	Moderate Constraint The overall trail alignment may encourage OHV use.
Geology and Soils:	Low Constraint	Low Constraint
Other	Low to Moderate Constraint Trail routed below existing road. Trail construction may limit use of road. Trail also extends through grove of trees	Low Constraint Trial follows existing road for 400 feet

Central Segment



LEGEND

- Project Boundary
- MRCA-Owned Parcels
- Privately-Owned Parcels
- Potential Acquisition Parcels
- OHV Trails
- Central - Alternative B1
- Central - Alternative B2

0 100 200 400 Feet

NORTH

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CENTRAL SEGMENT

ELEPHANT HILL TRAIL

EASTERN SEGMENT: SEGMENT C

The eastern trail segment follows an existing dirt road that switches back down a broad 6 acre grassland swale (eastern swale) before reaching eastside gated entrance on Lathrop Street. This alignment is suitable for trail use with upgrades.

The first 650 feet of trail switches back down the hillside with an average grade of 10% to 15%. The road is in good condition though poorly drained. The principal constraints in this segment are 1) poor road drainage allowing runoff to collect, resulting in downslope erosion and 2) informal OHV trails bypass the switchbacks resulting in erosion. Both of these issues can be mitigated by installing drain dips to improve drainage and abandoning the OHV trails.

Below the switchbacks the lower 350 feet of road drops steeply down the side of the valley at a 15% to 23% grade before reaching the gate. This segment of road is in moderate to good condition though again poorly drained. The principal constraints are 1) the relatively steep road grade and 2) swale drainage at entrance off Lathrop Street.

The 15% to 23% trail grade is steeper than preferred and as a result will be more difficult to drain. It will also be more difficult to travel by some users, especially bicyclists going uphill. Drainage problems can be reduced but not completely eliminated by installing drain dips. Consideration was made to realign this segment to have a lower grade but overall no significant benefit was recognized, as the grade difference was minimal and the additional construction costs would have been significant.

The lowest 120 feet of this segment descends down the hillside to the mouth of a broad swale at the gate entrance. As with the westside swale, this configuration cannot be avoided without placing several tightly spaced switchbacks within the narrow mouth of the swale; such switchbacks would be frequently cut and as such are not considered sustainable. The road shows evidence of rilling with sediment being deposited onto Lathrop Street. The dirt road tread should be stabilized or paved as it approaches Lathrop Street to prevent further runoff and erosion of the road surface.

TABLE 3: EASTERN TRAIL SEGMENT

SUMMARY OF CONSTRAINTS

CONSTRAINT	ALTERNATIVE C1 MRCA-Owned Property
Property Boundaries	**Low Constraint** **Located on exiting road on MRCA-owned property or City paper streets.**
Road Grade and Orientation:	**Moderate Constraint** **Several segments with sustained grades between 15% and 23%. Steepest segment is located at bottom of reach. Rerouting to have a lower grade provides little net benefit.**
Road Drainage:	**Moderate Constraint** **Currently poorly drained. Drainage along most of the road can be upgraded with drain dips. Periodic problems may continue to exist on the steeper trail segment at the base of the reach.**
Steep unstable slopes:	**Low Constraint** **Portion of the exiting road crosses steep slopes identified by DMG (1999) as potentially unstable. Existing road, however, appears stable and without signs of past landsliding.**
Eastside Swale Entrance:	**Moderate Constraint** **Lowest 120 feet of trail drains onto Lathrop Street likely depositing sediment onto the paved road. Road entrance may need to be stabilized with rock, pavers, pavement to minimize future road erosion at this location.**
Downslope Properties:	**Low Constraint** **Two downslope properties located at mouth of eastern swale but outside the axis of the drainage. Proposed trail will not increase this risk if properly drained.**
OHV use:	**Low Constraint** **No significant impact to exiting road expected. Adjacent OHV trails should be abandoned.**
Geology and Soils:	**Low Constraint**

Eastern Segment

Trail alignment connects from spur ridge to existing road to avoid adjacent private property.

Widen existing turn

~102 feet of trail extends up the mouth of a broad swale. Trail drainage needs improvement.

5309 Lathrop Street
Back yard of residence is located adjacent to the axis of the broad swale

Trailhead
Pedestrian Access

Lathrop Street

Install drain dips

Existing Vehicular Gate

Poorly drained, steep road segment. Improve by adding 2 (min.) drain dips. This segment will require ongoing maintenance. Consideration was made to relocate segment but no significant benefit was expected.

