PRELIMINARY SANITARY SEWER REPORT

FOR

PRADO RANCH – AREA 4 TENTATIVE MAP

Prepared for:

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January 12, 2018

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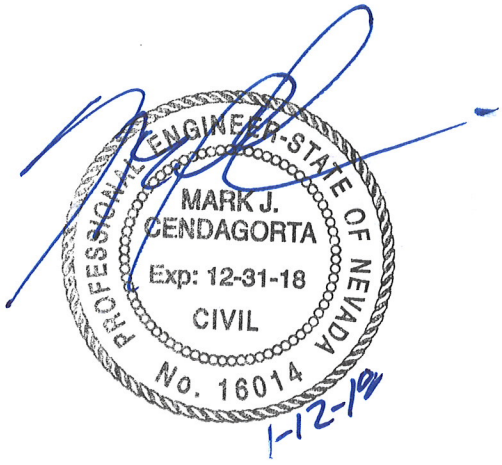

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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1 INTRODUCTION

This report shall serve as the preliminary sanitary sewer report for the Prado Ranch Area 4 subdivision, which will consist of 538 single family lots. The proposed project site (a portion of APN's 080-723-01, 02, 03 and 04) is approximately 146.3± acres in size and is located within portions of Sections 22 and 23 of T21N, R19E, MDM, City of Reno, Washoe County, Nevada. The project site is bounded by Lemmon Drive to the west, existing single family housing to the north, undeveloped land to the east and Nectar Street to the south. Area 4 is a portion of the larger Prado Ranch landholding, which also includes approximately 445 acres located to the south that was annexed into the City of Reno in 2015 and is currently in process for entitlements (Planned Unit Development-PUD) to develop a mix of single family, multi-family, industrial and commercial uses. As the timing of approval for the PUD entitlements through the City of Reno is unknown at this time, the PUD will be considered not a part for the purposes of this preliminary report. A Vicinity Map is included in the **Appendix** of this report for reference. As this report is preliminary in nature, a more detailed study will need to be conducted and a final technical sewer report will need to be submitted, with the final improvement plans for the project.

2 BACKGROUND

The 146.3± acre site is undeveloped and surrounded by existing large lot residential to the northwest and southeast. An undeveloped area of the larger Prado Ranch landholding exists to the north of the subject site, and to the west of Lemmon Drive and adjacent to Swan Lake. The westernmost portion of the site is located within the FEMA mapped 100-year floodplain and will require placement of additional fill within the Swan Lake Floodplain. The existing topography consists of relatively flat slopes (0.2% -1%) trending generally from northeast to southwest towards Swan Lake.

The Prado Ranch Area 4 concept envisions a mix of lot sizes in multiple villages along with open space corridors and park areas to create a cohesive project. The majority of lots within each village range between 5,000 sf and 7,000 sf while perimeter lots abutting existing residential are approximately 15,000 sf. The project will be constructed in multiple phases, of which the exact sequence is yet to be determined at this time. The development plan for Prado Ranch Area 4 includes the following village breakdown and acreages:

Table 1: Land Use Categories

Land Use Designation	Gross Acres	Proposed Lot Count	Allowable Dwelling Units (4 du/ac max)	Density
Village 1				
Single Family Residential	24.0±	108 lots	96	4.5
Village 2				
Single Family Residential	40.5±	148 lots	162	3.65
Village 3				
Single Family Residential	41.2±	131 lots	164	3.98
Village 4				
Single Family Residential	40.6±	151 lots	162	3.72
Totals	146.3±	538 lots	584	3.68

The project site resides outside of existing municipal sanitary sewer service areas, and is located approximately 1.5 miles to the north of the existing Washoe County owned and operated Lemmon Valley Wastewater Treatment Plant (LVWTP). There is no sanitary sewer infrastructure in place between the LVWTP and the project site, and per recent conversations with Washoe County representatives, the LVWTP does not have sufficient treatment capacity to serve the project. As such, development of the site requires construction of sanitary sewer infrastructure to convey flows to the City of Reno owned and operated Reno Stead Water Reclamation Facility (RSWRF), where additional treatment capacity is currently available. The conveyance of flows to the RSWRF will require an inter-local agreement between the City of Reno and Washoe County for sewage treatment and disposal. It is anticipated that this infrastructure will be designed and constructed to public standard, and oversized to accommodate future growth, which will aid in the development of adjacent areas located outside of the project boundaries. (Reference Figure 1-Existing Facilities Exhibit)

In response to growth projections in the North Valleys, the City of Reno and Washoe County have jointly commissioned a sanitary sewer study and master plan for the area which analyzes the existing infrastructure in place (both conveyance and treatment), identifies existing uses and proposed developments that have or will contribute flows to the system, and provides capital expenditure recommendations to provide additional capacity for future growth. The study prepared by Stantec and entitled *North Valleys Sanitary Sewer Capacity Analysis and Master Plan, November 2017*, recommends utilizing existing treatment capacity at the regional Truckee Meadows Water Reclamation Facility (TMWRF) in the near term until the growth projections for the North Valleys are proven and would thereby warrant the large capital costs necessary to

increase treatment capacity at the RSWRF. As such, the study recommends as capital expenditures in the near term, conveyance and pumping capacity projects that would redirect flows from the LVWTP and the RSWRF to TMWRF, thereby freeing up additional capacity at both plants in the North Valleys.

Currently, the RSWRF is treating approximately 1,500,000 gpd with capacity to treat approximately 2,000,000 gpd according to information provided by representatives from Washoe County and the City of Reno at a joint meeting to discuss the project. That equates to approximately 500,000 gpd of available capacity at the plant. Of note is the ability for the RSWRF to increase total treated capacity to 2,300,000 gpd, or an additional 300,000 gpd beyond the current capacity, with relatively lower cost improvements that do not require extensive Nevada Division of Environmental Protection (NDEP) permitting measures. This limited expansion is referred to as Phase 1, while a larger scale project to expand the plant capacity by an additional 2,500,000 gpd is referred to as Phase 2. The Phase 2 expansion carries a large capital cost in terms of plant expansion and effluent disposal, as well as a longer permitting process through NDEP. In total, the available treatment capacity, with the additional 300,000 gpd treatment considered at the RSWRW, is approximately 800,000 gpd.

City of Reno Staff, at a joint City Council and Planning Commission workshop in February of 2017, also identified two projects for capital expenditure that will, if implemented, redirect flows to TMWRF. The first, identified as the North Hills Lift Station Improvements project to be located near Buck Drive, will replace two aging lift stations and will redirect flows from the LVWTP to TMWRF, freeing up an additional 70,000 gpd of treatment capacity at that plant. That project is currently in design, and slated for near term construction. The second project, identified as the Sky Vista II Lift Station Improvements project to be located on Lear Boulevard just east of Military Road, will replace an existing lift station and redirect flows from the RSWRF to TMWRF, freeing up an additional 700,000 gpd of treatment capacity at that plant. The Sky Vista II Lift Station Improvements project is currently projected for the 2020 to 2021 timeframe. In total, both projects would free up an additional 770,000 gpd of additional treatment capacity at the two plants in the North Valleys.

3 PROPOSED CONDITIONS

As the project site is devoid of existing sanitary sewer infrastructure, new collection and conveyance networks will be required for individual villages within the overall project. These systems are anticipated to be typical gravity networks designed to Washoe County standards, and are proposed to be public as they will be located within public roadways serving each village. The

project will require the construction of a lift station and associated force main to convey flows to the RSWRF. (Reference Figure 2-Proposed Conditions Exhibit)

The following table estimates the proposed sewerage contribution from the project in relation to Washoe County's minimum sewer system requirements.

Table 2: Proposed Contributions

Land Use	Quantity	Unit Rate	Peak Flow* (gpd)	Treated Flow** (gpd)
Village 1	108 Lots	270 gal/day*3.0 PF	87,480	34,992
Village 2	148 Lots	270 gal/day*3.0 PF	119,880	47,952
Village 3	131 Lots	270 gal/day*3.0 PF	106,110	42,444
Village 4	151 Lots	270 gal/day*3.0 PF	122,310	48,924
Open Space	13.2 Acres	664 gal/day/acre*3.0 PF	26,294	10,518
TOTAL			**462,074**	**184,830**

*Peak flow design values per the Washoe County Design Standards

**Treated flow design values equivalent to peak flow divided by a factor of 2.5

As can be seen above, the current available treatment capacity at the RSWRF (±500,000 gpd) exceeds the estimated project contribution (184,830 gpd) at total buildout. Should the two capital improvement projects detailed above along with the possible Phase 1 RSWRF plant expansion be implemented, the available treatment capacity would far exceed the estimated project contribution. Note the difference between peak flow and treated flow rates in the table. Peak flow rates are used for conveyance system design, while treated flow rates are commonly estimated by dividing the peak flow rates by a factor of 2.5. The anticipated treated flows are thereby slightly higher than the estimated average daily flows (3.0 peaking factor not applied) for a measure of conservatism.

It is anticipated that the lift station and force main infrastructure will be designed and constructed as public facilities, and would include oversizing flexibility to accommodate future growth. The lift station is currently proposed to be constructed on property that is part of the larger Prado Ranch landholding to the south and west of the project site and adjacent to Swan Lake. The force main would be constructed from the lift station along Lemmon Drive and the within the future alignment for Lear Boulevard to the RSWRF. (Reference Figure 2-Proposed Conditions Exhibit)

Based upon recent discussions with City of Reno and Washoe County representatives, the lift station and force main may also be designed in accordance with the Lemmon Drive II Lift Station Improvements project identified in the Stantec study for years 2022 to 2023, which includes construction of a lift station at the outfall to the LVWTP and associated force main within Lear

Boulevard to the RSWRF. The Lemmon Drive II Lift Station project is intended to divert flows to the RSWRF with the long range goal of decommissioning the LVWTP. The design and construction delivery method for the lift station and force main will depend upon a number of factors including timing and implementation of public capital expenditures, but the opportunity exists for a public/private partnership to meet certain goals of the sewer master plan for the North Valleys on an accelerated schedule while also allowing for full development of the proposed project. Should the lift station and force main be constructed by the master developer, it is anticipated that any upsizing to accommodate future growth outside of the project limits would be subject to a development agreement with Washoe County and the City of Reno and eligible for cost reimbursement.

4 CONCLUSION

Prior to development of any portion of the proposed project, the developer will be required to provide a full technical sanitary sewer study that not only details the conveyance system design but verifies treatment capacity exists for the project. The technical studies will be provided in accordance with the final mapping application for the first subdivision, and will include an analysis for the project in total. As the treatment capacity at the RSWRF is limited and recognizing that other projects in the tributary area to the plant will utilize portions of the existing capacity as they come online, an analysis of the plant capacity at the time of each final map application will be necessary.

5 REFERENCES

Washoe County Community Services Department Gravity Sewer Collection Design Standards, March 2017.

North Valleys Sanitary Sewer Capacity Analysis and Master Plan, Stantec, November 2017.

