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31 January 2024

Stacy Lint, CCAM
Magee Ranch Geologic Hazard Abatement District
c/o Homeowners Association Services
2266 Camino Ramon
San Ramon, California 94583

RE: Annual Observation Services
Magee Ranch Open Space
Danville, California
CE&G Document 0207451-002

Dear Ms. Lint:

At your request, we have completed our annual geologic and geotechnical evaluation of the Magee Ranch open space area in Danville, California. The open space area is part of a Geologic Hazard Abatement District (GHAD) managed by the Magee Ranch Homeowners Association (HOA). H&A has assumed the role of performing annual observation services, which were completed in the years prior by Tryhorn Consulting (TC) and Cal Engineering & Geology, inc. (CE&G).

The scope of our services was performed to satisfy the requirements of Exhibit C of the Magee Ranch GHAD Plan of Control document's purpose to reduce the potential, mitigate, abate, and provide control measures for identified geologic hazards within the open space boundaries.

Based on the information reviewed, we understand that the GHAD open space area includes the following accessor parcel numbers:

- 215070024 - Parcel B Subdivision 7669
- 215070016 - Parcel A Subdivision 7668
- 215070017 - Parcel B Subdivision 7668
- 215070005 - Parcel C Subdivision 7058
- 215070006 - Parcel D Subdivision 7058
- 215070014 - Parcel E Subdivision 7058
- 215070012 - Parcel J Subdivision 7058

1.0 PURPOSE AND SCOPE

The purposes of this project were to:

- observe the condition of the common open space areas and the associated improvements maintained by the GHAD;
- evaluate the geologic and geotechnical hazards/conditions such as landslides, areas of surface erosion, shallow soil creep, soil slumps, etc. in the open space areas;
- observe the condition of the surface drainage facilities and detention basins in the open space areas;
- observe the condition and functionality of the subdrains outlets and cleanouts;
- observe and document the condition of the GHAD-managed improvements, including retention and catchment structures;
- observe the condition of the Sunhaven Trail sewer easement road; and
- provide recommendations for mitigation, monitoring, and maintenance of the identified geologic and geotechnical conditions, the surface and subsurface drainage facilities, and GHAD-managed improvements.

The scope of our work has included:

- review of maps, reports, and plans for the project area made available by the GHAD;
- review of published regional geologic reports and maps of the project area and historical stereo-paired aerial photographs in our files;
- preparation of an updated base map;
- reconnaissance level observations and geologic mapping;
- preparation of an updated geologic map book of the project site, including identified surface and subsurface drainage features, retention structures, and geologic hazards;
- photo-documentation of the identified geologic and geotechnical conditions in the project site;
- update of a GIS-based document management system;
- analysis of the collected data; and
- preparation of this summary report of findings and recommendations.

2.0 DOCUMENT REVIEW AND BACKGROUND

We understand that Tryhorn Consulting (TC) provided annual observation and geologic consulting services for the GHAD until 2021. Tryhorn Consulting's services included periodic site observations and recommendations for the GHAD. As part of their services, TC prepared annual reports documenting those observations.

Cal Engineering & Geology (CE&G) completed annual observation services for the GHAD in 2022. As part of their services, CE&G developed a geospatial-based document management system for the project area. CE&G also provided general consultation and emergency response services for the GHAD in early 2023. Services included evaluating and developing recommendations for winterization and temporary stabilization measures associated with geohazards that developed during the winter storms between January and March 2023.

CE&G was acquired by H&A in 2023, and subsequently, H&A has assumed the role of providing annual observation and general geologic and geotechnical consultation services.

The GHAD provided H&A with the 2018 and 2019-2020 Tryhorn Consulting annual observation reports for review. The reports focused on conditions of the hillslopes, subdrains, surface drainage, detention basins, and the Sunhaven Trail easement. The GHAD also provided H&A with the Grading Plans for Subdivision 7058 Magee Ranch, prepared by DK Associates and dated July 1988. The plans were annotated and documented the as-built locations of the cut and fill slopes, areas of remedial grading, installation of subdrain systems, landslides, and surface drainage facilities. The plans indicated that the grading for the subdivision was completed in early 1992.

3.0 UPDATED BASE MAP AND GIS-BASED DOCUMENT MANAGEMENT SYSTEM

H&A prepared an updated topographic base map of the project area. The base map was developed based on the most recently publicly available LiDAR and ortho-photographic information from Contra Costa County. The base map was required to complete the reconnaissance-level geologic and site observations mapping. The base map was separated into a map book with 29 sheets that encompassed the GHAD limits and the Sunhaven Trail sewer easement.

H&A then updated the existing GIS-based document management system (DMS) for the GHAD. The system includes regional published geologic data, parcel boundaries, and the GHAD boundary limits. The provided documents were also uploaded to the system. Existing as-built information provided by the GHAD, including mapped landslides, subdrain system and cleanouts, surface drainage facilities, and detention basins, were plotted onto the system.

The DMS can be used to track documents, changes to site conditions, and provide the GHAD management and residents with data at a glance. The data from 2022 and 2023 observations and mapping were added to the system and incorporated into the map book included at the end of this report. Additional data will be added and updated following subsequent field observations and consulting services.

A link to the DMS is below:

https://cegis.caleng.com/projects/2022/220560/GeoViewer.html

4.0 2023 SITE OBSERVATIONS AND RECOMMENDATIONS

The following observations were made during our site visits between 4 December and 7 December 2023 by staff geologist Jennifer Pfau-Flores and engineering geologist David Burger. Observations of site features were photo-documented. Selected captioned photographs of the site are included at the end of this report. Observations from our reconnaissance level mapping are included in the map book at the end of this report. Our observations, notes regarding specific site features, and reconnaissance-level mapping were plotted onto the DMS.

Discussion of our site observations are followed by recommendations for maintenance, monitoring, and remedial repairs. The purposes of our work were to observe the open space areas before the winter storm season and to provide recommendations for maintenance/mitigation of damages to the existing surface and subsurface drainage facilities and adverse soil and drainage conditions noted during the site visit.

The project area was historically divided into specific areas as originally designated in the provided as-built plan. We have referenced the original designations for landslide and drainage improvements and other callouts on the DMS. However, for the purposes of this report, our observations and recommendations will reference these original designations, as warranted, as well as addresses or known existing site features.

4.1 HILLSLOPES

4.1.1 Graded Slopes

Graded slopes are present throughout the project area. We understand that most graded slopes were completed as part of the subdivision's original development. These slopes were primarily created by cutting into the hillsides, removing native soil and some of the underlying bedrock materials, placement of engineered fill, installation of surface and subsurface drainage measures, during the remedial grading activities and previous landslide repairs.

In general, the graded slopes are performing as intended. Deep-seated movement or reactivation of the areas that received remedial grading or repairs of the landslide features was not observed. Portions of these graded slopes have experienced areas of severe soil creep and isolated shallow slope failures. Additionally, isolated areas within these graded

slopes have experienced some localized areas of erosion and activity from rodent burrows (Photo 1).

4.1.2 Recommendations – Graded Slopes

It is recommended that the condition of the graded slopes be observed on an annual basis. The observation should be completed before the winter storm season. Additional monitoring is recommended following periods of significant rain and a large seismic event. Additionally, ongoing particular attention should be given to the previously repaired slope behind 15 Brightwood Drive, where extensive burrowing and soil creep were observed. The shallow movement and loose soil have impacted the v-ditch and drop inlet below. We recommend, at minimum, monitoring this area be completed bi-annually (twice per year) before and following the winter storm season.

4.1.3 Landslides

Prior to the mass grading within the project area, significant portions of the hillside and swale areas were impacted by landslides. Most of the mapped landslide features in this project area appear to have been mitigated by the removal of landslide deposits and replacement with under-drained buttress fills. We identified several subdrain outfall pipes discharging into various drop inlets and concrete-lined v-ditches throughout the project site (Photo 2). The majority of the cleanouts shown on the as-built plans were located during our December 2023 site reconnaissance. The additional cleanouts located, as compared to those identified in the August 2022 site reconnaissance, were likely due to the reduced vegetation at the time of our 2023 site reconnaissance. However, a number of the cleanouts identified on the as-built drawing reviewed were still not located. This is likely due to cleanout risers terminating near or below the existing ground surface, limited visibility from dense vegetation, or damage from weed abatement or fire suppression mowing/discing efforts. Several of the subdrain cleanouts observed were broken off at ground level or did not contain caps (Photo 3). The conditions or observed damage to each identified cleanout is included in the DMS.

We did not observe readily identifiable evidence of reactivation of the previously repaired slide areas. It should be noted that during our December 2023 site reconnaissance, we mapped a small, surficial landslide above the previous failure repair behind 15 Brightwood Circle (Photo 4). Our observations indicated that the overall repair is stable, and deeper-seated movement was not observed.

It should be noted that we have identified evidence of recent shallow landsliding in the drainage area east of Windover Drive near the gabion wall (Photo 5). Evidence of deeper-seated movement was not observed, and the gabion wall appeared to be in good condition.

We determined that several mapped landslide features identified in the 1988 as-built plan had not been repaired at the time of our December 2023 site reconnaissance. Of particular note are the landslide features behind 9 and 11 Brooktree Drive. We also observed that the upslope portion of the landslides upslope of 35 and 39 Brightwood Lane East had not been repaired. However, a gabion wall and basin were constructed directly upslope of the properties to intercept debris and drainage from the slope and slide feature above. It should be noted that the observed landslides and interpreted drainage pathways were judged to pose a potential risk to the downslope improvements.