Abandon OHV trails.
- Rip and slash pack
-Add drain dips

LEGEND

- Project Boundary
- MRCA-Owned Parcels
- Privately-Owned Parcels
- OHV Trails
- Eastern Alignment - C1

0 100 200 400 Feet

NORTH

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EASTERN SEGMENT

ELEPHANT HILL TRAIL

ELEPHANT HILL TRAIL - MOUNTAINS RECREATION AND CONSERVATION AUTHORITY
ESTIMATE OF PROBABLE DESIGN & CONSTRUCTION COST - MARCH 2017

REVIEWED BY: JP - Alta PREPARED BY: ALTA PLANNING + DESIGN

Note: Quantities and descriptions are approximate and are provided for Contractor's convenience. Contractor shall verify all requirements and quantities on the Plans and in the field.

WESTERN SEGMENT - A1

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	1627	16,270	SF	$0.75	$12,202.50	
	Sub-total							**$12,202.50**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			0	EA	$20,000.00	$0.00	
	Sub-total							**$0.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		1227	1,227	LF	$10.00	$12,270.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			4	EA	$5,750.00	$23,000.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			8	EA	$175.00	$1,575.00	
	Sub-total							**$36,845.00**
6	**Signage**							
6.1	Entry signage			2	EA	$500.00	$1,000.00	
6.2	Confirmation posts			3	EA	$400.00	$1,200.00	
	Sub-total							**$1,200.00**

Contractor Direct Cost		**$82,747.50**
General Conditions/Requirements	6%	$4,964.85
Overhead and Profit	20%	$16,549.50
Bonds and Insurance	2%	$1,654.95
Estimating Allowance for Incomplete Plans	20%	$21,183.36
Total Contract		**$127,100.16**
Final Plans, Specifications, Estimates	10%	$12,710.02
Construction Mgmnt, Architect CA, Labor Compliance	15%	$19,065.02
Inspections & Testing	3%	$3,813.00
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$13,055.06
Subtotal		**$176,243.26**
Contingency for Unforseen Site Conditions	15%	$26,436.49
TOTAL		**$202,679.75**

WESTERN SEGMENT - A2

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	1718	17,180	SF	$0.75	$12,885.00	
	Sub-total							**$12,885.00**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			0	EA	$20,000.00	$0.00	
	Sub-total							**$0.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		1318	1,318	LF	$10.00	$13,180.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			4	EA	$5,750.00	$23,000.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			9	EA	$175.00	$1,575.00	
	Sub-total							**$37,755.00**
6	**Signage**							
6.1	Entry signage			2	EA	$500.00	$1,000.00	
6.2	Confirmation posts			3	EA	$400.00	$1,200.00	
	Sub-total							**$1,200.00**

Contractor Direct Cost		**$84,340.00**
General Conditions/Requirements	6%	$5,060.40
Overhead and Profit	20%	$16,868.00
Bonds and Insurance	2%	$1,686.80
Estimating Allowance for Incomplete Plans	20%	$21,591.04
Total Contract		**$129,546.24**
Final Plans, Specifications, Estimates	10%	$12,954.62
Construction Mgmnt, Architect CA, Labor Compliance	15%	$19,431.94
Inspections & Testing	3%	$3,886.39
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$13,305.53
Subtotal		**$179,624.72**
Contingency for Unforseen Site Conditions	15%	$26,943.71
TOTAL		**$206,568.43**

WESTERN SEGMENT - A3

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	1577	15,770	SF	$0.75	$11,827.50	
	Sub-total							**$11,827.50**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			1	EA	$20,000.00	$20,000.00	
	Sub-total							**$20,000.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		1277	1,277	LF	$10.00	$12,770.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			3	EA	$5,750.00	$17,250.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			9	EA	$175.00	$1,575.00	
	Sub-total							**$31,595.00**
6	**Signage**							
6.1	Entry signage			2	EA	$500.00	$1,000.00	
6.2	Confirmation posts			3	EA	$400.00	$1,200.00	
	Sub-total							**$1,200.00**

Contractor Direct Cost		**$97,122.50**
General Conditions/Requirements	6%	$5,827.35
Overhead and Profit	20%	$19,424.50
Bonds and Insurance	2%	$1,942.45
Estimating Allowance for Incomplete Plans	20%	$24,863.36
Total Contract		**$149,180.16**
Final Plans, Specifications, Estimates	10%	$14,918.02
Construction Mgmnt, Architect CA, Labor Compliance	15%	$22,377.02
Inspections & Testing	3%	$4,475.40
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$15,316.05
Subtotal		**$206,766.65**
Contingency for Unforseen Site Conditions	15%	$31,015.00
TOTAL		**$237,781.65**