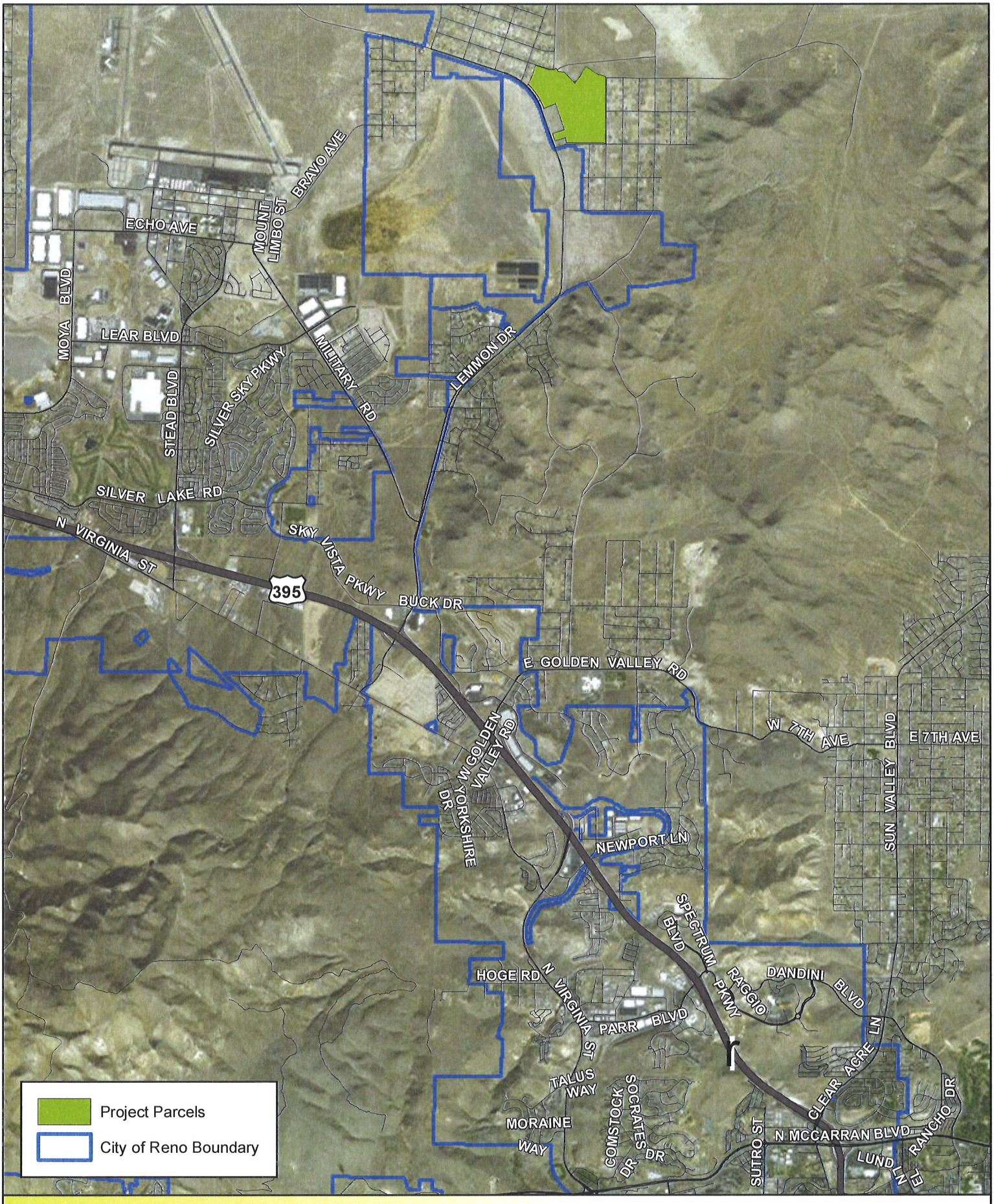
APPENDIX

VICINITY MAP

FIGURE 1-EXISTING FACILITIES EXHIBIT

FIGURE 2-PROPOSED CONDITIONS EXHIBIT

FIGURE 3-PROPOSED FACILITIES EXHIBIT



Vicinity Map

Prado Ranch Area 4

December, 2017

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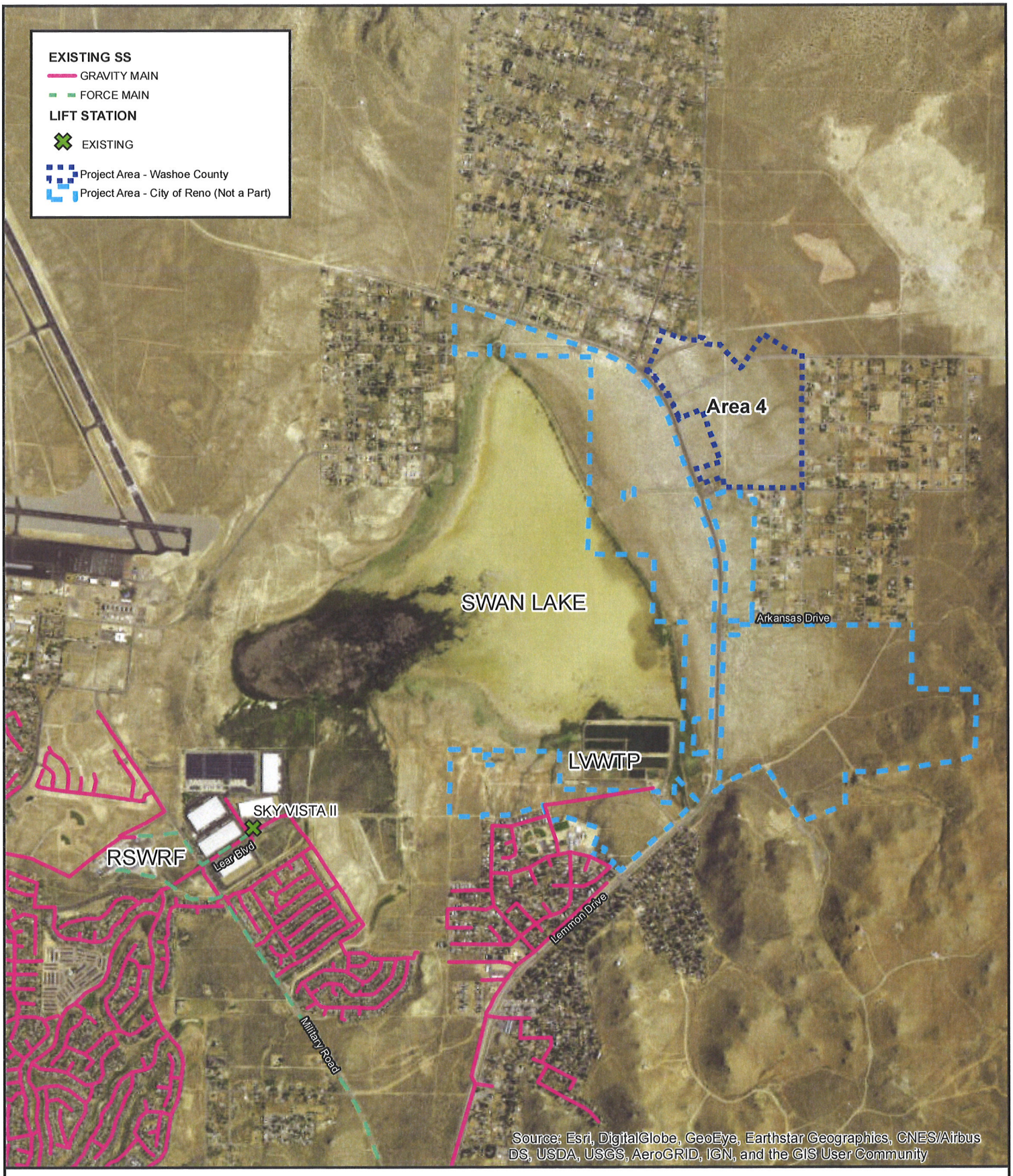

EXISTING FACILITIES EXHIBIT

PRADO RANCH AREA 4
RENO, NV
DECEMBER, 2017

NORTH

0 1,000 2,000

FEET

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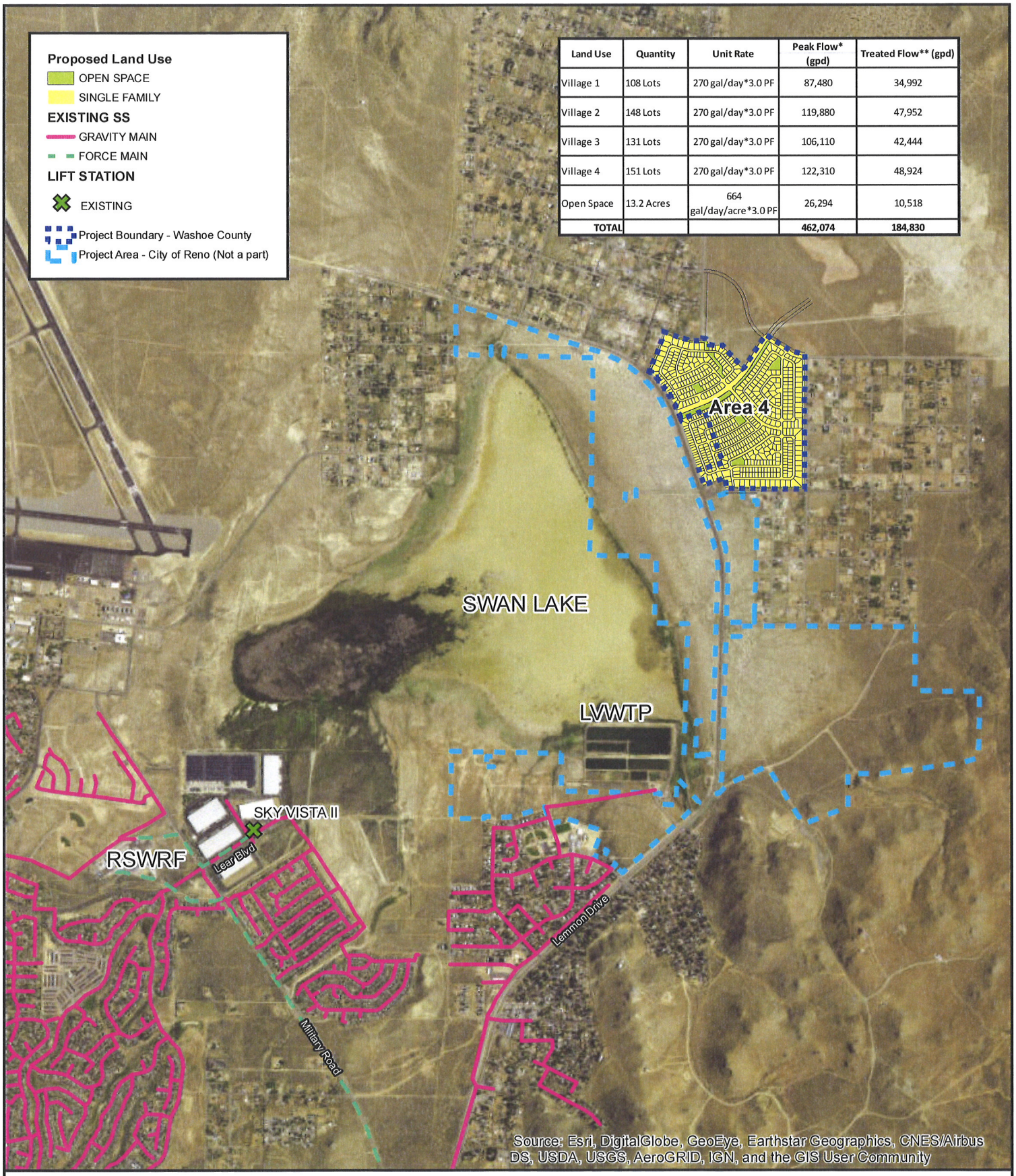
FIGURE 1



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PROPOSED CONDITIONS EXHIBIT

PRADO RANCH AREA 4
RENO, NV
DECEMBER, 2017

NORTH

0 1,000 2,000

FEET

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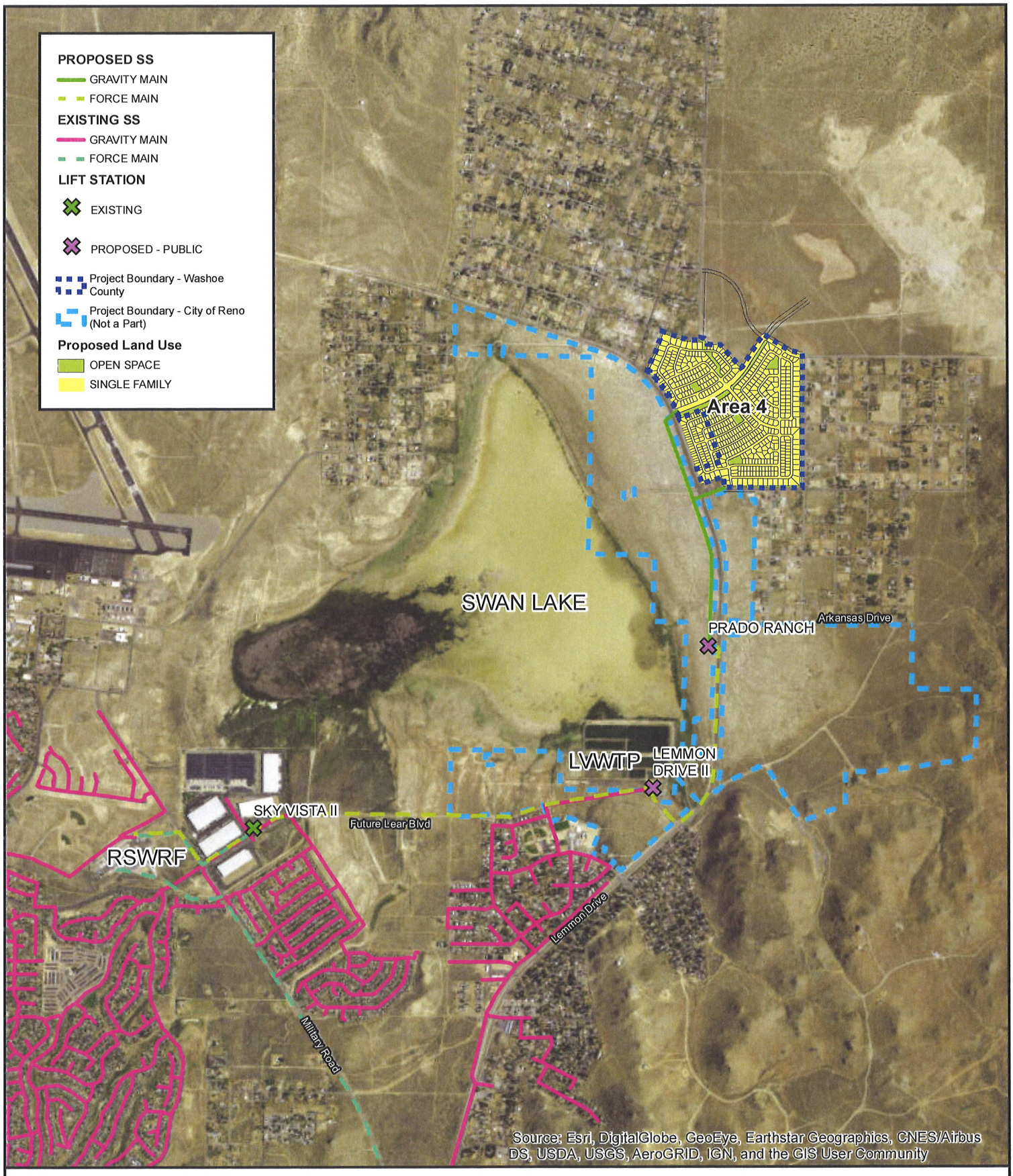
FIGURE 2



PROPOSED FACILITIES EXHIBIT

PRADO RANCH AREA 4
RENO, NV
DECEMBER, 2017

NORTH

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FIGURE 3

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PRADO RANCH AREA 4

TRAFFIC STUDY

JANUARY, 2018

1-5-18
EXP 6-30-18

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TRAFFIC STUDY

EXECUTIVE SUMMARY

The proposed Prado Ranch Area 4 development will be located in Washoe County, Nevada. The project site is located north of Nectar Street, south of Tupelo Street, east of Lemmon Drive, and west of Chesapeake Drive. The project site is currently undeveloped land. The purpose of this study is to address the project's impact upon the adjacent street network. The Lemmon Drive intersections with Sky Vista Parkway-Buck Drive, Military Drive, Arkansas Drive, Nectar Street, Chickadee Drive, and Prado Ranch Boulevard have been identified for AM and PM peak hour capacity analysis for the existing, existing plus project, and 2028 scenarios.