During our site reconnaissance, we identified a significant number of smaller landslides and colluvial deposits. The thickness of these deposits is estimated to range from several feet to tens of feet. These smaller slope instability features are primarily located near the base of slopes behind the residences. They are judged to be localized within the surficial soils and generally set within the swales and drainage areas of the project site. Movement appears to be gradual, with localized deposition of soil into the surface drainage facilities and impacting property fence lines.

We observed a large landslide feature within the graded slope above and to the south of Magee Ranch Road. Evidence of recent movement of this slide was not observed. However, the mapped limits of the slide were interpreted to pose a potential risk to the surface drainage facilities within the slide mass.

We observed a large landslide feature within the large ravine area west of Saddleback Court. This feature is located away from any improvements and has been judged to pose a low risk to any downslope improvements.

Near the northeastern corner of the project site and upslope of Saddleback Drive, a small to medium-sized landslide feature was observed. This feature appears active, as evidenced by a somewhat fresh headscarp. Near the toe of this feature is an older 3-foot-tall wood catchment wall. This wall was observed as failing. A new cast-in-place retaining/catchment wall was observed at the base of the slope along Saddleback Drive below this feature. This structure was observed to be in good condition.

4.1.4 Recommendations - Landslides

The previously repaired landslides within the project area appear to be performing as intended. We did not observe readily identifiable evidence of recent localized or global instabilities within the observed slide repairs. It is recommended that these slide areas be evaluated at least once a year as part of the recommended annual observation services. The conditions of the existing cleanouts and outfalls for subdrains should also be located, observed, and evaluated as part of the annual inspection. To limit damage during moving/discing operations, we recommend the cleanout risers be protected and or made visually apparent with the installation of T-posts. Cleanout risers that are at or below the ground surface should be extended to a minimum of 18-inches above the ground surface. Damaged riser pipes should be repaired, and missing riser caps should be replaced to limit the introduction of soil or debris into the 7ubdrainn system. Consideration should be made to inspect or clean the subdrain systems where soil and/or debris may have been allowed to enter. A significant number of cleanouts identified on the as-built plans were not located during our 2023 site reconnaissance. This may be due to the accuracy of the as-built plans, damage from past activities, or being buried due to soil creep. Consideration should be made to locating each cleanout riser identified on the as-built plans, extending them above the ground surface, and repairing/cleaning the subdrain system as warranted. Maintaining the subdrain system's functionality will reduce the potential for the repairs to fail and will reduce the risk to nearby improvements.

The slide complex behind 124 Shadewell Drive has deposited significant amounts of debris behind the gabion wall near the base of the slope. We recommend the removal of the deposited material and restoring capacity in the basin behind the wall. Additional remedial measures for the gabion wall are not warranted at this time. Evidence of recent movement in this area indicates that landsliding is progressive and ongoing. We recommend monitoring this area bi-annually before and following the winter storm season, at minimum. This area should also be monitored following periods of intense rainfall or a large seismic event. If evidence of increased risk to downslope improvements is observed, consideration for additional remedial or protective measures should be made. Consideration should also be made to repairing or replacing the failing wood catchment wall near the base of the slope behind the residence.

Consideration should be made to installing improvements to protect the residences located at 9 and 11 Brooktree Drive. The geomorphology indicates there is a significant risk from surface drainage and sediment deposition during a large rain event that may impact these residences. Surface drainage facilities behind these residences are present. However, the capacity of these systems may be overwhelmed, given the size of the observed watershed

and the potential for debris deposition. Although we did not observe evidence that this landslide experienced recent movement, the potential for reactivation of this feature should be considered high. Debris from this slide may migrate downslope and impact the residences. Consideration should be made to installing additional protection measures for these residences. We recommend that a geotechnical investigation and design of a catchment and/or retention system be completed. This area should be closely monitored before and after the winter storm season.

The observed basin and gabion wall above 35 and 39 Brightwood Lane East appeared to be in good condition and functioning as intended. Consideration should be made to monitoring this detention basis and gabion wall bi-annually, at a minimum. Sedimentation within the basin may occur over a single storm season or rain event. Consideration should be made to observing this basin following a significant storm event and maintaining capacity throughout the winter storm season.

The slides observed to the west of Shadwell Drive and Shadwell Court did not appear to pose a significant risk to the downslope improvements. At this time, remedial measures are not warranted. However, consideration should be made to repairing or replacing the failed catchment wall near the northeastern corner of the GHAD boundary. We recommend continued monitoring of these slides areas on an annual basis.

Smaller landslides and colluvial deposits were observed throughout the project area. Evidence of recent or significant movement of these features was not observed. At this time, remedial measures are not warranted. We recommend monitoring these features annually. If evidence of progressive downslope movement increases the risk to nearby improvements is observed, we will provide recommendations at that time.

4.1.5 Areas of Active Soil Creep

Areas of active soil creep were identified throughout the hillside area during our December 2023 site reconnaissance. Areas identified with significant soil creep are delineated on the map book and DMS as curved pointed arrows. These areas exhibited signs of active shallow downslope creep of the surface soils. The areas are characterized by hummocky and undulating ground surfaces. These features have generally developed in areas of over-steepened slopes, areas subject to increased landsliding, or which were previously impacted by grading and have been disced for fire control. As the soil from the creep-prone areas migrates downslope, it has contributed to the development of separation cracks, offsets, accumulation of debris, and ongoing distress to the surface drainage facilities and property fence lines at some locations (Photos 6 & 7).

4.1.6 Recommendation - Creep Prone Slopes

It is recommended that the areas of active soil creep be observed on an annual basis. Any significant changes should be noted and documented. Consideration may be made to reducing the potential for soil entering the surface drainage facilities in the areas where the soil has been observed cascading in into the v-ditches and drop inlets. This may be accomplished by removing loose deposits and potentially unstable soil directly upslope and adjacent to the v-ditches and drop inlet structures and installing straw wattles along the upslope sides of the v-ditches.

4.1.7 Animal Burrows

Numerous animal and or rodent burrows were observed at various locations within the hillside areas. The burrows were often located adjacent to and above the concrete-lined v-ditches and property fence lines. These burrows have resulted in the deposition of excess soil into the v-ditches and some undermining of the v-ditches at some locations (Photo 8). These burrows can reduce the underlying support of the ditch, increase the potential for excess cracking or offsets within the ditches, reduce the functionality of the surface drainage facilities via the introduction of debris into the system, and have the potential to create potential localized shallow landsliding or slumping within the hillside areas.

Burrows were also observed within the slope and at the base of the new wall constructed as part of the 2023 repair located above 155 and 158 Sunhaven Rd (Photo 9). These burrows can impact the long-term performance of the repair, undermine structures, and increase the potential for instabilities or increased debris mobilization and sedimentation. The continued undermining of the retaining wall will increase the potential for localized settlement and or destabilization of the soil below the wall.

4.1.8 Recommendations – Animal Burrows

We recommend that areas where undermining of the v-ditches, drainage facilities, support structures, and previous slope repairs have occurred should be repaired. This may be accomplished by filing the burrow voids with the placement of neat cement grout or compacted soil.

Considering the concentration of animal burrows observed, there is a moderate potential for the development of soil slumps in the hillsides within these areas. In general, soil slumps would be expected to develop from these animal activities, as observed at similar hillside areas within the vicinity of the project area.

It is recommended that the areas with significant animal burrow activities be monitored for future movement. Repair of soil slumping would be warranted if the soil moves downslope and impacts the surface drainage facilities or other improvements. Consideration should be given to implementing a rodent abatement project for these areas.

4.2 AREAS OF SIGNIFICANT EROSION AND DETENTION BASINS

Similar to previous observations, the basin area to the south of 138 Windover Drive has experienced similar functionality limitations given the volume of material it experiences. It should also be noted that the stacked rock wall identified between the three basins behind 138 Windover Drive was continuing to fail. The central wall had a small section of rock missing, exposing the deposited soil behind the wall. The rock appeared to be stacked with evidence of filter fabric or structural control measure for the wall not observed. Our observations indicated that water and sediment have overtopped these structures, likely contributing to the ongoing failures.

The drainage ravine to the south of 138 Windover Drive has experienced ongoing and significant erosion, downcutting, and embankment failures (Photos 10-12). The result of this has been the significant deposition of sediment into the three basins south of 138 Windover Drive. Our observations indicate that previous attempts to limit this downcutting have been made. A rip-rap blanket was placed at the southern end of this erosion-prone area as an energy dissipation structure for the outlet pipe for the basin to the south. However, the drainage from this 8-inch pipe has resulted in erosion and downcutting along the western edge of the rip-rap blanket. Downcutting is ongoing and progressive. As erosion and downcutting continue, the ravine embankments have experienced localized failures and landsliding. Two failures have impacted the fire access road along the eastern side of the ravine. Temporary winterization measures, including the installation of plastic, straw wattles, and sandbags, have been installed to reduce the potential for retrogression or widening of these features.