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COST ESTIMATES PER ALIGNMENT ALTERNATIVE - WESTERN

ELEPHANT HILL TRAIL

ELEPHANT HILL TRAIL - MOUNTAINS RECREATION AND CONSERVATION AUTHORITY
ESTIMATE OF PROBABLE DESIGN & CONSTRUCTION COST - MARCH 2017

REVIEWED BY: JP - Alta PREPARED BY: ALTA PLANNING + DESIGN

Note: Quantities and descriptions are approximate and are provided for Contractor's convenience. Contractor shall verify all requirements and quantities on the Plans and in the field.

CENTRAL SEGMENT - B1

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	614	6,140	SF	$0.75	$4,605.00	
	Sub-total							**$4,605.00**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			0	EA	$20,000.00	$0.00	
	Sub-total							**$0.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		614	614	LF	$10.00	$6,140.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			0	EA	$5,750.00	$0.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			4	EA	$175.00	$875.00	
	Sub-total							**$7,015.00**
6	**Signage**							
6.1	Entry signage			2	EA	$500.00	$1,000.00	
6.2	Confirmation posts			3	EA	$400.00	$1,200.00	
	Sub-total							**$1,200.00**

Contractor Direct Cost		**$45,320.00**
General Conditions/Requirements	6%	$2,719.20
Overhead and Profit	20%	$9,064.00
Bonds and Insurance	2%	$906.40
Estimating Allowance for Incomplete Plans	20%	$11,601.92
Total Contract		**$69,611.52**
Final Plans, Specifications, Estimates	10%	$6,961.15
Construction Mgmnt, Architect CA, Labor Compliance	15%	$10,441.73
Inspections & Testing	3%	$2,088.35
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$7,168.22
Subtotal		**$96,770.97**
Contingency for Unforseen Site Conditions	15%	$14,515.64
TOTAL		**$111,286.61**

CENTRAL SEGMENT - B2

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	672	6,720	SF	$0.75	$5,040.00	
	Sub-total							**$5,040.00**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			2	EA	$20,000.00	$40,000.00	
	Sub-total							**$40,000.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		672	672	LF	$10.00	$6,720.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			0	EA	$5,750.00	$0.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			4	EA	$175.00	$875.00	
	Sub-total							**$7,595.00**
6	**Signage**							
6.1	Entry signage			2	EA	$500.00	$1,000.00	
6.2	Confirmation posts			3	EA	$400.00	$1,200.00	
	Sub-total							**$1,200.00**

Contractor Direct Cost		**$86,335.00**
General Conditions/Requirements	6%	$5,180.10
Overhead and Profit	20%	$17,267.00
Bonds and Insurance	2%	$1,726.70
Estimating Allowance for Incomplete Plans	20%	$22,101.76
Total Contract		**$132,610.56**
Final Plans, Specifications, Estimates	10%	$13,261.06
Construction Mgmnt, Architect CA, Labor Compliance	15%	$19,891.58
Inspections & Testing	3%	$3,978.32
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$13,619.32
Subtotal		**$183,860.84**
Contingency for Unforseen Site Conditions	15%	$27,579.13
TOTAL		**$211,439.96**

ELEPHANT HILL TRAIL - MOUNTAINS RECREATION AND CONSERVATION AUTHORITY
ESTIMATE OF PROBABLE DESIGN & CONSTRUCTION COST - MARCH 2017

REVIEWED BY: JP - Alta PREPARED BY: ALTA PLANNING + DESIGN

Note: Quantities and descriptions are approximate and are provided for Contractor's convenience. Contractor shall verify all requirements and quantities on the Plans and in the field.

EASTERN SEGMENT - C1

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	1017	10,170	SF	$0.75	$7,627.50	
	Sub-total							**$7,627.50**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			0	EA	$20,000.00	$0.00	
	Sub-total							**$0.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		1017	1,017	LF	$10.00	$10,170.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			0	EA	$5,750.00	$0.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			7	EA	$175.00	$1,225.00	
	Sub-total							**$11,395.00**
6	**Signage**							
6.1	Entry signage			2	EA	$500.00	$1,000.00	
6.2	Confirmation posts			3	EA	$400.00	$1,200.00	
	Sub-total							**$1,200.00**