The proposed Prado Ranch Area 4 development will consist of the construction of a residential subdivision containing 538 single family detached homes. The project is anticipated to generate 4,939 average daily trips with 386 trips occurring during the AM peak hour and 478 trips occurring during the PM peak hour.

Traffic generated by Prado Ranch Area 4 will have some impact on the adjacent street network. The following recommendations are made to mitigate project buildout traffic impacts.

It is recommended that any required signing, striping, or traffic control improvements comply with Washoe County requirements.

It is recommended that the Lemmon Drive/Nectar Street intersection be improved to include an exclusive right turn lane at the south approach containing 245 feet of storage/deceleration length with a 100 foot taper.

It is recommended that the Lemmon Drive/Prado Ranch Boulevard intersection be designed to include stop sign control and separate left and right turn lanes at the east approach and an exclusive right turn lane at the south approach containing 245 feet of storage/deceleration length with a 100 foot taper.

It is recommended that the Nectar Street access road shown on the project site plan be eliminated and a new access connection be provided on Nectar Street from an extension of the most easterly internal north/south street. It is recommended that the segment of this new connection road between Nectar Street and the first internal east/west street be designed to collector street standards.

INTRODUCTION

STUDY AREA

The proposed Prado Ranch Area 4 development will be located in Washoe County, Nevada. The project site is located north of Nectar Street, south of Tupelo Street, east of Lemmon Drive, and west of Chesapeake Drive. Figure 1 shows the location of the project site. The purpose of this study is to address the project's impact upon the adjacent street network. The Lemmon Drive intersections with Sky Vista Parkway-Buck Drive, Military Drive, Arkansas Drive, Nectar Street, Chickadee Drive, and Prado Ranch Boulevard have been identified for AM and PM peak hour capacity analysis for the existing, existing plus project, and 2028 scenarios.

EXISTING AND PROPOSED LAND USES

The project site is currently undeveloped land. Adjacent properties generally include single family homes and undeveloped land to the north, single family homes to the east and south, and undeveloped land to the west. The proposed Prado Ranch Area 4 development will consist of the construction of a residential subdivision containing 538 single family detached homes.

EXISTING AND PROPOSED ROADWAYS AND INTERSECTIONS

Lemmon Drive is a six-lane roadway from US-395 to Sky Vista Parkway, a four-lane roadway from Sky Vista Parkway to Fleetwood Drive, and a two-lane roadway north of Fleetwood Drive. The speed limit is posted for 45 miles per hour except for 35 mile per hour zones south of Sky Vista Parkway and from Hydraulic Street to south of Palace Drive. Roadway improvements generally include curb, gutter and sidewalk in developed areas and paved or graded shoulders in undeveloped areas. Raised center medians exist near the Sky Vista Parkway and Military Road intersections, a depressed median exists north of Military Road to Fleetwood Drive, and centerline striping exists on the two-lane segment.

Sky Vista Parkway is a four-lane roadway with two through lanes in each direction from Lemmon Drive to Vista Knoll Parkway. The speed limit is posted for 35 miles per hour. Roadway improvements include curb, gutter, sidewalk and a bike lane on both sides of the street and a raised center median or center two-way left turn lane. The roadway narrows to one lane in each direction west of Vista Knoll Parkway.

Buck Drive is a three-lane roadway with two eastbound lanes and one westbound lane from Lemmon Drive to the shopping center's east driveway. The speed limit is not posted. Roadway improvements include curb, gutter, sidewalk and a bike lane on both sides of the street and a center two-way left turn lane.

Arkansas Drive is a two-lane roadway with one through lane in each direction east of Lemmon Drive. The speed limit is posted for 25 miles per hour. Roadway improvements generally include paved travel lanes and graded shoulders.

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PRADO RANCH AREA 4

VICINITY MAP
FIGURE 1

Military Road is a four-lane roadway with two through lanes in each direction just west of Lemmon Drive and a two-lane roadway with one through lane in each direction further north to Echo Avenue. The speed limit is posted for 45 miles per hour. Roadway improvements generally include curb, gutter, sidewalk, and a bike lane on both sides of the four-lane roadway and bike lanes and graded shoulders on the two-lane section. Some curb, gutter, and sidewalk improvements exist on the two-lane section in developed areas.

Nectar Street is a two-lane roadway with one through lane in each direction east of Lemmon Drive. The speed limit is posted for 25 miles per hour. Roadway improvements generally include paved travel lanes and graded shoulders.

Chickadee Drive is a two-lane roadway with one through lane in each direction east of Lemmon Drive. The speed limit is posted for 25 miles per hour. Roadway improvements generally include paved travel lanes and graded shoulders. Chickadee Drive between Lemmon Drive and Chesapeake Drive will be replaced with Prado Ranch Boulevard with development of the project. Prado Ranch Boulevard will be constructed as a major arterial road from Lemmon Drive to the project's northeast boundary.

The Lemmon Drive/Sky Vista Parkway-Buck Drive intersection is a signalized four-leg intersection with protected phasing for all left turn movements. The north and south approaches each contain dual left turn lanes, two through lanes, and one shared through-right turn lane. The west approach contains one left turn lane, one through lane, and dual right turn lanes. The east approach contains one left turn lane, one through lane, and one right turn lane. Crosswalks exist at all approaches.

The Lemmon Drive/Military Road intersection is a signalized four-leg intersection with protected left turn phasing at the north and south approaches. The north approach contains one left turn lane, one through lane, and one shared through-right turn lane. The south approach contains dual left turn lanes, one through lane and one shared through-right turn lane. The west approach contains one shared left turn-through lane and one free right turn lane with a southbound acceleration lane. The east approach serves a church and contains one shared left turn-through-right turn lane.

The Lemmon Drive/Arkansas Drive intersection is an unsignalized three-leg intersection with stop sign control at the east approach. The north approach contains one shared left turn-through lane. The south approach contains one shared through-right turn lane. The east approach contains one shared left turn-right turn lane.

The Lemmon Drive/Nectar Street intersection is an unsignalized three-leg intersection with stop sign control at the east approach. The north approach contains one shared left turn-through lane. The south approach contains one shared through-right turn lane. The east approach contains one shared left turn-right turn lane.

The Lemmon Drive/Chickadee Drive intersection is an unsignalized three-leg intersection with stop sign control at the east approach. The north approach contains one shared left turn-through lane. The south approach contains one shared through-right turn lane. The east approach contains one shared left turn-right turn lane. This intersection will be eliminated with development of the project.

The Lemmon Drive/Prado Ranch Boulevard intersection is anticipated to be constructed as an unsignalized three-leg intersection with stop sign control at the east approach with development of the project. The intersection will be analyzed with single lanes at all approaches.

TRIP GENERATION

In order to assess the magnitude of traffic impacts of the proposed development on the key intersections, trip generation rates and peak hours had to be determined. Trip generation rates were obtained from the Ninth Edition of *ITE Trip Generation* (2012) for Land Use 210: Single Family Detached Housing. Trip generation was calculated for the peak hours occurring between 7:00 AM and 9:00 AM and 4:00 PM and 6:00 PM which correspond to the peak hours of adjacent street traffic. Table 1 shows a summary of the average daily traffic volumes and peak hour volumes generated by the project. The trip generation worksheet is included in the Appendix.

TABLE 1
TRIP GENERATION

LAND USE	ADT	AM PEAK HOUR			PM PEAK HOUR		
		IN	OUT	TOTAL	IN	OUT	TOTAL
Single Family (538 Dwelling Units)	4,939	97	289	386	301	177	478

TRIP DISTRIBUTION AND ASSIGNMENT

The distribution of project trips to the key intersections was based on existing peak hour traffic patterns and the locations of attractions and productions in the area. Figure 2 shows the anticipated trip distribution. The peak hour trips were assigned to the key intersections based on this distribution. Figure 3 shows the AM and PM peak hour trip assignment.

EXISTING AND PROJECTED TRAFFIC VOLUMES

Figure 4 shows the existing traffic volumes at the key intersections during the AM and PM peak hours. The existing traffic volumes were obtained from traffic counts taken in December of 2017 and from RTC's North Valleys Multimodal Transportation Study. Figure 5 shows the existing plus project traffic volumes at the key intersections during the AM and PM peak hours. The existing plus project volumes were obtained by adding the trip assignment volumes shown on Figure 3 to the existing traffic volumes shown on Figure 4. Figure 6 shows the 2028 traffic volumes at the key intersections during the AM and PM peak hours. The 2028 traffic volumes were estimated based on a review of existing traffic volumes presented in this study and 2035 traffic volumes obtained from the North Valleys Multimodal Transportation Study. Prado Ranch was listed as a planned 20-year forecast project in the North Valleys Multimodal Transportation Study. The 2028 volumes are a combination of Prado Ranch buildout volumes and factored 2035 volumes.

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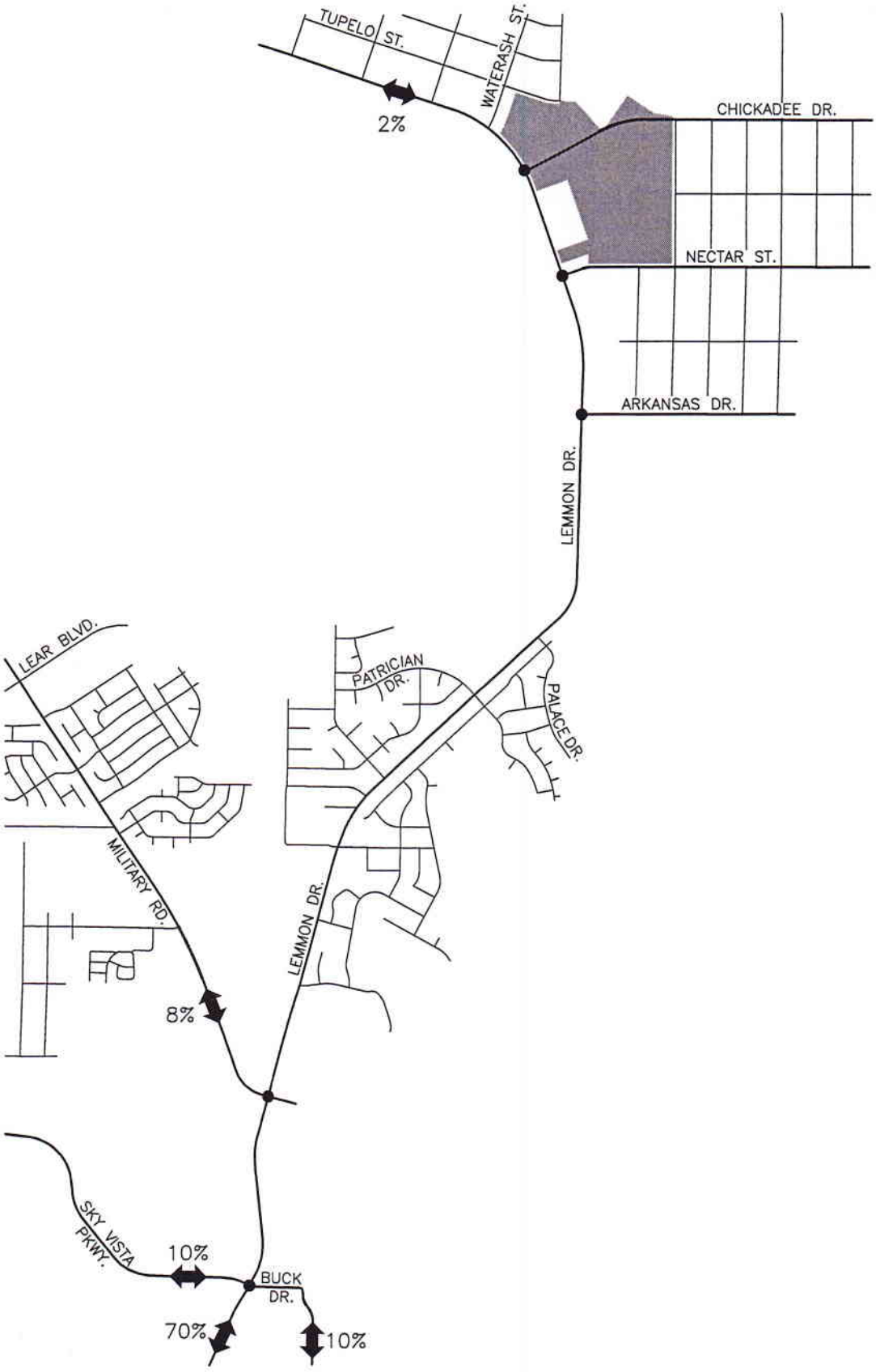