Additional drainage pathways were observed throughout the project area. Minor amounts of erosion were observed at various locations within the project area. Some areas downslope of slopes that have experienced significant erosion appeared to have been mitigated with the installation of gabion walls and detention basins. The basins were observed as performing as intended. However, several basins have reached capacity. The three basins behind 138 Windover Drive and the one basin behind 124 Shadewell Drive are full and at capacity (Photo 13). The other basins were observed with significant soil deposition. Our observations indicated that water and sediment had overtopped these structures.

4.2.1 Recommendations – Areas of Significant Erosion and Detention Basins

The area south of Windover Drive will likely continue to down-cut and be a significant source of sediment transported northward toward the downslope improvements. Consideration should be made to establishing and improving the erosion and sediment control measures within this area. We recommend the placement of additional rip-rap and energy dissipation systems at the outlet location for the 8-inch pipe at the southern end of the areas of significant erosion. Additionally, we recommend the removal of the sediment from the basin and the repair or construction of new walls between the basins. This area should be monitored bi-annually, at minimum, before and following the winter storm season. As it is anticipated that this area will continue to experience significant impacts from drainage and debris accumulation, consideration should be made to improving the capacity and outlet structure for this basin area. Consideration should also be made to monitoring these areas following periods of significant rain.

We recommend cleaning the basins behind each of the gabion walls. At this time, we do not have data on the rate of sediment deposition behind each gabion wall or within each basin. Consideration should be made to restoring the capacity of each basin to design grades. We recommend monitoring the rate of sediment deposition within each basin annually. The rate of deposition should be compared with annual precipitation rates and specific storm event data as warranted. This will allow for predictive modeling and evaluation to be completed through subsequent monitoring cycles. The data can then be used to determine an updated schedule for future sediment removal and required maintenance operation items for each basin.

4.3 2023 PRIORITY AREAS OF CONCERN

The early 2023 winter storms resulted in significant erosion and slope instabilities throughout the GHAD-managed area. As part of mitigation efforts resulting from the early 2023 storms, we understand slope repair, erosion control measures, debris clean up, and surface drainage improvements were performed in 2023 at the following locations:

- Slope above 155 & 158 Sunhaven Road
- Slope above 116 Shadewell Drive
- Slope above 124 Shadewell Drive
- Windover Drive Retention Basin
- Slope west and above 3 Sunglen Way
- Shadewell Drive Retention Basin
- Area south 144 Sunhaven Road
- Slope east of 137 Shadewell Drive
- Sunhaven Road Trail

Our observations for each of the above-mentioned repair areas were observed for current conditions and added to our DMS. Most areas appeared to have undergone grading and placement of erosion control measures (Photo 14). Direct inlets impacted by the repair were also improved with drain rock (Photo 15). Slope repairs with steeper slopes were improved with new cleanouts and rock walls (Photo 16).

Repair areas observed were determined to be in good condition and functional. Consideration should be made to monitoring the repairs, maintaining erosion and sediment control measures, repairing burrow holes as warranted, and evaluating the condition of the slope and drainage measures annually.

4.4 DRAINAGE FACILITIES

4.4.1 Surface Drainage Facilities

The surface drainage facilities within the project site consist of a system of concrete-lined ditches, drop-inlet structures, and outfall pipes. These surface drainage facilities were intended to collect the surface water runoff from the hillside areas within the project site and to convey the captured water to the storm drain system for the Magee Ranch development. These facilities were also intended to reduce the amount of surface water runoff that reaches the private properties and the streets below. The approximate locations of the surface drainage features are shown on Map Book and DMS.

In general, most of the concrete-lined surface drainage ditches are in good condition. Minor vertical and horizontal offsets were also observed at a few locations. Offsets of up to two and a half inches were observed at the v-ditch behind 25 Maplewood Drive (Photos 17-19). Offsets may impede flows within the ditch, creating an obstruction for debris to accumulate.

In addition, we observed soil deposition in the v-ditches from creep and animal burrows at some locations (Photo 20). The soil reduced the capacity of the ditch and appeared to reduce the functionality and flows within the ditch. Soil deposition was generally located in areas adjacent to significant areas of creep, landslides, and significant animal burrow activity immediately adjacent to the v-ditches.

A substantial number of sections of the concrete-lined ditches within the project site are partially filled with organic debris (Photo 21). Most of the organic debris is composed of cuttings from the annual weed abatement program and leaves from trees and bushes. The debris appears to have been wind-blown into the ditches. At some locations, the native

grasses and bushes have grown over the top and within the ditches. These grasses and bushes have also dropped significant organic debris into the ditches (Photo 22).

It should be noted that the culvert pipe southeast of 138 Windover Drive and crossing under the fire road was previously blocked and subsequently cleared. Our observations indicated this culvert pipe was clear at the time of our 2023 observations. We observed the inlet receiving the surface drainage for the ravine to the east may become blocked by debris following periods of intense rainfall. The geomorphology suggests that the functionality of the culvert pipe is critical to reduce the potential from the drainage from this ravine overflowing onto the fire road and likely creating erosion and potential impacts to the downslope improvements.

Notes of these observations and areas of distress are contained within our DMS and callouts out on the map book.

4.4.2 Remedial Measures and Maintenance of Surface Drainage Facilities

It is recommended that all of the debris in the concrete surface drainage ditches be removed, at minimum, annually, prior to the start of the winter storm season. This will facilitate the free flow of water and reduce the potential for blockage of the ditches and inlet structures and subsequent overflowing of water onto the private properties below. The debris removal should be completed prior to the onset of the winter storm season. The winter storm season in the greater Bay Area is generally considered to occur between October and April. Therefore, the annual inspection should take place around August of each year to allow the appropriate time to address any recommended remedial measures.

The drop-inlets for the concrete ditches should be visually inspected and cleaned annually prior to the onset of the winter rains. This work should be done concurrently with the debris removed from the concrete ditches. It is recommended that additional periodic monitoring of these inlet structures be completed throughout the winter storm season and following significant rain events be completed. The potential for additional debris to collect and block the drop-inlet structures during significant rain events should be anticipated.

It is also advisable to trim or prune the vegetation that overhangs or is growing within the drainage facilities. Pruning the vegetation should help reduce the amount of vegetative debris that falls into the surface drainage facilities.

Segments of the concrete ditches are damaged and require repairs. It is recommended that the sections of the ditch that have developed cracks greater than ½-inch, missing portions, and offsets that impede flows or functionality be repaired using high-strength concrete.

Cracks less than ½-inch may be patched using a high-strength masonry caulking. It is likely that following the removal of vegetative and soil debris, additional damage to the v-ditch will be exposed. Repair to these damaged sections should be completed concurrently with the cleaning operation. Repairs to the v-ditch should be completed before the upcoming winter storm season.

Damaged pipes discharging into the v-ditches from subdrains and residences should be repaired. We recommend extending these pipes into the v-ditch or providing additional protection measures to avoid damage or blockage.

The culvert located southeast of 138 Windover Drive should be repaired to restore functionality. The outlet pipe location for this culvert should be directed into an energy dissipation system or routed into the basin below.

4.4.3 Additional Observations and Recommendations

Portions of the v-ditches cross into private parcels. In some areas, the fencing for these parcels extends into the v-ditch at the locations. This fence installation within the ditches is likely to prevent animals from entering the properties. However, this often allows debris to accumulate against the fence within the ditch. We recommend these barriers be removed, modified, or cleaned periodically to restore functionality to the ditches.

We observed the large basins near the western end of Brightwood Lane West and south of 118 Sunhaven Road. The basins appeared to be in good condition and functioning as intended. We recommend periodic monitoring of these basins, bi-annually at a minimum. Vegetative and soil debris may accumulate near the outlet structures following periods of significant rainfall. Vegetative and soil debris should be removed as warranted to maintain the functionality of the basins.

5.0 CLOSURE

We have employed accepted engineering geologic procedures and our professional opinions and conclusions are made in accordance with generally accepted engineering geology principles and practices. This standard is in lieu of all warranties, either expressed or implied.

We trust this report provides you with the information required to proceed. If you have any questions, please call us.

Sincerely,

CAL ENGINEERING & GEOLOGY, INC.

Jennifer Pfau

Jennifer Pfau-Flores
Project Geologist

Reviewed by:

David Burger, P.G., E.G.
Senior Project Manager/ Geologist

SITE PHOTOGRAPHS

Photo 1. View of rodent burrows on the previously graded slope on the eastern side of Magee Ranch Road.

Photo 2. View of v-ditch with cracks and discharge from subdrain pipe.

Photo 3. View of a damaged subdrain cleanout riser.

Photo 4. View of recently active landslide above repair behind 15 Brightwood Circle.

Photo 5. View of recently active landslide in drainage area east of Windover Drive near gabion wall.

Photo 6. View of creep impacting the fence behind 120 Windover Drive.

Photo 7. Soil cracks and creep observed behind 19 Maplewood Drive.

Photo 8. View of burrow holes depositing sediment into v-ditch behind 7 Crownridge Drive.

Photo 9. Burrow holes observed at the base of the wood wall built as part of the repair behind 155 & 158 Sunhaven Road.

Photo 10. View of significant erosion in the ravine south of 138 Windover Drive.

Photo 11. Slope failure on the eastern bank of the fire road south of 138 Windover Drive.

Photo 12. Slope failure on the eastern bank of the fire road south of 138 Windover Drive.

Photo 13. View of basin behind 138 Windover Drive at capacity.