Contractor Direct Cost		**$52,722.50**
General Conditions/Requirements	6%	$3,163.35
Overhead and Profit	20%	$10,544.50
Bonds and Insurance	2%	$1,054.45
Estimating Allowance for Incomplete Plans	20%	$13,496.96
Total Contract		**$80,981.76**
Final Plans, Specifications, Estimates	10%	$8,098.18
Construction Mgmnt, Architect CA, Labor Compliance	15%	$12,147.26
Inspections & Testing	3%	$2,429.45
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$8,332.53
Subtotal		**$112,489.19**
Contingency for Unforseen Site Conditions	15%	$16,873.38
TOTAL		**$129,362.56**

alta PLANNING + DESIGN

COST ESTIMATES PER ALIGNMENT ALTERNATIVE - CENTRAL AND EASTERN

ELEPHANT HILL TRAIL

ELEPHANT HILL TRAIL - MOUNTAINS RECREATION AND CONSERVATION AUTHORITY
ESTIMATE OF PROBABLE DESIGN & CONSTRUCTION COST - MARCH 2017

REVIEWED BY: JP - Alta PREPARED BY: ALTA PLANNING + DESIGN

Note: Quantities and descriptions are approximate and are provided for Contractor's convenience. Contractor shall verify all requirements and quantities on the Plans and in the field.

PREFERRED ALIGNMENT - ALL SEGMENTS

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	3266	32,660	SF	$0.75	$24,495.00	
	Sub-total							**$24,495.00**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			3	EA	$20,000.00	$60,000.00	
	Sub-total							**$60,000.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		2966	2,966	LF	$10.00	$29,660.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			3	EA	$5,750.00	$17,250.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			20	EA	$175.00	$3,500.00	
	Sub-total							**$50,410.00**
6	**Signage**							
6.1	Entry signage			4	EA	$500.00	$2,000.00	
6.2	Confirmation posts			6	EA	$400.00	$2,400.00	
	Sub-total							**$2,400.00**

Contractor Direct Cost		**$169,805.00**
General Conditions/Requirements	6%	$10,188.30
Overhead and Profit	20%	$33,961.00
Bonds and Insurance	2%	$3,396.10
Estimating Allowance for Incomplete Plans	20%	$43,470.08
Total Contract		**$260,820.48**
Final Plans, Specifications, Estimates	10%	$26,082.05
Construction Mgmnt, Architect CA, Labor Compliance	15%	$39,123.07
Inspections & Testing	3%	$7,824.61
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$26,748.02
Subtotal		**$361,098.23**
Contingency for Unforseen Site Conditions	15%	$54,164.73
TOTAL		**$415,262.97**

ELEPHANT HILL TRAIL - MOUNTAINS RECREATION AND CONSERVATION AUTHORITY
ESTIMATE OF PROBABLE DESIGN & CONSTRUCTION COST - MARCH 2017

REVIEWED BY: JP - Alta PREPARED BY: ALTA PLANNING + DESIGN

Note: Quantities and descriptions are approximate and are provided for Contractor's convenience. Contractor shall verify all requirements and quantities on the Plans and in the field.

LOWEST-COST ALIGNMENT - ALL SEGMENTS

NO	DESCRIPTION	Width	LF	QTY	UNIT	UNIT COST	COST	SUB TOTAL
1	**Erosion Control - includes all BMPs, SWPPP and Supply QSP**			1	LS	$15,000.00	$15,000.00	
2	**Traffic Control - includes all requirements for trail users; project identity and information sign at both entrances**			1	LS	$2,500.00	$2,500.00	
2	**Mobilization**			1	LS	$15,000.00	$15,000.00	
	Sub-total							**$32,500.00**
3	**Sitework, Demolition and Removal - includes all clearing and grubbing, demolition, and site preparation for construction; temporary construction fencing; closure of OHV trails**							
3.1	Site preparation, clearing and grubbing for trail constructior	10	3258	32,580	SF	$0.75	$24,435.00	
	Sub-total							**$24,435.00**
4	**Property acquisition**							
4.1	Purchase of adjacent parcels			0	EA	$20,000.00	$0.00	
	Sub-total							**$0.00**
5	**Trail work and grading**							
5.1	Natural surface trail with balanced cut and fil		2858	2,858	LF	$10.00	$28,580.00	
5.2	Trail switchback (2 reversals), including segmental retaining wall and boulders			4	EA	$5,750.00	$23,000.00	
5.3	Trail drain dips (one dip for every 150 foot of trail			19	EA	$175.00	$3,500.00	
	Sub-total							**$55,080.00**
6	**Signage**							
6.1	Entry signage			4	EA	$500.00	$2,000.00	
6.2	Confirmation posts			6	EA	$400.00	$2,400.00	
	Sub-total							**$2,400.00**