PRADO RANCH AREA 4

TRIP DISTRIBUTION
FIGURE 2

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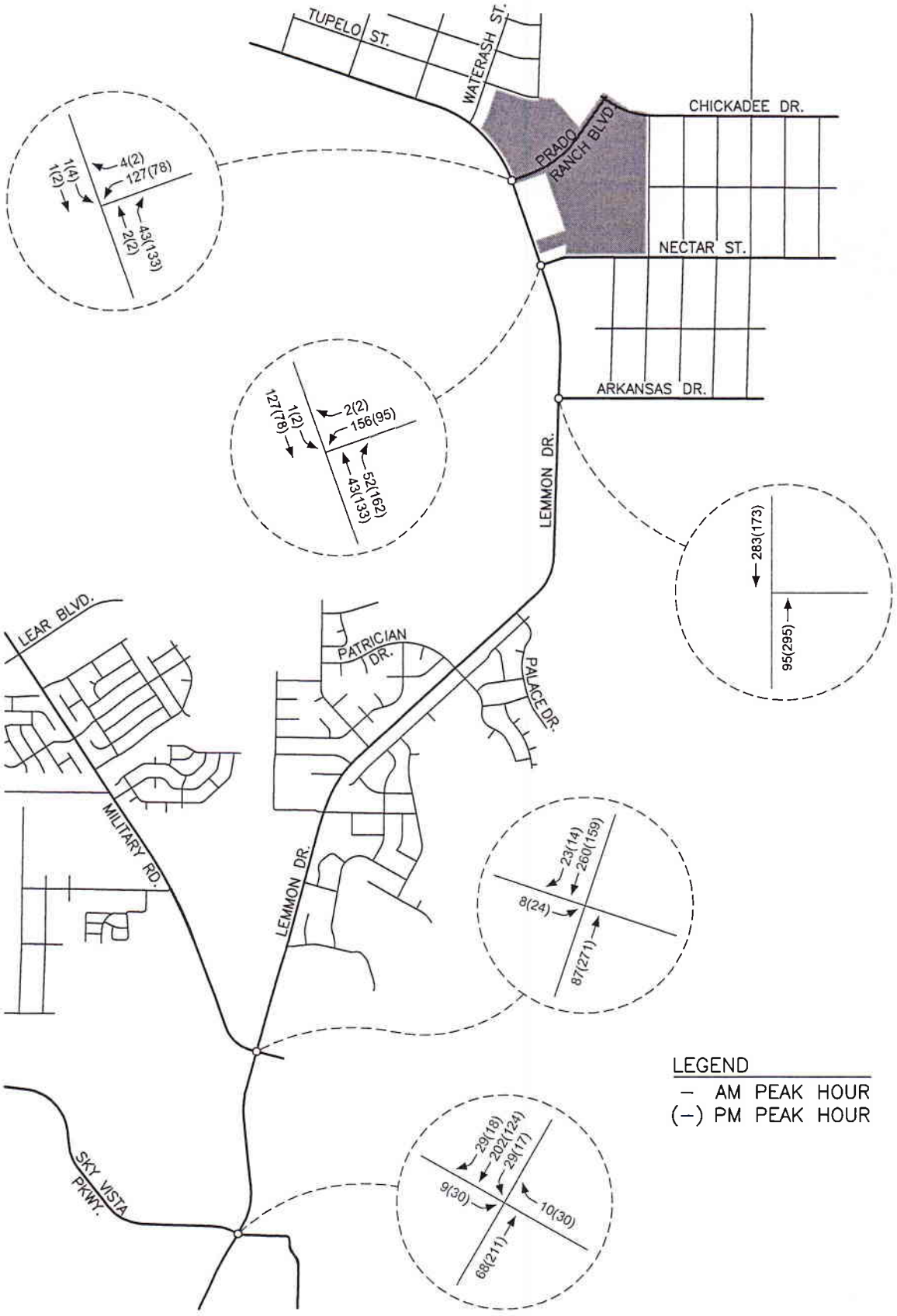

PRADO RANCH AREA 4

TRIP ASSIGNMENT
FIGURE 3

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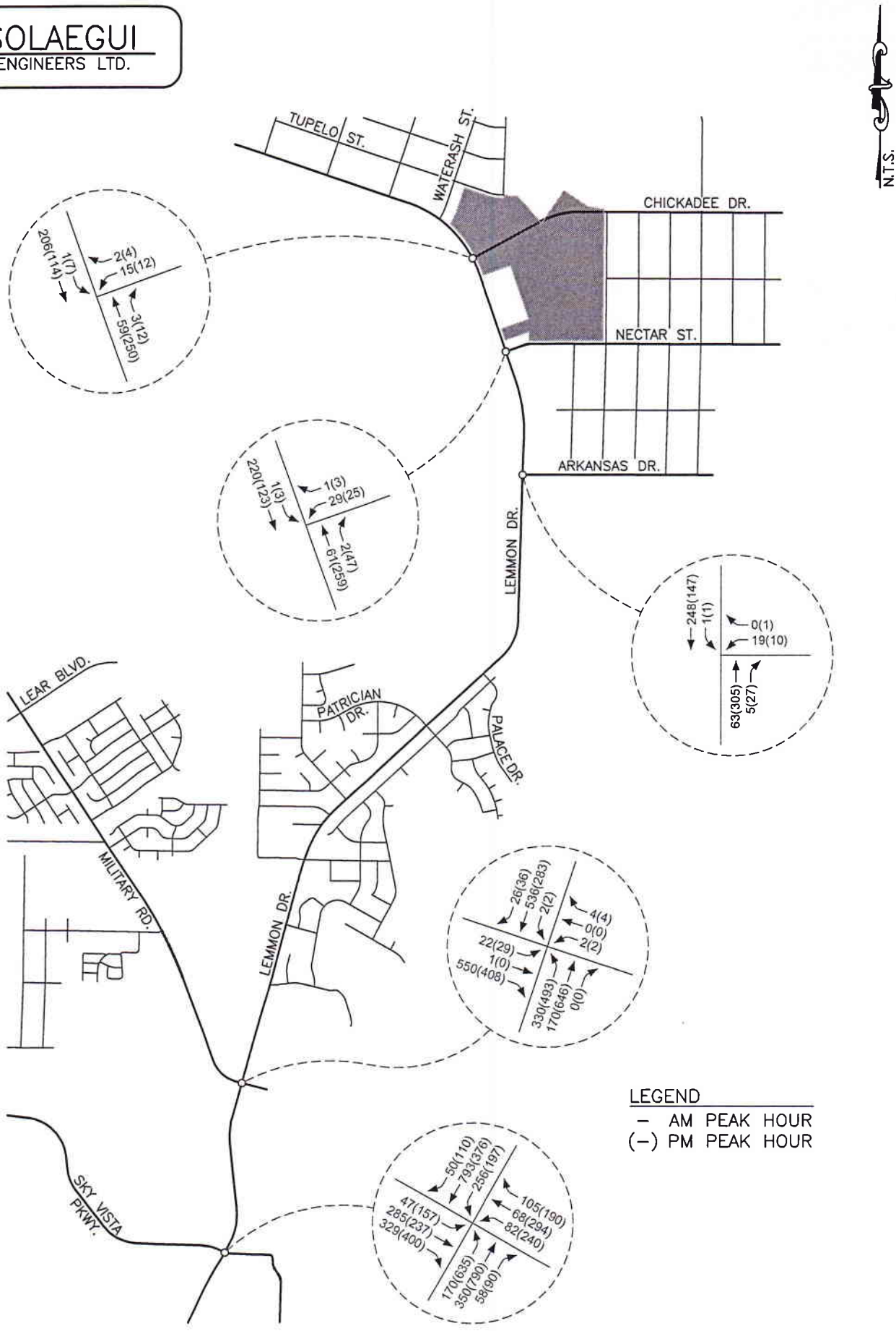

PRADO RANCH AREA 4

EXISTING TRAFFIC VOLUMES

FIGURE 4

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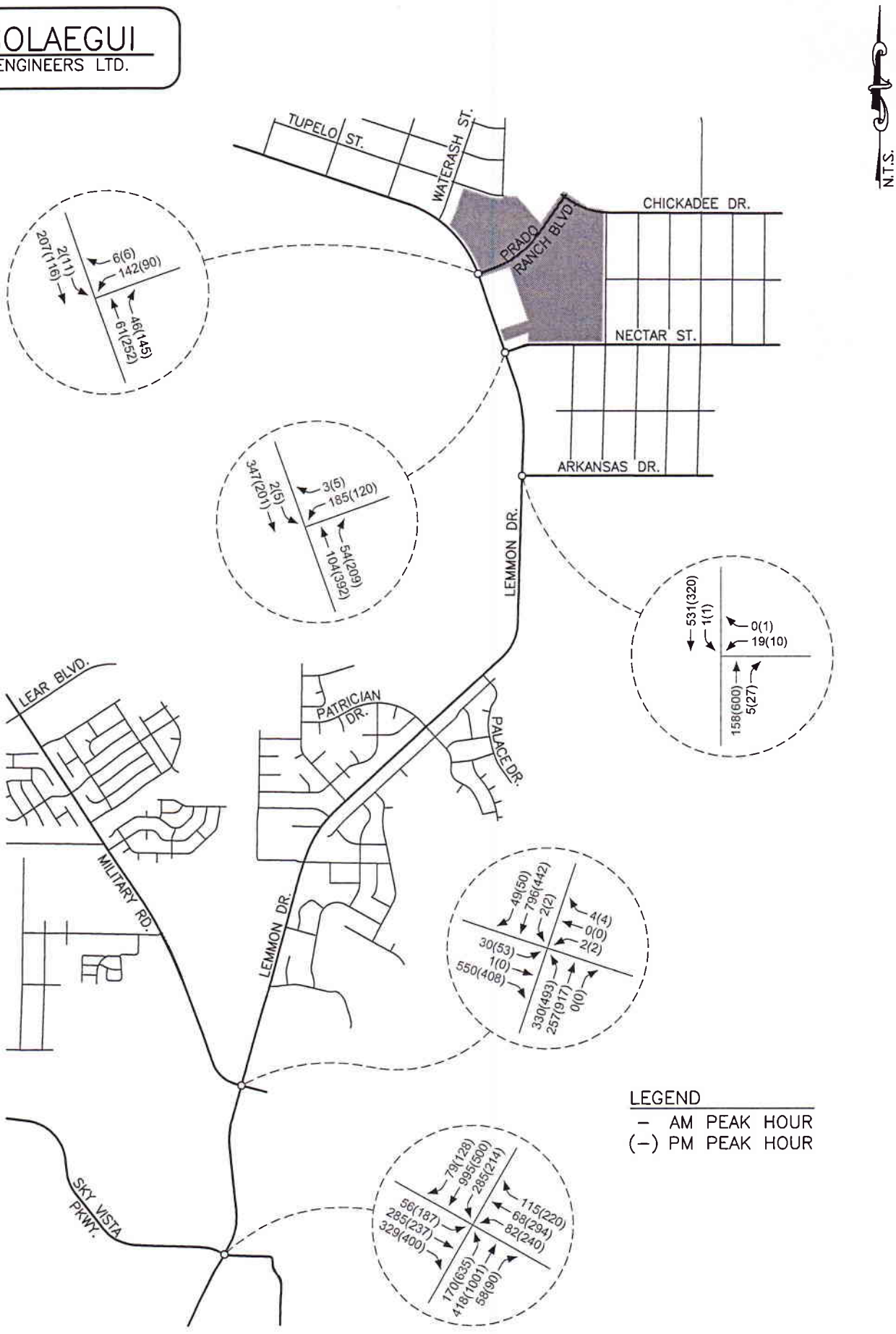