Photo 14. Repaired slope with hydroseed and drain rock behind 158 Sunhaven Road.

Photo 15. View of erosion repair with drain rock and new direct inlet on Sunhaven Trail.

Photo 16. View of repair with new cleanouts and rockwall behind 116 Shadewell Drive.

Photo 17. Vertical offset of 1.5 inches at v-ditch behind 25 Maplewood Drive.

Photo 18. V-ditch lifted 2.5 to 3 inches and cracking from creep behind 25 Maplewood Drive.

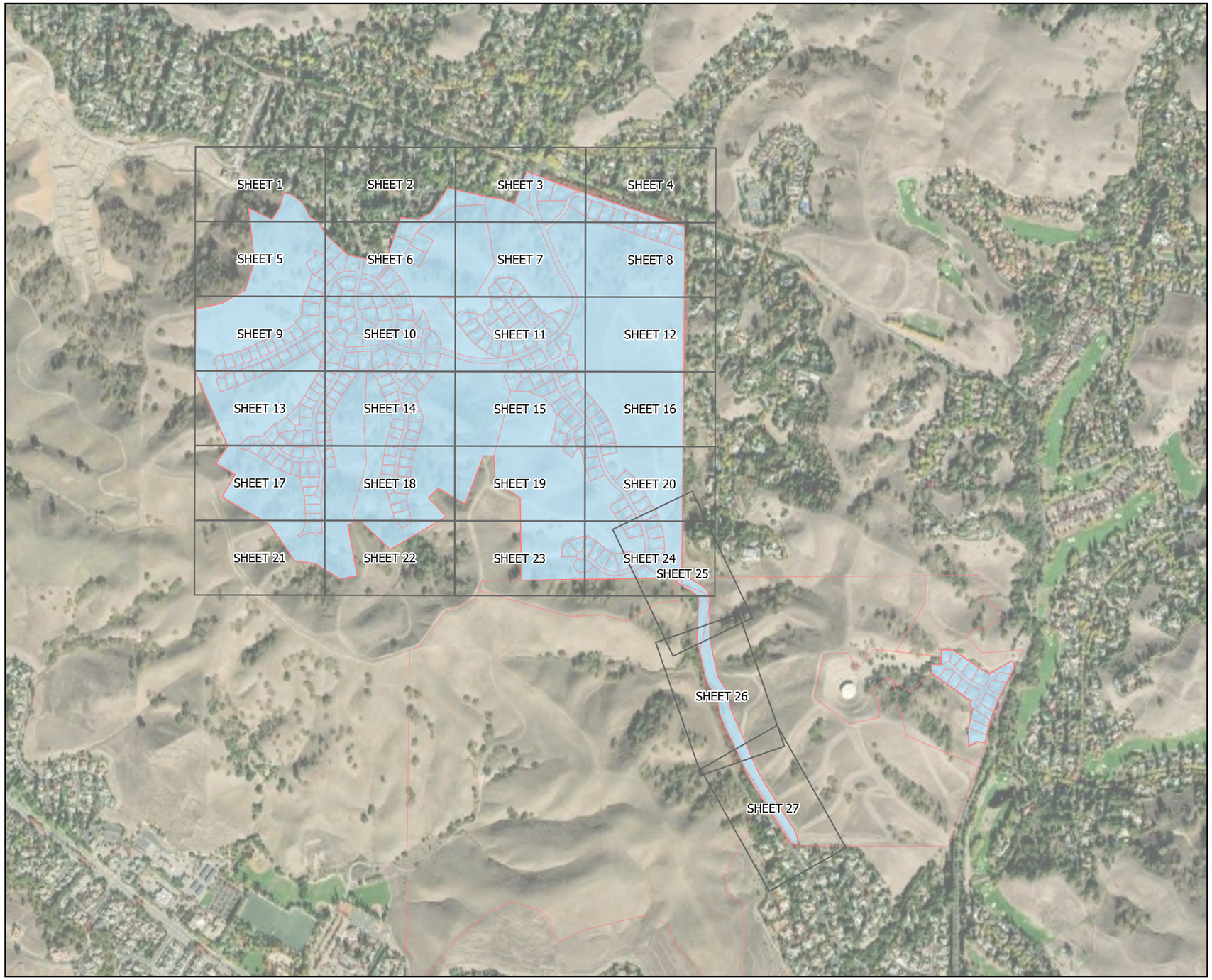
Photo 19. Soil cracks and creep impacting v-ditch behind 25 Maplewood Drive.

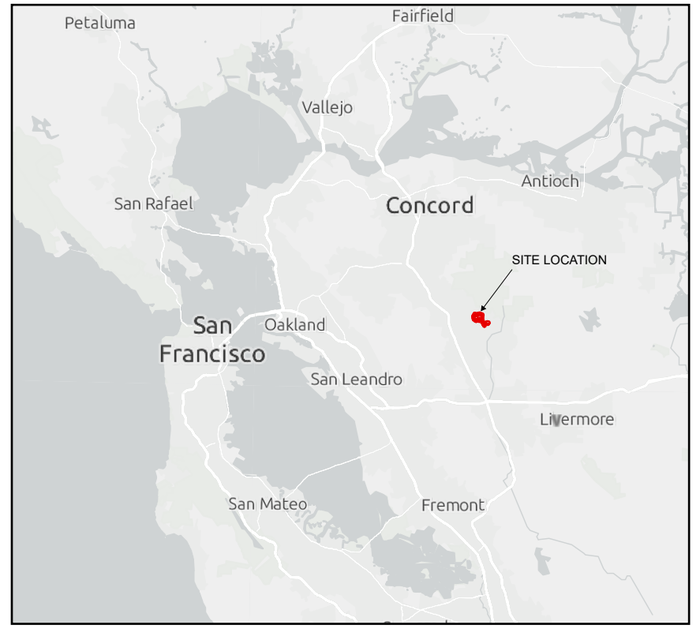
Photo 20. V-ditch and direct inlet behind 19 Maplewood Dr affected by creep, erosion, and debris deposition.

Photo 21. Debris blocking direct inlet at 154 Sunhaven Road.

Photo 22. Significant amount of debris and grass growing in v-ditch behind 116 Leafield Rd.

Attachment A. Map Book





MAP UNIT DESCRIPTION

- CLEANOUTS
- OTHER FIELD NOTES
- DIRECT INLETS
- BURROW HOLES
- ASPHALT DAMAGE
- CREEP (ARROWS INDICATE DIRECTION OF MOVEMENT)
- V-DITCH
- BERM
- CRIB WALL
- GABION WALL
- RIP RAP
- ROCK WALL
- WOOD WALL
- BASINS
- MAPPED FAILURES 2023
- PREVIOUS REPAIR LIMITS
- LANDSLIDES MAPPED 2022
- EROSION FAILURE

BASEMAP REFERENCE

1. ORTHOIMAGERY FROM ESRI, MAXAR 2020.

N

0 0.13 0.25 0.5
MILES

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0207451-002	JANUARY 2024	SHEET 0

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BASEMAP REFERENCE

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2. CONTOURS FROM USGS 2018 LIDAR. ACCESSED ONLINE JUNE 29, 2022. CONTOUR INTERVAL - 5 FT.
3. QC = COLLUVIUM; QLS = LANDSLIDE
   ARROWS SHOW DIRECTION OF MOVEMENT.

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0207451-002	DECEMBER 2023	SHEET 1

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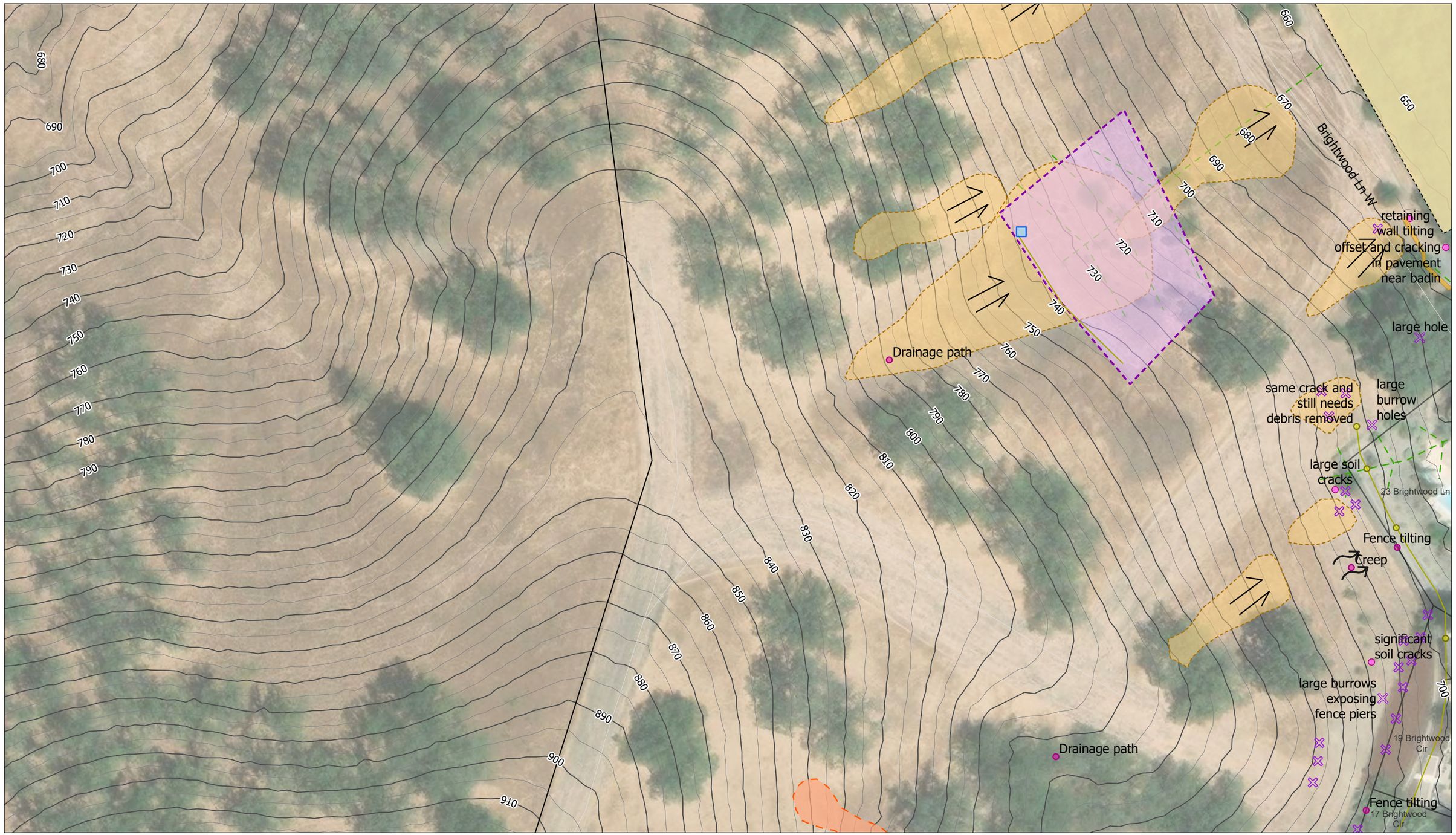