Contractor Direct Cost		**$114,415.00**
General Conditions/Requirements	6%	$6,864.90
Overhead and Profit	20%	$22,883.00
Bonds and Insurance	2%	$2,288.30
Estimating Allowance for Incomplete Plans	20%	$29,290.24
Total Contract		**$175,741.44**
Final Plans, Specifications, Estimates	10%	$17,574.14
Construction Mgmnt, Architect CA, Labor Compliance	15%	$26,361.22
Inspections & Testing	3%	$5,272.24
Bid Costs	$500.00	$500.00
Escalation 2 YR	4%	$18,035.92
Subtotal		**$243,484.97**
Contingency for Unforseen Site Conditions	15%	$36,522.74
TOTAL		**$280,007.71**

WAYFINDING

It is recommended that the MRCA install minimal wayfinding along the Elephant Hill trail, in order to help users remain on the trail instead of veering onto adjacent trails and maintenance roads, while also preserving the site's uncluttered, open feel.

This wayfinding could take the form of recycled plastic posts or carsonite markers, which will be visually unobtrusive, and the materials will be more resilient and less flammable than wood.

As there will be few intersections between the Elephant Hill Trail and other roads and trails on site, these posts will only require a simple symbol or logo for the trail with an arrow to indicate the desired route for visitors.

At either end of the trail, entry signage should be created that names the trail, identifies the MRCA as the operator, outlines allowed uses, and provides information about the experience users can expect, such as slope, surface, and length.

EROSION

The lowest 120 feet of the eastern edge of the trail descends steeply down the hillside to the mouth of a broad swale at the gate entrance. This steep configuration cannot be avoided without placing several tightly spaced switchbacks within the narrow mouth of the swale; such switchbacks would be frequently cut-through by users and as such are not considered sustainable, and are not recommended. The road shows evidence of rilling with sediment being deposited onto Lathrop Street. In order to slow further erosion, the lower 100' of road tread should be stabilized with gravel or paved to prevent further erosion of the road surface.

At the western edge of the project area, the existing axis of the swale places the property at 1111 Pullman Street at risk for flooding and sedimentation, if runoff from the hill were great enough. The proposed trail is not expected to significantly increase this risk given the small footprint of the trail and because the trail will be drained with frequent drain dips to prevent trail runoff from concentrating. As a preventative measure, an earthen berm can be constructed at the bottom of the swale to help direct potential runoff away from the residence, but it is beyond the scope of the trail feasibility study to redesign stormwater flows to a greater extent.

ILLEGAL USE PREVENTION

New trails at Elephant Hill are proposed to be narrower than would accommodate offroad vehicles. Where wider roads intersect new trails, efforts should be made to close those roads and their access to the trails wherever possible. This can be done through the use of physical barriers, such as brush, berms, and ditches.

The MRCA can take measures to prevent offroad vehicle use on new trail construction, but until all entrances to Elephant Hill, most of which are not on MRCA-owned property, are closed, this will be a continual possibility. Ongoing negotiations with adjacent property owners will help facilitate coordination for the closure of entrances to unauthorized vehicles.

IMPLEMENTATION

Next steps to be taken in order to bring this project to completion involve funding, permitting, completion of design, bidding, and construction.

Funding will be required to pay for final design and property acquisition. A variety of federal, state, and local grants are available that pay for recreational trails and active transportation. Private donors and foundations should also be considered, particularly with a relatively small project such as Elephant Hill, where the trail can be dedicated to an individual or institution.

No permits are expected to be required for the development of trails on the properties owned by the MRCA. Trails that fall onto paper streets will require coordination with the City of Los Angeles, and the MRCA may need to request the City to vacate the paper street. Where significant development or impacts are expected on a paper street a "B" permit is required from the City's Bureau of Engineering, but impacts of this magnitude are not expected as part of this project. Where additional parcels may be acquired, standard real estate procedures should be followed.

Completion of design will require either: a survey, including topography, to inform detailed plans with slopes, cross-slopes, cross sections, and alignments. Alternatively, the MRCA can contract a trail-building specialist to stake and flag trail alignments in the field, draft plans, and supervise construction to ensure appropriate alignments, construction methods, slopes, and drainage. Construction drawings may be stamped by a landscape architect, and will not require civil or structural engineers.

Bidding and construction should be undertaken upon the completion of design, with the assistance of the designer. Due to excessive slopes on-site, a contractor should be hired with extensive work in trail building, and the designer should be retained for observation during construction.