PRADO RANCH AREA 4

EXISTING PLUS PROJECT TRAFFIC VOLUMES

FIGURE 5

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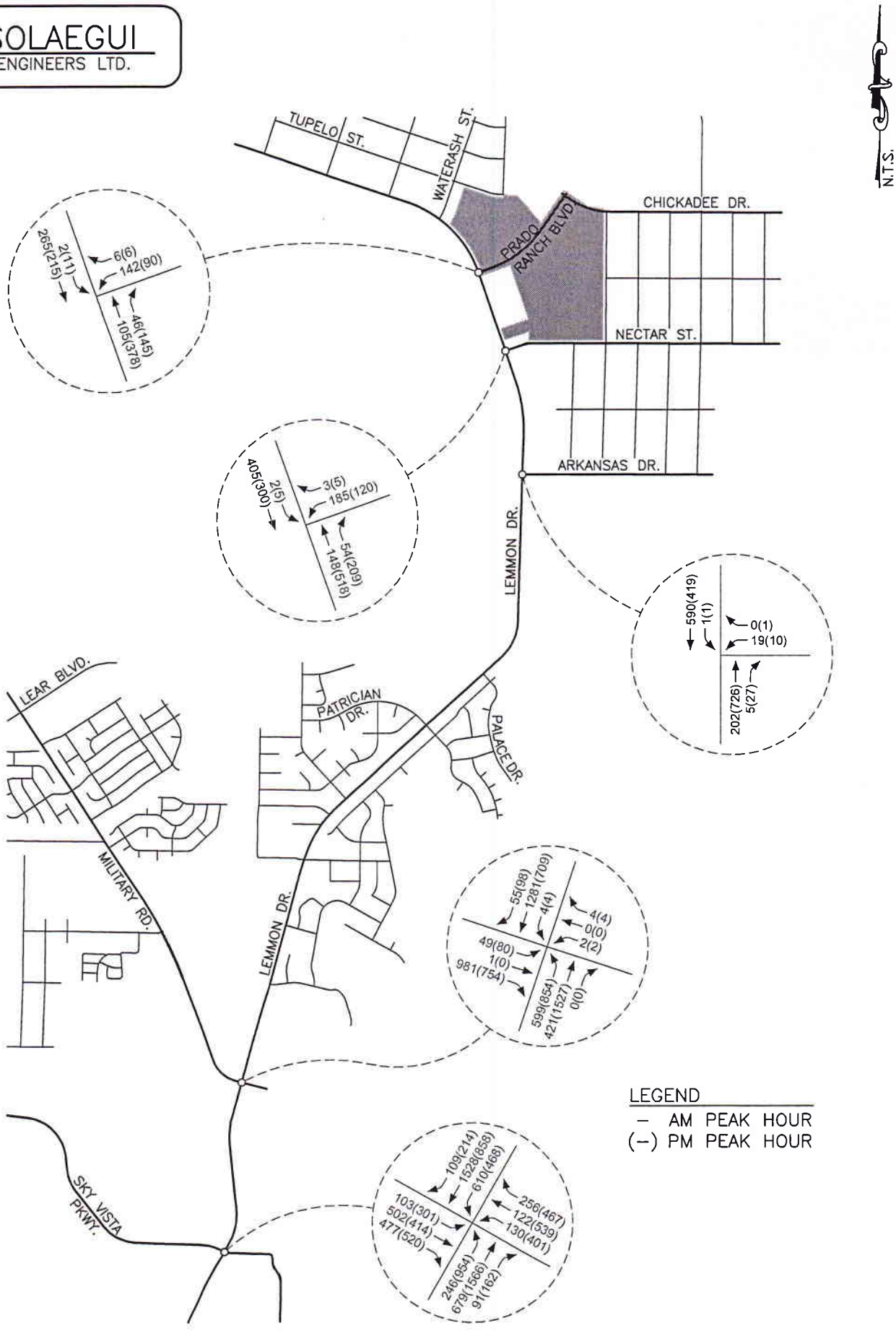


PRADO RANCH AREA 4

2028 TRAFFIC VOLUMES

FIGURE 6

INTERSECTION CAPACITY ANALYSIS

The key intersections were analyzed for capacity based on procedures presented in the *Highway Capacity Manual (6th Edition)*, prepared by the Transportation Research Board, for unsignalized and signalized intersections using the latest version of the Highway Capacity software.

The result of capacity analysis is a level of service (LOS) rating for each signalized intersection or minor movement at a two-way stop controlled intersection. Level of service is a qualitative measure of traffic operating conditions where a letter grade "A" through "F", corresponding to progressively worsening traffic operation, is assigned to the signalized intersection or unsignalized intersection minor movement.

The *Highway Capacity Manual* defines level of service for stop controlled intersections in terms of computed or measured control delay for each minor movement. Level of service is not defined for the intersection as a whole. The level of service criteria for unsignalized intersections is shown in Table 2.

TABLE 2
LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	DELAY RANGE (SEC/VEH)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Level of service for signalized intersections is stated in terms of the average control delay per vehicle for a peak 15 minute analysis period. The level of service criteria for signalized intersections is shown in Table 3.

TABLE 3
LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Table 4 shows a summary of the level of service and delay results at the key intersections for the existing, existing plus project, and 2028 scenarios. The level of service worksheets are included in the Appendix.

TABLE 4
INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS

	EXISTING		EXISTING + PROJECT		2028	
INTERSECTION	AM	PM	AM	PM	AM	PM
Lemmon/Sky Vista/Buck (Signal)	C30.5	D35.8	C32.2	D37.3	D51.0	F115.2
Lemmon/Military (Signal)	B16.3	B16.4	B16.9	B16.9	C33.4	C31.2
Lemmon/Arkansas (Stop at East)						
WB Left-Right	B10.7	B11.9	C15.1	C18.8	C16.9	C24.5
SB Left	A7.4	A8.0	A7.6	A9.0	A7.7	A9.5
Lemmon/Nectar (Stop at East)						
WB Left-Right	B10.5	B11.5	C16.5	C20.1	C19.7	D31.4
SB Left	A7.4	A7.9	A7.6	A8.9	A7.7	A9.4
Lemmon/Chickadee (Stop at East)						
WB Left-Right	B10.1	B11.0	N/A	N/A	N/A	N/A
SB Left	A7.3	A7.8	N/A	N/A	N/A	N/A
Lemmon/Prado Ranch (Stop at East)						
WB Left-Right	N/A	N/A	B11.9	B13.4	B13.4	C17.8
SB Left	N/A	N/A	A7.4	A8.2	A7.6	A8.6

Lemmon Drive/Sky Vista Parkway-Buck Drive Intersection

The Lemmon Drive/Sky Vista Parkway/Buck Drive intersection was analyzed as a signalized four-leg intersection with the existing approach lanes for all scenarios. The intersection currently operates at LOS C with a delay of 30.5 seconds per vehicle during the AM peak hour and LOS D with a delay of 35.8 seconds per vehicle during the PM peak hour. For the existing plus project traffic volumes the intersection operates at LOS C with a delay of 32.2 seconds per vehicle during the AM peak hour and LOS D with a delay of 37.3 seconds per vehicle during the PM peak hour. For the 2028 traffic volumes the intersection is anticipated to operate at LOS D with a delay of 51.0 seconds per vehicle during the AM peak hour and LOS F with a delay of 115.2 seconds per vehicle during the PM peak hour. The intersection meets RTC's policy LOS E or better standard for the existing and existing plus project scenarios but not for the 2028 scenario. The North Valleys Multimodal Transportation Study recommends long-term intersection capacity improvements at this intersection that will include a combination of measures such as adding additional through lanes or turning lanes, lengthening existing turn pockets, upgrading intersection control, signal timing optimization and coordination, and upgrade to a roundabout.

Lemmon Drive/Military Road Intersection

The Lemmon Drive/Military Road intersection was analyzed as a signalized four-leg intersection with the existing approach lanes for all study scenarios. The intersection currently operates at LOS B with a delay of 16.3 seconds per vehicle during the AM peak hour and 16.4 seconds per vehicle during the PM peak hour. For the existing plus project traffic volumes the intersection is anticipated to continue to operate at LOS B with delays slightly increasing to 16.9 seconds per vehicle during both the AM and PM peak hours. For the 2028 traffic volumes the intersection is anticipated to operate at LOS C with a delay of 33.4 seconds per vehicle during the AM peak hour and 31.2 seconds per vehicle during the PM peak hour. The intersection meets RTC's policy LOS E or better standard for all scenarios.

Lemmon Drive/Arkansas Drive Intersection

The Lemmon Drive/Arkansas Drive intersection was analyzed as an unsignalized three-leg intersection with stop control at the east approach for all scenarios. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. For the existing plus project volumes the intersection minor movements operate at LOS C or better during the AM and PM peak hours. For the 2028 traffic volumes the intersection minor movements operate at LOS C or better during the AM and PM peak hours. The intersection was analyzed with the existing lanes for all scenarios. The intersection meets RTC's policy LOS D or better standard for all study scenarios.

Lemmon Drive/Nectar Street Intersection

The Lemmon Drive/Nectar Street intersection was analyzed as an unsignalized three-leg intersection with stop control at the east approach for all study scenarios. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. For the existing plus project volumes the intersection minor movements operate at LOS C or better during the AM and PM peak hours. For the 2028 traffic volumes the intersection minor movements operate at LOS D or better during the AM and PM peak hours. The intersection was analyzed with the existing lanes for all scenarios. The intersection meets RTC's policy LOS D or better standard for all study scenarios.

The need for an exclusive right turn deceleration lane on Lemmon Drive at Nectar Street was reviewed based on RTC's access management standards. The access management standards indicate that right turn deceleration lanes are required on moderate access control arterials (Lemmon Drive) if the right turn movement serves more than 60 vehicles per hour. An exclusive right turn deceleration lane is required based on the existing plus project traffic volumes. A minimum deceleration length of 145 feet is required for the right turn lane based on the 45 mile per hour speed limit on Lemmon Drive and a 100 foot minimum taper is required based on RTC's Regional Traffic Guidelines. It is recommended that 100 feet of storage length also be provided for the right turn lane.

The need for an exclusive left turn lane on Lemmon Drive at Nectar Street was reviewed based on AASHTO guidelines for left turn lanes on two-lane roadways. Table 9-23 of the AASHTO publication lists traffic volumes and operating speeds which necessitate the need for left turn lanes on two-lane roads. The traffic volumes to be considered include advancing traffic volumes, opposing traffic volumes, and the percent of advancing traffic which is turning left. The existing plus project and 2028 traffic volumes do not meet the requirements for an exclusive left turn lane based on the 45 mile per hour speed limit on Lemmon Drive.

Lemmon Drive/Chickadee Drive (Prado Ranch Boulevard) Intersection

The Lemmon Drive/Chickadee Drive intersection was analyzed as an unsignalized three-leg intersection with stop control at the east approach for only the existing scenario. The intersection minor movements currently operate at LOS B or better during the AM and PM peak hours. The Lemmon Drive/Prado Ranch Boulevard intersection was analyzed as an unsignalized three-leg intersection with stop control at the east approach for the existing plus project and 2028 scenarios. The intersection minor movements operate at LOS B or better during the AM and PM peak hours for the existing plus project volumes and LOS C or better during the AM and PM peak hours for 2028 volumes. The intersection meets RTC's policy LOS D or better standard for all scenarios. The intersection was analyzed with single lanes at each approach for all scenarios. However, it is recommended that the east approach contain separate left and right turn lanes.

The need for an exclusive left turn lane on Lemmon Drive at Prado Ranch Boulevard was reviewed based on AASHTO guidelines for left turn lanes on two-lane roadways. Table 9-23 of the AASHTO publication lists traffic volumes and operating speeds which necessitate the need for left turn lanes on two-lane roads. The traffic volumes to be considered include advancing traffic volumes, opposing traffic volumes, and the percent of advancing traffic which is turning left. The existing plus project and 2028 traffic volumes do not meet the requirements for an exclusive left turn lane based on the 45 mile per hour speed limit on Lemmon Drive.

The need for an exclusive right turn deceleration lane on Lemmon Drive at Prado Ranch Boulevard was reviewed based on RTC's access management standards. The access management standards indicate that right turn deceleration lanes are required on moderate access control arterials (Lemmon Drive) if the right turn movement serves more than 60 vehicles per hour. A northbound right turn deceleration lane is required based on the existing plus project traffic volumes. A minimum deceleration length of 145 feet is required for the right turn lane based on the 45 mile per hour speed limit on Lemmon Drive and a minimum 100 foot taper is required based on RTC's Regional Traffic Guidelines. It is recommended that 100 feet of storage length also be provided for the right turn lane.

SITE PLAN REVIEW

A copy of the site plan for the Prado Ranch Area 4 development is included with this submittal. The site plan indicates that the project is divided into four villages and includes a newly proposed arterial roadway, Prado Ranch Boulevard, which will extend off Lemmon Drive, run northeasterly through the site, and terminate at the project's northeast boundary. Prado Ranch Boulevard will replace the existing segment of Chickadee Drive between Lemmon Drive and Chesapeake Drive. The site plan also indicates that a new segment of Chickadee Drive will be constructed between Chesapeake Drive and Prado Ranch Boulevard near the project's northeast boundary. Access to the project's four villages will be provided from two access roads intersecting Prado Ranch Boulevard and one access road each intersecting Nectar Street and Chickadee Drive.

Average daily traffic volumes were subsequently reviewed on the access roads intersecting Prado Ranch Boulevard, Nectar Street, and Chickadee Drive in order to determine if they meet Washoe County street loading standards. Washoe County street standards indicate that local streets can carry 1,000 ADT or less and collector streets can carry up to 7,300 ADT. Collector streets with residential driveways can carry a maximum volume of 2,000 ADT.

The site plan indicates that the two access roads from Prado Ranch Boulevard serving the northwest portion of the site and the access road from Chickadee Drive are designated local streets. These three access roads are each anticipated to serve less than 1,000 vehicles per day which meet local street standards. The access road from Prado Ranch Boulevard serving the southern portion of the site is designated a collector street. This access road will serve traffic volumes that are well under the 7,300 vehicle per day threshold for collector streets.