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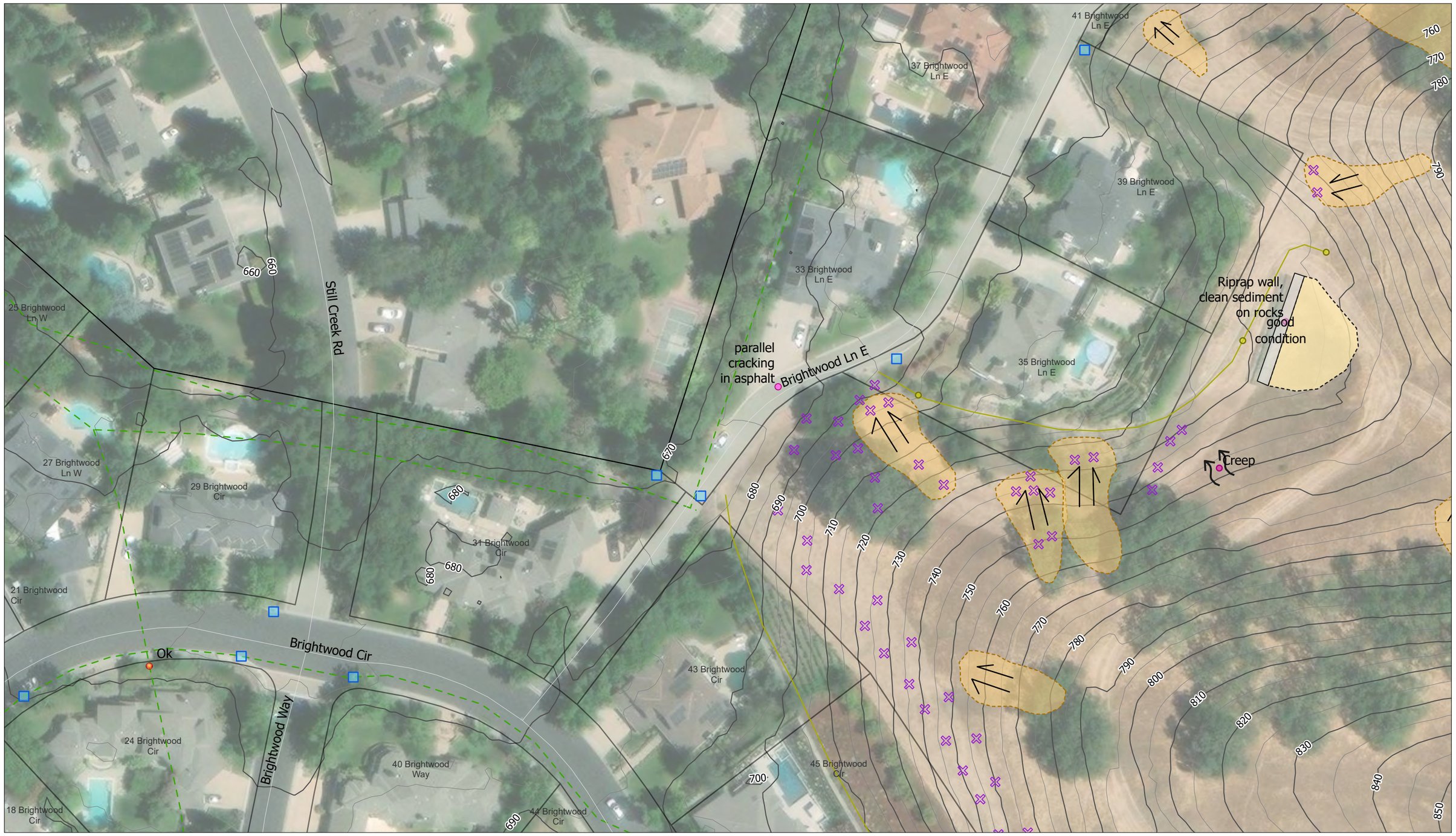
0207451-002	DECEMBER 2023	SHEET 5



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located 9in out of ground good condition

has cap good conditionm mixed up with co beliw

located missing top still

3in hole still needs repair

good condition

Good condition

Lots of green veg, check subdrain pipes

good condition

mixed up with another updated to map good condition

1in hole needs repair

lrg 1ft hole

OK condition

OK condition

subdrains unable to locate

CO not found

0.5 in crack in VD

10 Crownridge Dr

9 Crownridge Dr

8 Crownridge Dr

6 Crownridge Dr

Magee Ranch Rd

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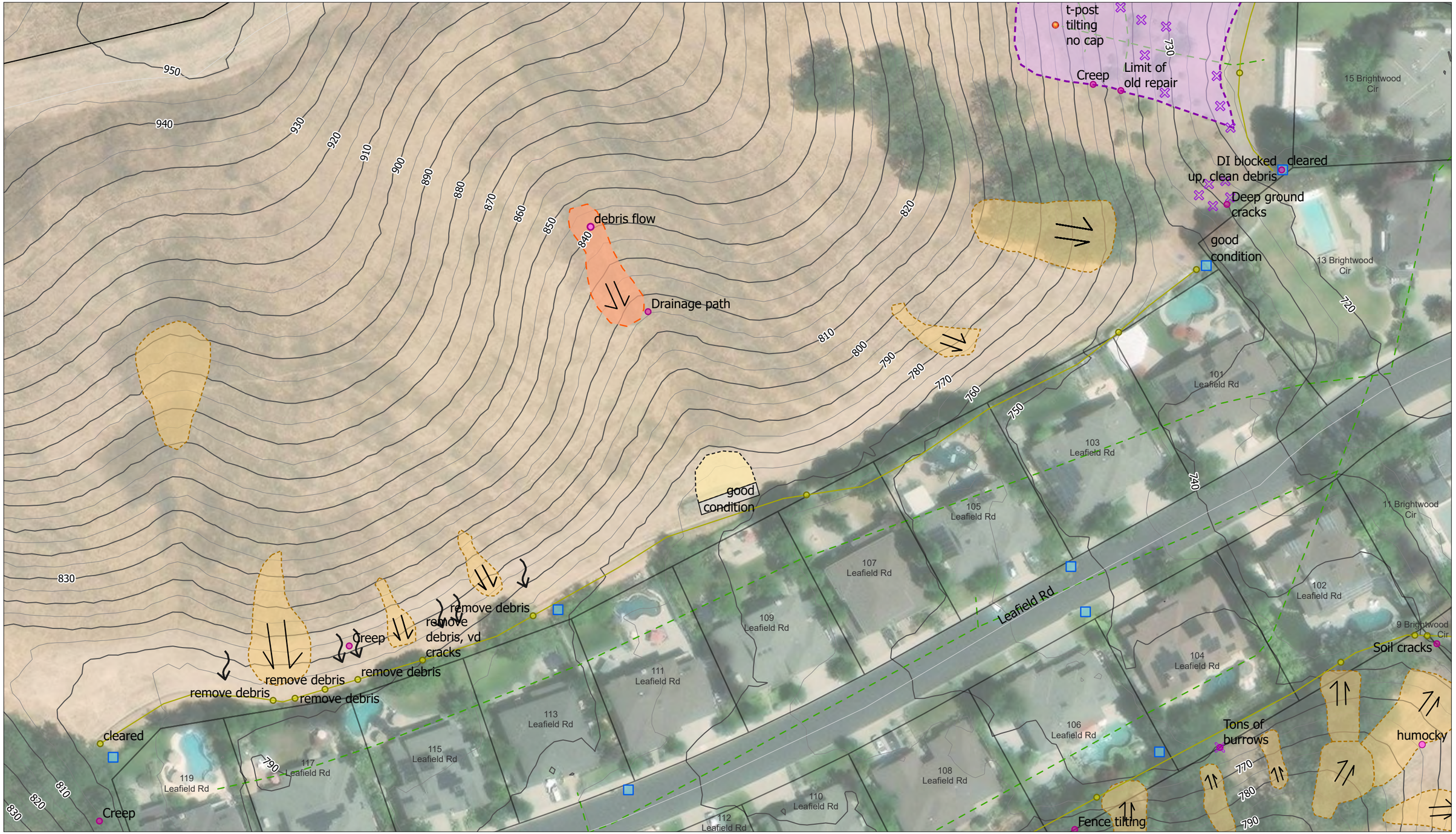