The site plan indicates that the access road from Nectar Street is designated a local street. This access road is estimated to serve approximately 2,700 vehicles per day due to its close proximity to Nectar Street and Lemmon Drive. This access road from Nectar Street and potentially other internal roads will exceed the 1,000 vehicle per day threshold for local streets. The access road from Nectar Street will also exceed the 2,000 vehicle per day threshold for a collector with residential driveway access allowed. An alternate Nectar Street access location was subsequently reviewed. Relocating the Nectar Street access further east is anticipated to increase travel times along this route. The increased travel times will reduce the number of lots served by Nectar Street while increasing the number of lots served by Prado Ranch Boulevard. It is recommended that the Nectar Street westerly access shown on the site plan be eliminated and a new Nectar Street access be provided from an extension of the most easterly internal street. The segment between Nectar Street and the first east-west street is anticipated to serve approximately 1,400 vehicles per day which will require a collector street.

RECOMMENDATIONS

Traffic generated by Prado Ranch Area 4 will have some impact on the adjacent street network. The following recommendations are made to mitigate project buildout traffic impacts.

It is recommended that any required signing, striping, or traffic control improvements comply with Washoe County requirements.

It is recommended that the Lemmon Drive/Nectar Street intersection be improved to include an exclusive right turn lane at the south approach containing 245 feet of storage/deceleration length with a 100 foot taper.

It is recommended that the Lemmon Drive/Prado Ranch Boulevard intersection be designed to include stop sign control and separate left and right turn lanes at the east approach and an exclusive right turn lane at the south approach containing 245 feet of storage/deceleration length with a 100 foot taper.

It is recommended that the Nectar Street access road shown on the project site plan be eliminated and a new access connection be provided on Nectar Street from an extension of the most easterly internal north/south street. It is recommended that the segment of this new connection road between Nectar Street and the first internal east/west street be designed to collector street standards.

APPENDIX

Trip Generation Summary - Alternative 1

Project: New Project
Alternative: Alternative 1

Open Date: 1/2/2018
Analysis Date: 1/2/2018

ITE	Land Use	Average Daily Trips			AM Peak Hour of Adjacent Street Traffic			PM Peak Hour of Adjacent Street Traffic		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
210	SFHOUSE 1	2470	2469	4939	97	289	386	301	177	478
	538 Dwelling Units									
Unadjusted Volume		0	0	0	0	0	0	0	0	0
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		0	0	0	0	0	0	0	0	0

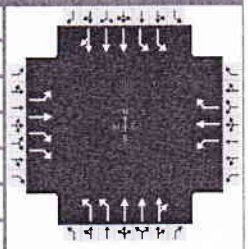
Total AM Peak Hour Internal Capture = 0 Percent

Total PM Peak Hour Internal Capture = 0 Percent

Source: Institute of Transportation Engineers, Trip Generation Manual 9th Edition, 2012

HCS7 Signalized Intersection Results Summary

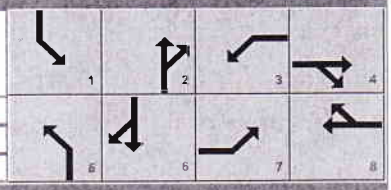
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Lemmon & Sky Vista	File Name	LeSv18ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	47	285	329	82	68	105	170	350	58	256	793	50

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	13.0	25.0	10.0	22.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



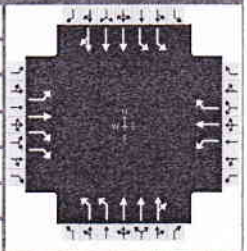
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	4.0
Phase Duration, s	15.0	27.0	15.0	27.0	18.0	30.0	18.0	30.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	4.4	15.5	6.2	6.2	6.3	7.7	8.7	14.7
Green Extension Time (g_e), s	0.0	1.2	0.0	1.6	0.2	2.9	0.3	2.6
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.02	0.24	0.40	0.00	0.02	0.02	0.33	0.13

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	51	310	303	89	74	92	185	292	141	278	608	297
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1403	1781	1870	1585	1730	1870	1754	1730	1870	1822
Queue Service Time (g_s), s	2.4	13.5	8.2	4.2	2.8	4.2	4.3	5.5	5.7	6.7	12.6	12.7
Cycle Queue Clearance Time (g_c), s	2.4	13.5	8.2	4.2	2.8	4.2	4.3	5.5	5.7	6.7	12.6	12.7
Green Ratio (*g/C*)	0.11	0.24	0.24	0.11	0.24	0.24	0.14	0.28	0.28	0.14	0.28	0.28
Capacity (*c*), veh/h	198	457	686	198	457	387	500	1039	487	500	1039	506
Volume-to-Capacity Ratio (*X*)	0.258	0.678	0.442	0.450	0.162	0.238	0.370	0.281	0.290	0.557	0.585	0.587
Back of Queue (*Q*), ft/ln (95 th percentile)	46.6	263.5	123.2	83.5	55.8	71.3	82.1	108.3	103.9	129	237.6	236.5
Back of Queue (*Q*), veh/ln (95 th percentile)	1.8	10.4	4.9	3.3	2.2	2.8	3.2	4.3	4.2	5.1	9.4	9.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	36.6	30.8	28.8	37.4	26.7	27.3	34.8	25.5	25.5	35.8	28.0	28.0
Incremental Delay (d_2), s/veh	0.3	3.3	0.2	0.6	0.1	0.1	0.2	0.1	0.1	0.8	0.6	1.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	36.9	34.1	29.0	38.0	26.8	27.4	35.0	25.5	25.6	36.7	28.6	29.3
Level of Service (LOS)	D	C	C	D	C	C	C	C	C	D	C	C
Approach Delay, s/veh / LOS	32.0	C		30.9	C		28.4	C		30.7	C	
Intersection Delay, s/veh / LOS	30.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.4	C	3.4	C	2.9	C	3.0	C
Bicycle LOS Score / LOS	1.6	B	0.9	A	0.8	A	1.1	A

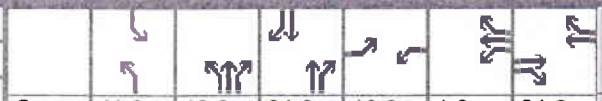
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Lemmon & Sky Vista	File Name	LeSv18px.xus		
Project Description					

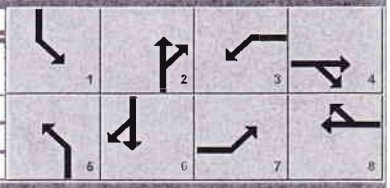


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	157	237	400	240	294	190	635	790	90	197	376	110

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	11.0	13.0	21.0	13.0	1.0	21.0						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.0	0.0	1.0	1.0	0.0	1.0						



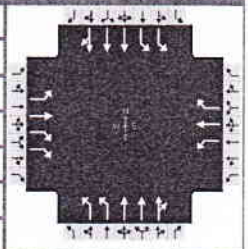
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	4.0
Phase Duration, s	18.0	26.0	19.0	27.0	29.0	39.0	16.0	26.0
Change Period, ($Y+R_c$), s	5.0	5.0	0.0	5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	11.2	14.6	15.9	18.1	19.7	15.5	7.9	10.4
Green Extension Time (g_e), s	0.1	0.5	0.2	1.2	1.4	3.3	0.1	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	0.79	0.04	0.02	0.99	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	171	258	326	261	320	163	690	631	304	214	344	162
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1403	1781	1870	1585	1730	1870	1790	1730	1870	1687
Queue Service Time (g_s), s	9.2	12.6	10.4	13.9	16.1	8.9	17.7	13.4	13.5	5.9	8.0	8.4
Cycle Queue Clearance Time (g_c), s	9.2	12.6	10.4	13.9	16.1	8.9	17.7	13.4	13.5	5.9	8.0	8.4
Green Ratio (*g/C*)	0.13	0.21	0.21	0.19	0.22	0.22	0.29	0.34	0.34	0.11	0.21	0.21
Capacity (*c*), veh/h	232	393	589	338	411	349	1003	1272	608	381	786	354
Volume-to-Capacity Ratio (*X*)	0.737	0.656	0.553	0.771	0.777	0.468	0.688	0.496	0.499	0.563	0.438	0.458
Back of Queue (Q), ft/ln (50 th percentile)	117.8	151.7	89.6	173	205.5	86.5	187.8	147.2	140	64.2	91.2	86.8
Back of Queue (Q), veh/ln (50 th percentile)	4.6	6.0	3.5	6.8	8.1	3.4	7.4	5.8	5.6	2.5	3.6	3.4
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	41.9	36.2	35.3	38.4	36.7	33.9	31.5	26.2	26.2	42.2	34.4	34.5
Incremental Delay (d_2), s/veh	10.3	3.1	0.7	9.5	8.3	0.4	1.7	0.1	0.2	1.2	0.1	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	52.2	39.3	36.0	47.9	45.0	34.3	33.2	26.3	26.5	43.4	34.5	34.9
Level of Service (LOS)	D	D	D	D	D	C	C	C	C	D	C	C
Approach Delay, s/veh / LOS	40.8	D		43.7	D		29.2	C		37.2	D	
Intersection Delay, s/veh / LOS	35.8						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.4	C	3.4	C	2.9	C	3.1	C
Bicycle LOS Score / LOS	1.7	B	1.7	B	1.4	A	0.9	A

HCS7 Signalized Intersection Results Summary

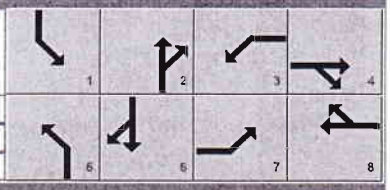
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Lemmon & Sky Vista	File Name	LeSv18aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	56	285	329	82	68	115	170	418	58	285	995	79

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	13.0	25.0	10.0	22.0	0.0	0.0	
Yellow	4.0	4.0	4.0	4.0	0.0	0.0	
Red	1.0	1.0	1.0	1.0	0.0	0.0	



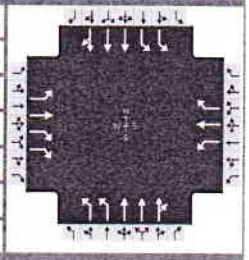
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	4.0
Phase Duration, s	15.0	27.0	15.0	27.0	18.0	30.0	18.0	30.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	4.8	15.5	6.2	6.7	6.3	8.7	9.6	19.1
Green Extension Time (g_e), s	0.0	1.2	0.0	1.7	0.2	3.8	0.3	2.4
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	0.04	0.24	0.40	0.01	0.02	0.06	0.76	0.55

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	61	310	303	89	74	103	185	341	165	310	780	377
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1403	1781	1870	1585	1730	1870	1770	1730	1870	1806
Queue Service Time (g_s), s	2.8	13.5	8.2	4.2	2.8	4.7	4.3	6.5	6.7	7.6	17.1	17.1
Cycle Queue Clearance Time (g_c), s	2.8	13.5	8.2	4.2	2.8	4.7	4.3	6.5	6.7	7.6	17.1	17.1
Green Ratio (*g/C*)	0.11	0.24	0.24	0.11	0.24	0.24	0.14	0.28	0.28	0.14	0.28	0.28
Capacity (*c*), veh/h	198	457	686	198	457	387	500	1039	492	500	1039	502
Volume-to-Capacity Ratio (*X*)	0.308	0.678	0.442	0.450	0.162	0.267	0.370	0.328	0.336	0.620	0.750	0.751
Back of Queue (*Q*), ft/ln (95 th percentile)	55.9	263.5	123.2	83.5	55.8	80.3	82.1	128.7	123.4	147.6	312.8	317.4
Back of Queue (*Q*), veh/ln (95 th percentile)	2.2	10.4	4.9	3.3	2.2	3.2	3.2	5.1	4.9	5.8	12.3	12.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	36.8	30.8	28.8	37.4	26.7	27.5	34.8	25.8	25.9	36.2	29.7	29.7
Incremental Delay (d_2), s/veh	0.3	3.3	0.2	0.6	0.1	0.1	0.2	0.1	0.1	1.8	2.7	5.6
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	37.1	34.1	29.0	38.0	26.8	27.6	35.0	25.9	26.0	37.9	32.4	35.3
Level of Service (LOS)	D	C	C	D	C	C	C	C	C	D	C	D
Approach Delay, s/veh / LOS	32.1	C		30.9	C		28.4	C		34.3	C	
Intersection Delay, s/veh / LOS	32.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.4	C	3.4	C	2.9	C	3.0	C
Bicycle LOS Score / LOS	1.6	B	0.9	A	0.9	A	1.3	A

HCS7 Signalized Intersection Results Summary

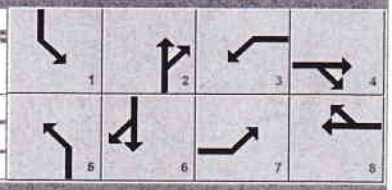
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Lemmon & Sky Vista	File Name	LeSv18pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	187	237	400	240	294	220	635	1001	90	214	500	128

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	11.0	13.0	21.0	13.0	1.0	21.0						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.0	0.0	1.0	1.0	0.0	1.0						