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drainage path
remove sed 2ft inlet with cage
no t post build up in basin
unable to locate - potentially in yard
soil cracks deep and fence tilting
Soil cracks
remove debris
remove debris, grass growing
grass ground
remove debris
outlet pipe into vd broken need repair
vd cracks
Fence tilting
vd crack
6in inlet pipe broken
Bulge
fence significantly tilting, veg growing on fence but keep an eye on
good condition
Bulge
Bulge
remove debris
Soil cracks
remove sediment in vd
remove debris in vd
Soil cracks
remove debris
Fence tilting
112 Leafield Rd
114 Leafield Rd
116 Leafield Rd
118 Leafield Rd
120 Leafield Rd
109 Shadewell Dr
111 Shadewell Dr
113 Shadewell Dr
115 Shadewell Dr
117 Shadewell Dr
4 Shadewell Ct
8 Shadewell Ct
Shadewell Ct
Shadewell Dr
14 Glen Hollow Rd
17 Glen Hollow Rd
12 Glen Hollow Rd
5 Shadewell Ct
3 Shadewell Ct
1 Shadewell Ct

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clear debris
clear debris
Still needs debris removed
still needs debris removed
still needs to be cleared
Bulge
Outlet damaged - install energy dissipater
located, 1in hole needs repair, 1ft above ground
Fence tilting
Fence tilting
large soil cracks
Creep
Bulge
Lots of green veg
Fence tilting
Lots of green veg
remove debris, grass is growing
4 inch PVC outlet pipe
large
sediment biuld up, remove debris
4 inch cap - broken at top - fix
old slide not mapped
new 2023
scarp of 2023 failure
new repair
new
good condition
fence tilting
Bulge
Drainage path
Windover Ter
Windover Dr
102 Shadewell Dr
104 Shadewell Dr
106 Shadewell Dr
108 Shadewell Dr
110 Shadewell Dr
5 Windover Ter
3 Windover Ter
2 Windover Ter
1 Windover Ter
106 Windover Dr
108 Windover Dr
110 Windover Dr
111 Windover Dr
112 Windover Dr
113 Windover Dr
114 Windover Dr
115 Windover Dr
116 Windover Dr
117 Windover Dr
118 Windover Dr
119 Windover Dr
120 Windover Dr
121 Windover Dr
122 Windover Dr
730
740
750
760
770
780
790
800
810
820
830
840
850
860
870
880
890

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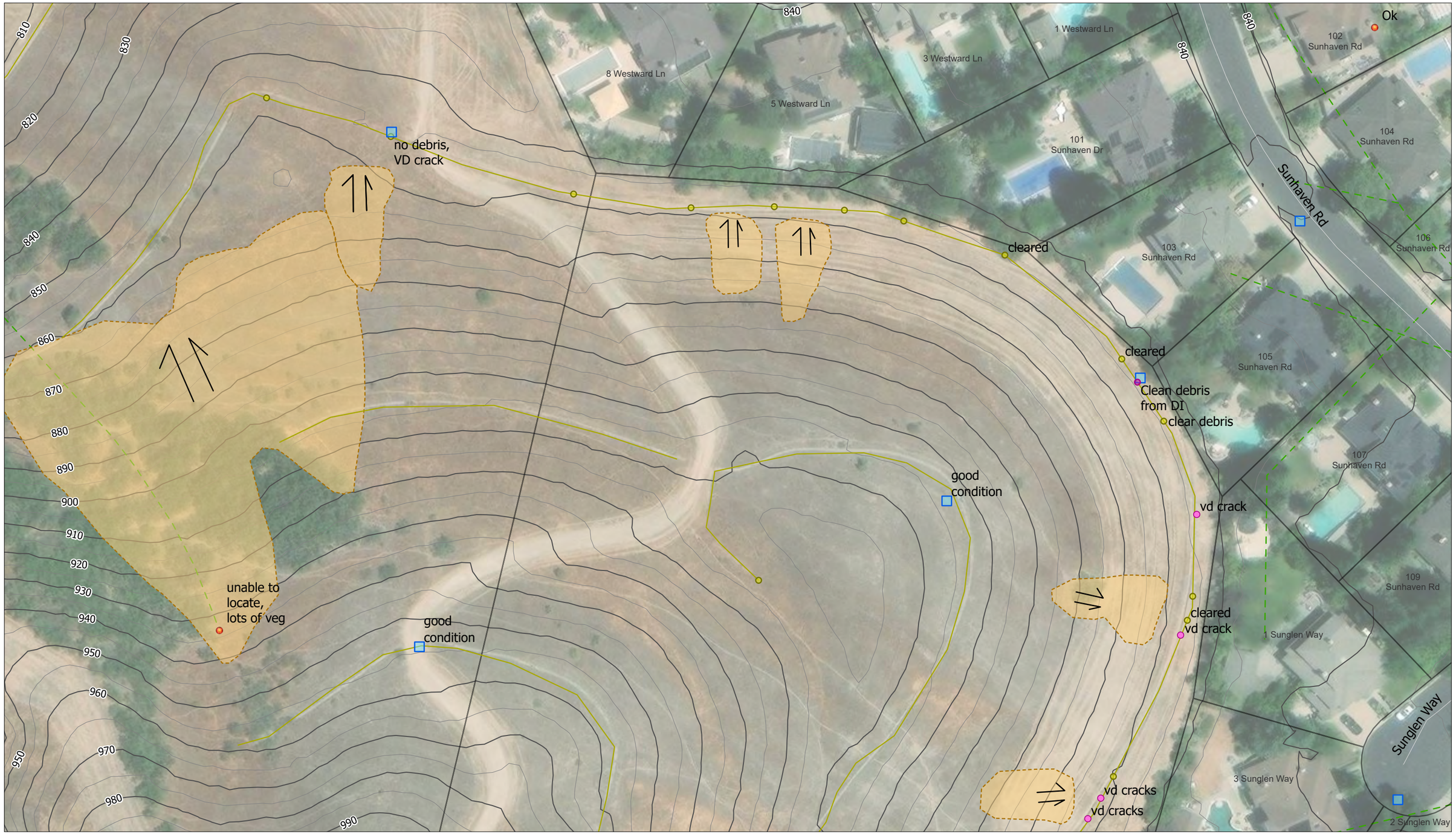

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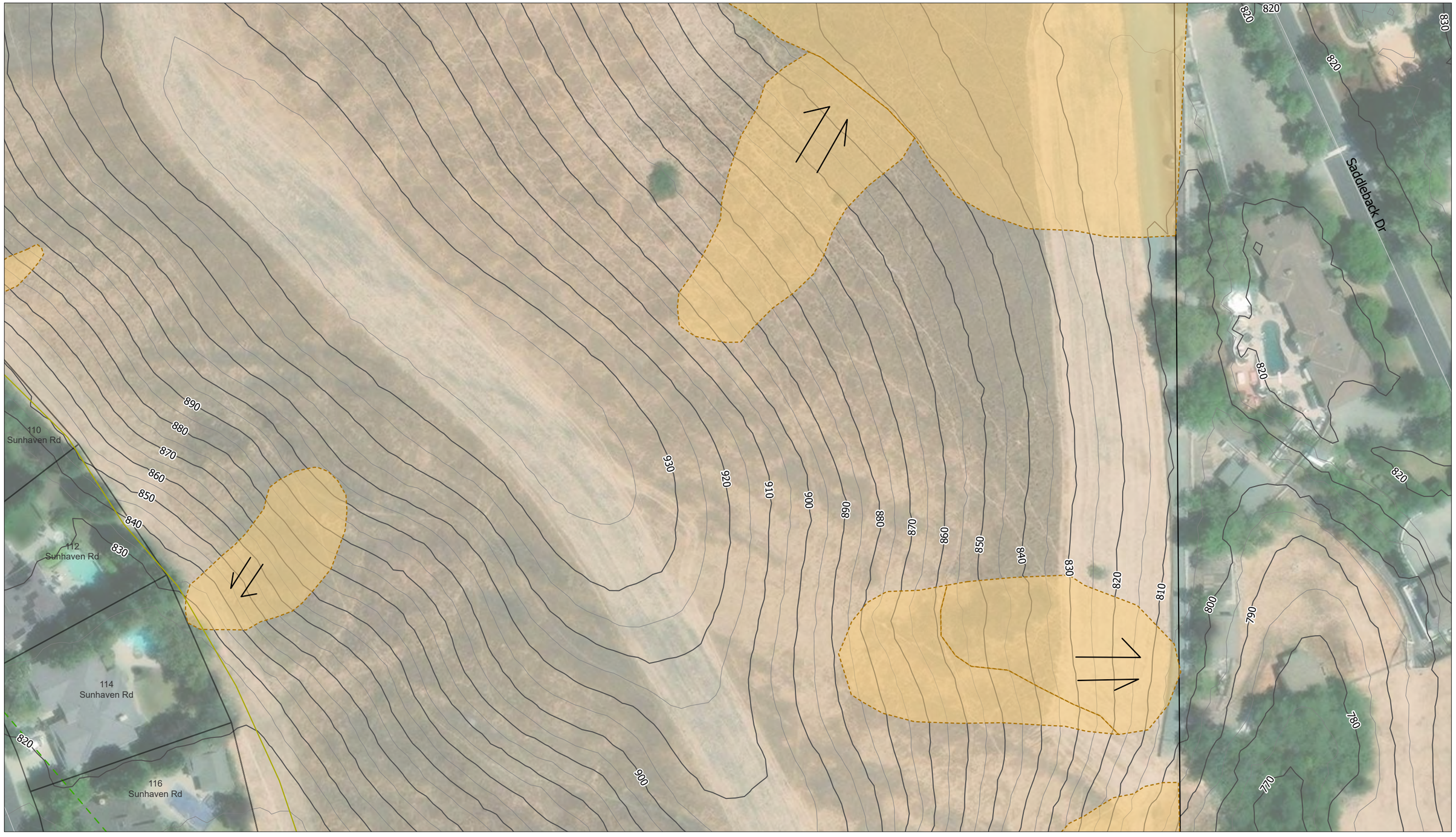

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Bulge

new repair

new with repair

Good condition.

Filled with sediment - clean out sed

new repair with sub drain

new repair

Dirt going into creek

fence tilting

123 Windover Dr

124 Windover Dr

125 Windover Dr

126 Windover Dr

127 Windover Dr

128 Windover Dr

129 Windover Dr

130 Windover Dr

132 Windover Dr

134 Windover Dr

136 Windover Dr

138 Windover Dr

Windover Dr

Fence tilting

Creep

Fence tilting

Fence tilting

Bulge - creep

Bulge - creep

not mapped tiered rock wall, good condition

Riprap wall

exposed pier in fence, tilting fence

Bulge

Creep

Fence tilting

Bulge

Approx limits of repair

clear debris

Slight fence tilting

Leaning oak tree

Lots of green veg and poison oak

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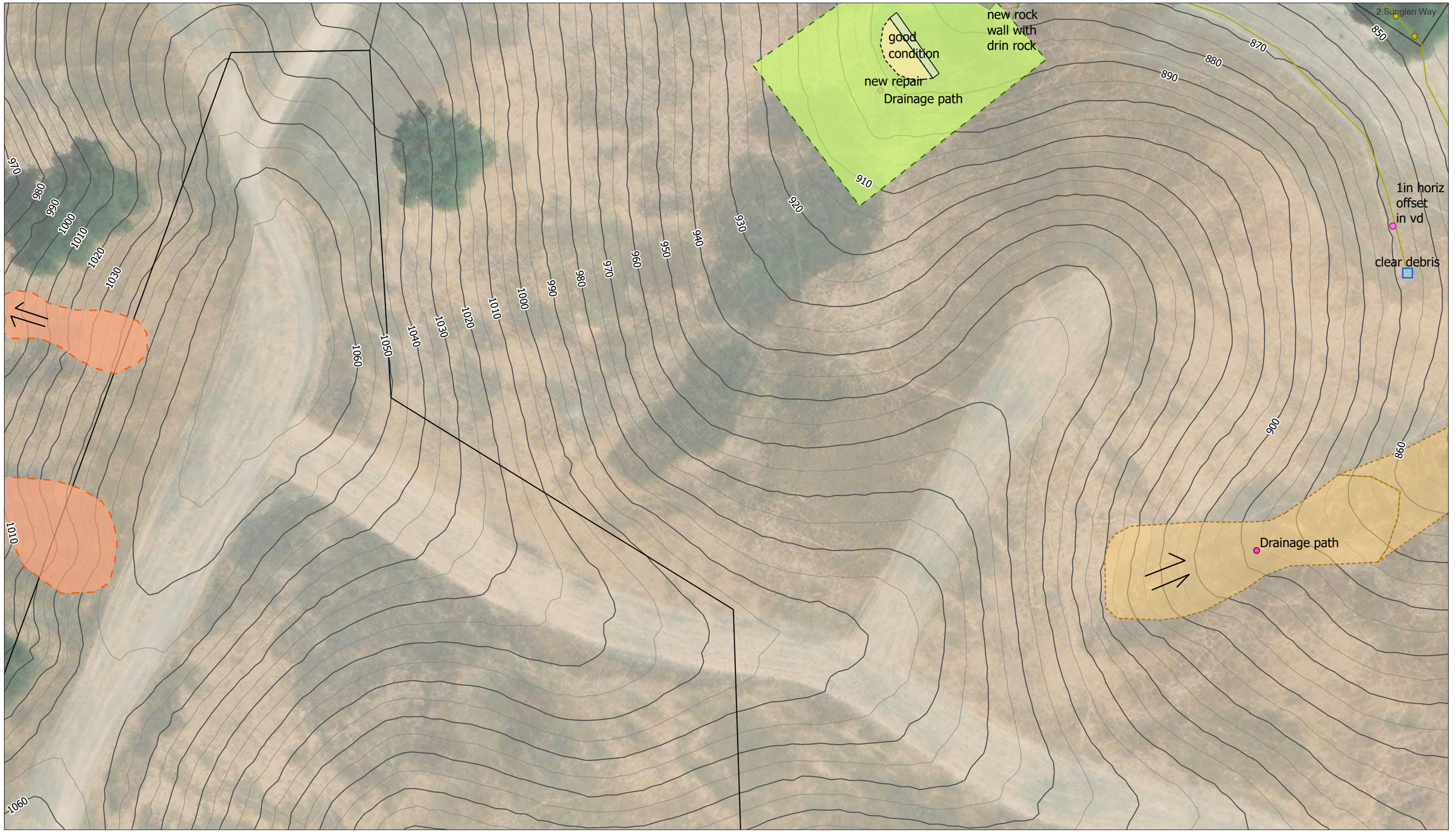

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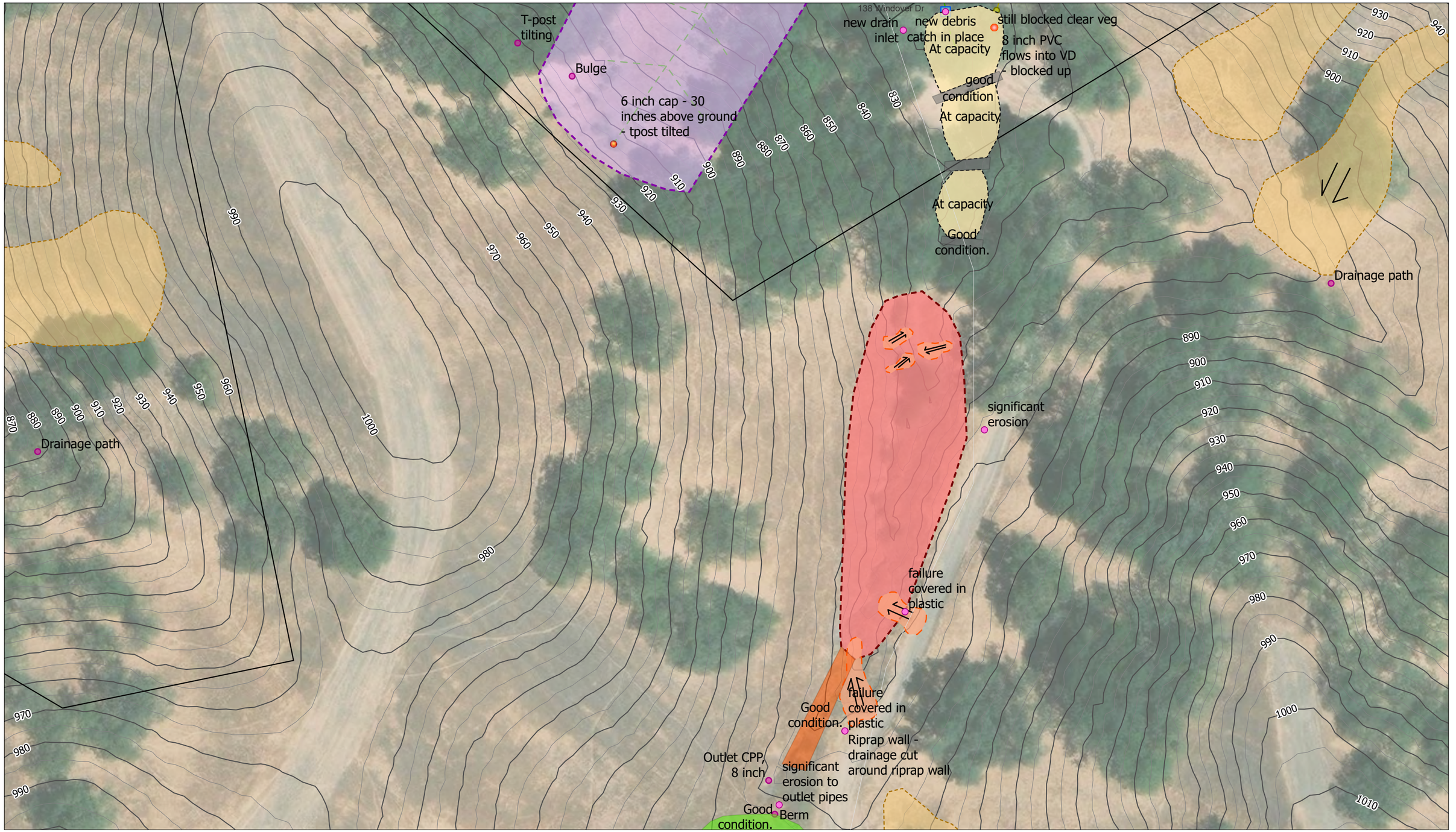