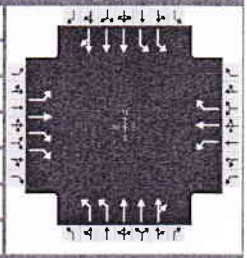
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	4.0
Phase Duration, s	18.0	26.0	19.0	27.0	29.0	39.0	16.0	26.0
Change Period, ($Y+R_c$), s	5.0	5.0	0.0	5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	13.2	14.6	15.9	18.1	19.7	19.6	8.4	13.2
Green Extension Time (g_e), s	0.0	0.5	0.2	1.2	1.4	4.1	0.1	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	0.79	0.04	0.12	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	203	258	326	261	320	196	690	785	379	233	450	210
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1403	1781	1870	1585	1730	1870	1805	1730	1870	1700
Queue Service Time (g_s), s	11.2	12.6	10.4	13.9	16.1	11.0	17.7	17.5	17.6	6.4	10.8	11.2
Cycle Queue Clearance Time (g_c), s	11.2	12.6	10.4	13.9	16.1	11.0	17.7	17.5	17.6	6.4	10.8	11.2
Green Ratio (*g/C*)	0.13	0.21	0.21	0.19	0.22	0.22	0.29	0.34	0.34	0.11	0.21	0.21
Capacity (*c*), veh/h	232	393	589	338	411	349	1003	1272	614	381	786	357
Volume-to-Capacity Ratio (*X*)	0.878	0.656	0.553	0.771	0.777	0.561	0.688	0.617	0.618	0.611	0.573	0.590
Back of Queue (*Q*), ft/ln (50 th percentile)	169.2	151.7	89.6	173	205.5	108.3	187.8	194.9	188.5	71.2	124.4	119.3
Back of Queue (*Q*), veh/ln (50 th percentile)	6.7	6.0	3.5	6.8	8.1	4.3	7.4	7.7	7.5	2.8	4.9	4.7
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	42.7	36.2	35.3	38.4	36.7	34.7	31.5	27.6	27.6	42.5	35.5	35.6
Incremental Delay (d_2), s/veh	28.5	3.1	0.7	9.5	8.3	1.3	1.7	0.7	1.4	2.1	0.7	1.8
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	71.2	39.3	36.0	47.9	45.0	36.0	33.2	28.2	29.0	44.6	36.1	37.4
Level of Service (LOS)	E	D	D	D	D	D	C	C	C	D	D	D
Approach Delay, s/veh / LOS	46.2	D		43.7	D		30.2	C		38.6	D	
Intersection Delay, s/veh / LOS	37.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.4	C	3.4	C	2.9	C	3.1	C
Bicycle LOS Score / LOS	1.8	B	1.8	B	1.5	B	1.0	A

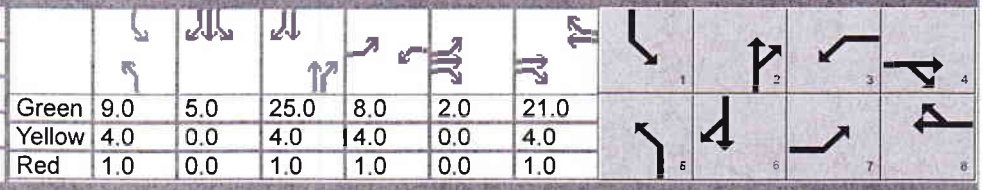
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2028	Analysis Period	1> 7:00
Intersection	Lemmon & Sky Vista	File Name	LeSv28aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	103	502	477	130	122	256	246	679	91	610	1528	109

Signal Information			
Cycle, s	90.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	9.0	5.0	25.0	8.0	2.0	21.0	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.0	0.0	1.0	1.0	0.0	1.0	

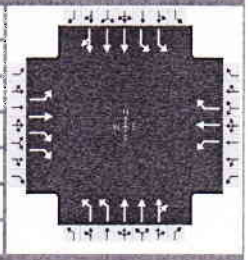
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	4.0
Phase Duration, s	15.0	28.0	13.0	26.0	14.0	30.0	19.0	35.0
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0	5.0	5.0	0.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	7.4	25.0	9.1	13.4	8.8	13.6	18.8	30.1
Green Extension Time (g_e), s	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	0.33	1.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	112	546	410	141	133	224	267	559	267	663	1191	577
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781	1870	1403	1781	1870	1585	1730	1870	1765	1730	1870	1810
Queue Service Time (g_s), s	5.4	23.0	11.5	7.1	5.3	11.4	6.8	11.4	11.6	16.8	28.0	28.1
Cycle Queue Clearance Time (g_c), s	5.4	23.0	11.5	7.1	5.3	11.4	6.8	11.4	11.6	16.8	28.0	28.1
Green Ratio (*g/C*)	0.11	0.26	0.26	0.09	0.23	0.23	0.10	0.28	0.28	0.21	0.33	0.33
Capacity (*c*), veh/h	198	478	717	158	436	370	346	1039	490	730	1247	603
Volume-to-Capacity Ratio (*X*)	0.566	1.142	0.572	0.892	0.304	0.605	0.773	0.538	0.544	0.908	0.955	0.957
Back of Queue (*Q*), ft/ln (95 th percentile)	110.3	794	173.1	213.9	105.6	198.9	149.1	218.8	209.6	331.2	529.8	568.1
Back of Queue (*Q*), veh/ln (95 th percentile)	4.3	31.3	6.8	8.4	4.2	7.8	5.9	8.6	8.4	13.0	20.9	22.4
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	37.9	33.5	29.2	40.6	28.5	30.8	39.5	27.6	27.7	34.6	29.3	29.4
Incremental Delay (d_2), s/veh	2.4	86.2	0.7	41.0	0.1	2.0	9.4	0.3	0.7	14.9	15.9	26.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	40.3	119.7	29.9	81.5	28.6	32.8	48.9	27.9	28.4	49.5	45.2	55.4
Level of Service (LOS)	D	F	C	F	C	C	D	C	C	D	D	E
Approach Delay, s/veh / LOS	76.9	E		45.5	D		33.2	C		48.8	D	
Intersection Delay, s/veh / LOS	51.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.4	C	3.4	C	2.9	C	3.1	C
Bicycle LOS Score / LOS	2.2	B	1.3	A	1.1	A	1.8	B

HCS7 Signalized Intersection Results Summary

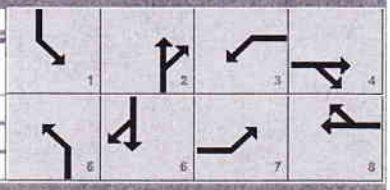
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	PM Peak Hour	PHF	0.92
Urban Street		Analysis Year	2028	Analysis Period	1> 7:00
Intersection	Lemmon & Sky Vista	File Name	LeSv28pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	301	414	520	401	539	467	954	1566	162	468	858	214

Signal Information			
Cycle, s	102.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	13.0	11.0	22.0	10.0	4.0	22.0	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.0	0.0	1.0	1.0	0.0	1.0	



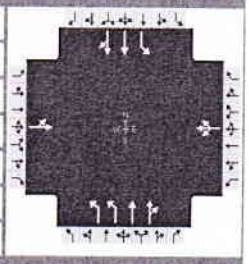
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	4.0
Phase Duration, s	15.0	27.0	19.0	31.0	29.0	38.0	18.0	27.0
Change Period, ($Y+R_c$), s	5.0	5.0	0.0	5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.1	3.2	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s	12.0	24.0	21.0	28.0	31.0	35.0	15.0	23.4
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max Out Probability	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	327	450	457	436	586	464	1037	1255	602	509	786	357
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1403	1781	1870	1585	1730	1870	1788	1730	1870	1691
Queue Service Time (g_s), s	10.0	22.0	15.5	19.0	26.0	26.0	29.0	33.0	33.0	13.0	21.3	21.4
Cycle Queue Clearance Time (g_c), s	10.0	22.0	15.5	19.0	26.0	26.0	29.0	33.0	33.0	13.0	21.3	21.4
Green Ratio (g/C)	0.10	0.22	0.22	0.19	0.25	0.25	0.28	0.32	0.32	0.13	0.22	0.22
Capacity (c), veh/h	175	403	605	332	477	404	984	1210	578	441	807	365
Volume-to-Capacity Ratio (X)	1.873	1.115	0.754	1.314	1.229	1.149	1.054	1.037	1.040	1.154	0.975	0.979
Back of Queue (Q), ft/ln (50 th percentile)	620.4	477.3	142.5	583.5	697.8	510	452.5	517.9	536.9	282	314.2	326.1
Back of Queue (Q), veh/ln (50 th percentile)	24.4	18.8	5.6	23.0	27.5	20.1	17.8	20.4	21.5	11.1	12.4	12.8
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	46.0	40.0	37.5	41.5	38.0	38.0	36.5	34.5	34.5	44.5	39.7	39.8
Incremental Delay (d_2), s/veh	414.0	80.0	4.8	161.0	120.4	92.0	44.1	35.9	48.3	92.2	25.4	41.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	460.0	120.0	42.3	202.5	158.4	130.0	80.6	70.4	82.8	136.7	65.1	81.1
Level of Service (LOS)	F	F	D	F	F	F	F	F	F	F	E	F
Approach Delay, s/veh / LOS	181.4	F		162.5	F		76.6	E		90.6	F	
Intersection Delay, s/veh / LOS	115.2						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	3.4	C	3.4	C	2.9	C	3.1	C
Bicycle LOS Score / LOS	2.5	C	2.9	C	2.1	B	1.4	A

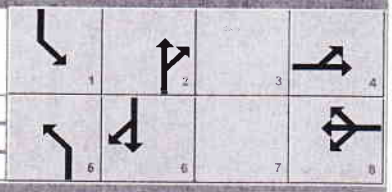
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Lemmon & Military	File Name	LeMi18ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	22	1		2	0	4	330	170	0	2	536	26

Signal Information					EB			WB			NB			SB		
Cycle, s	65.0	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	End	Green	6.0	2.0		27.0	15.0	0.0	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	4.0	0.0		4.0	4.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.0	0.0		1.0	1.0	0.0	0.0					



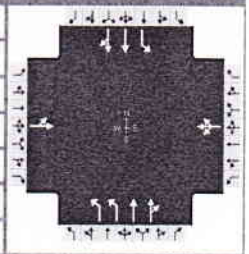
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		20.0		20.0	13.0	34.0	11.0	32.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s		2.9		2.2	8.3	3.9	2.1	9.7
Green Extension Time (g_e), s		0.0		0.0	0.4	1.6	0.0	1.5
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	0.28	0.00	0.08	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		26			7		367	189	0	2	315	310
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1378			1543		1689	1870	0	1781	1870	1838
Queue Service Time (g_s), s		0.7			0.0		6.3	1.9	0.0	0.1	7.7	7.7
Cycle Queue Clearance Time (g_c), s		0.9			0.2		6.3	1.9	0.0	0.1	7.7	7.7
Green Ratio (*g/C*)		0.23			0.23		0.20	0.45		0.09	0.42	0.42
Capacity (*c*), veh/h		426			430		675	1669		164	777	764
Volume-to-Capacity Ratio (*X*)		0.060			0.016		0.543	0.113	0.000	0.014	0.405	0.406
Back of Queue (*Q*), ft/ln (50 th percentile)		7.3			1.8		61.7	17.5	0	0.8	72.2	71.1
Back of Queue (*Q*), veh/ln (50 th percentile)		0.3			0.1		2.4	0.7	0.0	0.0	2.8	2.8
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		19.6			19.3		23.3	10.5		26.8	13.4	13.4
Incremental Delay (d_2), s/veh		0.0			0.0		0.5	0.0	0.0	0.0	0.1	0.1
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		19.6			19.3		23.8	10.5		26.8	13.5	13.5
Level of Service (LOS)		B			B		C	B		C	B	B
Approach Delay, s/veh / LOS	19.6	B		19.3	B		19.3	B		13.5	B	
Intersection Delay, s/veh / LOS	16.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	2.1	B	3.0	C
Bicycle LOS Score / LOS	0.0	A	0.5	A	0.9	A	1.0	A

HCS7 Signalized Intersection Results Summary

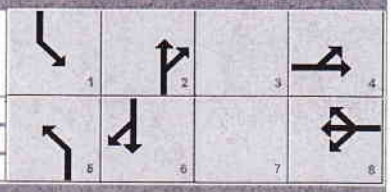
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Lemmon & Military	File Name	LeMi18px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	29	0		2	0	4	493	646	0	2	283	36

Signal Information			
Cycle, s	65.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	6.0	23.0	15.0	0.0	0.0	
Yellow	4.0	0.0	4.0	4.0	0.0	0.0	
Red	1.0	0.0	1.0	1.0	0.0	0.0	