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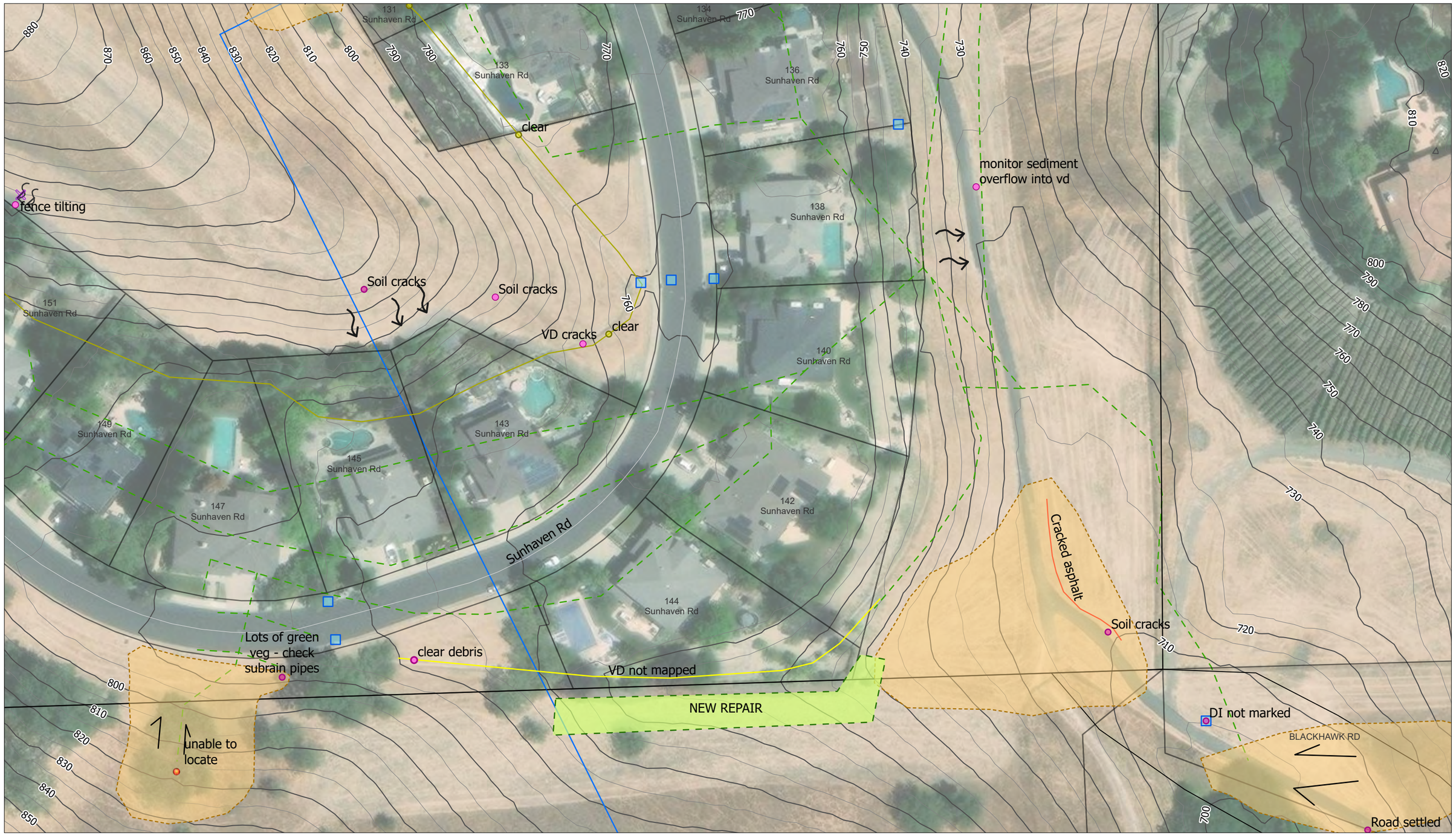

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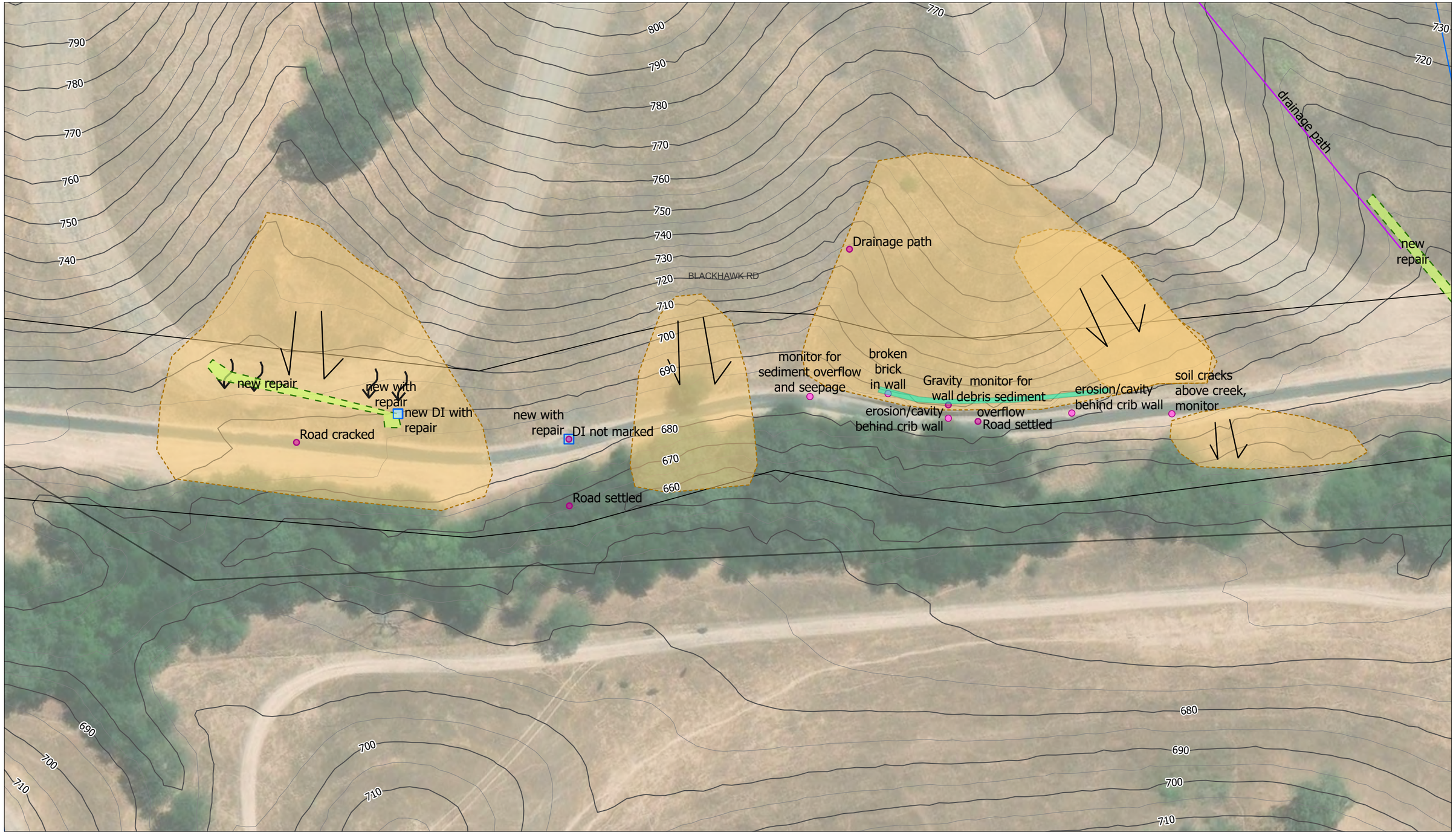

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0207451-002	DECEMBER 2023	SHEET 27

BASEMAP REFERENCE

1. ORTHOIMAGERY FROM ESRI, MAXAR 2020.
2. CONTOURS FROM USGS 2018 LIDAR. ACCESSED ONLINE JUNE 29, 2022. CONTOUR INTERVAL - 5 FT.
3. QC = COLLUVIUM; QLS = LANDSLIDE
   ARROWS SHOW DIRECTION OF MOVEMENT.

0 55 110 220
FEET

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DANVILLE, CALIFORNIA

2023 SITE OBSERVATION AND MAPPING

0207451-002	DECEMBER 2023	SHEET 28