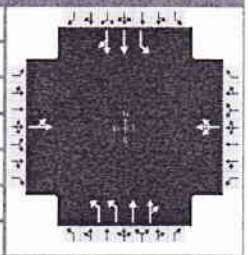
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		20.0		20.0	17.0	34.0	11.0	28.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s		3.2		2.2	11.3	10.5	2.1	6.5
Green Extension Time (g_e), s		0.0		0.0	0.8	2.3	0.0	2.3
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	0.20	0.00	0.08	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		32			7		548	718	0	2	179	175
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1360			1543		1689	1870	0	1781	1870	1792
Queue Service Time (g_s), s		1.0			0.0		9.3	8.5	0.0	0.1	4.5	4.5
Cycle Queue Clearance Time (g_c), s		1.2			0.2		9.3	8.5	0.0	0.1	4.5	4.5
Green Ratio (*g/C*)		0.23			0.23		0.26	0.45		0.09	0.35	0.35
Capacity (*c*), veh/h		425			430		883	1669		164	662	634
Volume-to-Capacity Ratio (*X*)		0.076			0.016		0.620	0.430	0.000	0.014	0.271	0.276
Back of Queue (*Q*), ft/ln (50 th percentile)		9.3			1.8		90	77.9	0	0.8	43.4	42.5
Back of Queue (*Q*), veh/ln (50 th percentile)		0.4			0.1		3.5	3.1	0.0	0.0	1.7	1.7
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		19.7			19.3		21.2	12.3		26.8	15.0	15.0
Incremental Delay (d_2), s/veh		0.0			0.0		1.0	0.1	0.0	0.0	0.1	0.1
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		19.7			19.3		22.2	12.4		26.8	15.1	15.1
Level of Service (LOS)		B			B		C	B		C	B	B
Approach Delay, s/veh / LOS	19.7	B		19.3	B		16.6	B		15.2	B	
Intersection Delay, s/veh / LOS	16.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	2.1	B	3.0	C
Bicycle LOS Score / LOS	0.0	A	0.5	A	1.5	B	0.8	A

HCS7 Signalized Intersection Results Summary

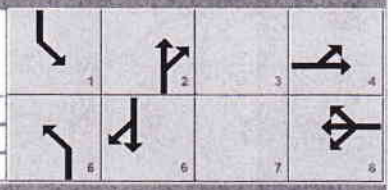
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Lemmon & Military	File Name	LeMi18aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	30	1		2	0	4	330	257	0	2	796	49

Signal Information			
Cycle, s	65.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	2.0		27.0	15.0	0.0	0.0					
Yellow	4.0	0.0		4.0	4.0	0.0	0.0					
Red	1.0	0.0		1.0	1.0	0.0	0.0					



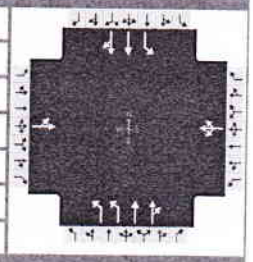
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		20.0		20.0	13.0	34.0	11.0	32.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s		3.3		2.2	8.3	5.0	2.1	14.9
Green Extension Time (g_e), s		0.0		0.0	0.4	2.5	0.0	2.3
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	0.28	0.00	0.08	0.07

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		34			7		367	286	0	2	475	464
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1374			1543		1689	1870	0	1781	1870	1830
Queue Service Time (g_s), s		1.1			0.0		6.3	3.0	0.0	0.1	12.9	12.9
Cycle Queue Clearance Time (g_c), s		1.3			0.2		6.3	3.0	0.0	0.1	12.9	12.9
Green Ratio (*g/C*)		0.23			0.23		0.20	0.45		0.09	0.42	0.42
Capacity (*c*), veh/h		426			430		675	1669		164	777	760
Volume-to-Capacity Ratio (*X*)		0.081			0.016		0.543	0.171	0.000	0.014	0.611	0.611
Back of Queue (*Q*), ft/ln (50 th percentile)		10			1.8		61.7	27.2	0	0.8	125.8	123.2
Back of Queue (*Q*), veh/ln (50 th percentile)		0.4			0.1		2.4	1.1	0.0	0.0	5.0	4.9
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		19.7			19.3		23.3	10.8		26.8	14.9	14.9
Incremental Delay (d_2), s/veh		0.0			0.0		0.5	0.0	0.0	0.0	1.0	1.0
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		19.7			19.3		23.8	10.8		26.8	15.9	15.9
Level of Service (LOS)		B			B		C	B		C	B	B
Approach Delay, s/veh / LOS	19.7	B		19.3	B		18.1	B		15.9	B	
Intersection Delay, s/veh / LOS	16.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	2.1	B	3.0	C
Bicycle LOS Score / LOS	0.0	A	0.5	A	1.0	A	1.3	A

HCS7 Signalized Intersection Results Summary

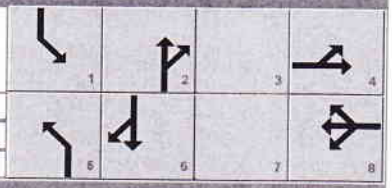
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	Existing + Project	Analysis Period	1> 7:00
Intersection	Lemmon & Military	File Name	LeMi18pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	53	0		2	0	4	493	917	0	2	442	50

Signal Information			
Cycle, s	65.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	6.0		23.0	15.0	0.0	0.0					
Yellow	4.0	0.0		4.0	4.0	0.0	0.0					
Red	1.0	0.0		1.0	1.0	0.0	0.0					



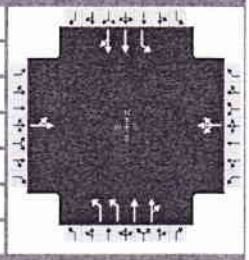
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		20.0		20.0	17.0	34.0	11.0	28.0
Change Period, ($Y+R_c$), s		5.0		5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	3.0	3.1	3.0
Queue Clearance Time (g_s), s		4.3		2.2	11.3	15.5	2.1	9.4
Green Extension Time (g_e), s		0.1		0.1	0.8	3.4	0.0	3.5
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	0.20	0.09	0.08	0.09

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		59			7		548	1019	0	2	278	269
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1360			1544		1689	1870	0	1781	1870	1800
Queue Service Time (g_s), s		2.1			0.0		9.3	13.5	0.0	0.1	7.3	7.4
Cycle Queue Clearance Time (g_c), s		2.3			0.2		9.3	13.5	0.0	0.1	7.3	7.4
Green Ratio (*g/C*)		0.23			0.23		0.26	0.45		0.09	0.35	0.35
Capacity (*c*), veh/h		425			430		883	1669		164	662	637
Volume-to-Capacity Ratio (*X*)		0.139			0.016		0.620	0.611	0.000	0.014	0.419	0.423
Back of Queue (*Q*), ft/ln (50 th percentile)		17.4			1.8		90	125	0	0.8	71.4	69.5
Back of Queue (*Q*), veh/ln (50 th percentile)		0.7			0.1		3.5	4.9	0.0	0.0	2.8	2.7
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh		20.1			19.3		21.2	13.7		26.8	15.9	16.0
Incremental Delay (d_2), s/veh		0.1			0.0		1.0	0.5	0.0	0.0	0.2	0.2
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		20.2			19.3		22.2	14.2		26.8	16.1	16.1
Level of Service (LOS)		C			B		C	B		C	B	B
Approach Delay, s/veh / LOS	20.2	C		19.3	B		17.0	B		16.1	B	
Intersection Delay, s/veh / LOS	16.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	2.1	B	3.0	C
Bicycle LOS Score / LOS	0.0	A	0.5	A	1.8	B	0.9	A

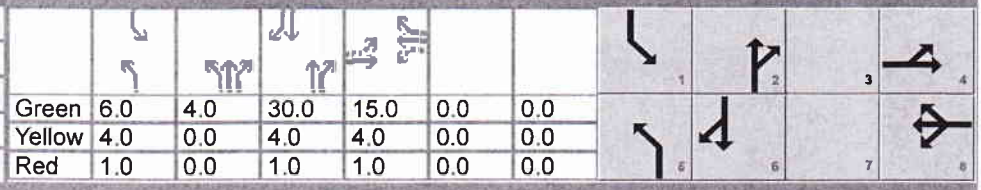
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	AM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2028	Analysis Period	1> 7:00
Intersection	Lemmon & Military	File Name	LeMi28aw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	49	1		2	0	4	599	421	0	4	1281	55

Signal Information			
Cycle, s	70.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	6.0	4.0		30.0	15.0	0.0	0.0					
Yellow	4.0	0.0		4.0	4.0	0.0	0.0					
Red	1.0	0.0		1.0	1.0	0.0	0.0					

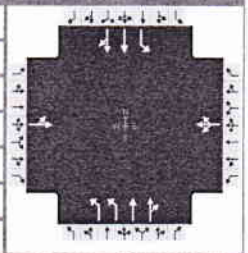
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		20.0		20.0	15.0	39.0	11.0	35.0
Change Period, (*Y+R c*), s		5.0		5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s		4.3		2.2	15.5	7.1	2.2	28.8
Green Extension Time (*g e*), s		0.0		0.1	0.0	4.9	0.0	0.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	1.00	0.03	0.13	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		56			7		666	468	0	4	746	738
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1367			1542		1689	1870	0	1781	1870	1842
Queue Service Time (*g s*), s		2.1			0.0		13.5	5.1	0.0	0.2	26.6	26.8
Cycle Queue Clearance Time (*g c*), s		2.3			0.2		13.5	5.1	0.0	0.2	26.6	26.8
Green Ratio (*g/C*)		0.21			0.21		0.21	0.49		0.09	0.43	0.43
Capacity (*c*), veh/h		395			399		724	1817		153	802	789
Volume-to-Capacity Ratio (*X*)		0.141			0.017		0.920	0.257	0.000	0.029	0.931	0.935
Back of Queue (*Q*), ft/ln (50 th percentile)		18.4			2.1		174.4	46.9	0	1.7	349.4	350.8
Back of Queue (*Q*), veh/ln (50 th percentile)		0.7			0.1		6.7	1.8	0.0	0.1	13.8	13.8
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh		22.5			21.7		26.9	10.6		29.3	19.0	19.1
Incremental Delay (*d 2*), s/veh		0.1			0.0		16.6	0.0	0.0	0.0	17.1	17.9
Initial Queue Delay (*d 3*), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		22.6			21.7		43.5	10.6		29.4	36.1	37.0
Level of Service (LOS)		C			C		D	B		C	D	D
Approach Delay, s/veh / LOS	22.6	C		21.7	C		29.9	C		36.5	D	
Intersection Delay, s/veh / LOS	33.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	2.1	B	3.0	C
Bicycle LOS Score / LOS	0.0	A	0.5	A	1.4	A	1.7	B

HCS7 Signalized Intersection Results Summary

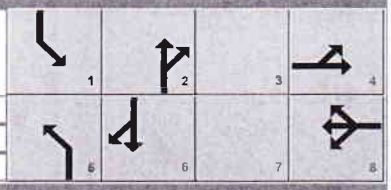
General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Jan 2, 2018	Area Type	Other
Jurisdiction	City of Reno	Time Period	PM Peak Hour	PHF	0.90
Urban Street		Analysis Year	2028	Analysis Period	1> 7:00
Intersection	Lemmon & Military	File Name	LeMi28pw.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	80	0		2	0	4	854	1527	0	4	709	98

Signal Information			
Cycle, s	70.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	9.0	25.0	15.0	0.0	0.0	
Yellow	4.0	0.0	4.0	4.0	0.0	0.0	
Red	1.0	0.0	1.0	1.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		20.0		20.0	20.0	39.0	11.0	30.0
Change Period, (*Y+R c*), s		5.0		5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	3.0	3.1	3.0
Queue Clearance Time (*g s*), s		5.9		2.2	21.5	31.9	2.2	16.6
Green Extension Time (*g e*), s		0.1		0.1	0.0	1.6	0.0	4.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	1.00	1.00	0.13	0.74

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4		3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		89			7		949	1697	0	4	459	438
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1359			1543		1689	1870	0	1781	1870	1786
Queue Service Time (*g s*), s		3.6			0.0		19.5	29.9	0.0	0.2	14.6	14.6
Cycle Queue Clearance Time (*g c*), s		3.9			0.2		19.5	29.9	0.0	0.2	14.6	14.6
Green Ratio (*g/C*)		0.21			0.21		0.29	0.49		0.09	0.36	0.36
Capacity (*c*), veh/h		394			399		965	1817		153	668	638
Volume-to-Capacity Ratio (*X*)		0.226			0.017		0.983	0.934	0.000	0.029	0.687	0.687
Back of Queue (*Q*), ft/ln (50 th percentile)		30.3			2.1		271.1	331	0	1.7	156.9	150.4
Back of Queue (*Q*), veh/ln (50 th percentile)		1.2			0.1		10.4	13.0	0.0	0.1	6.2	5.9
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh		23.1			21.7		24.8	16.9		29.3	19.2	19.2
Incremental Delay (*d 2*), s/veh		0.1			0.0		24.8	9.3	0.0	0.0	2.5	2.6
Initial Queue Delay (*d 3*), s/veh		0.0			0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh		23.2			21.7		49.6	26.3		29.4	21.6	21.7
Level of Service (LOS)		C			C		D	C		C	C	C
Approach Delay, s/veh / LOS	23.2	C		21.7	C		34.7	C		21.7	C	
Intersection Delay, s/veh / LOS	31.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.9	C	2.8	C	2.1	B	3.0	C
Bicycle LOS Score / LOS	0.1	A	0.5	A	2.7	C	1.2	A

HCS7 Two-Way Stop-Control Report

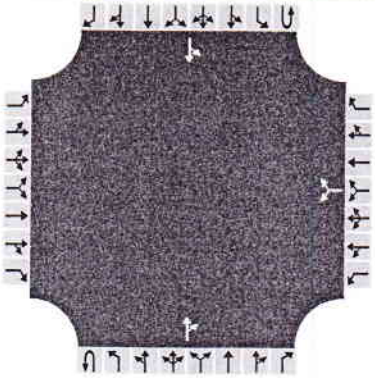
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	AM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Arkansas
Jurisdiction	Washoe County
East/West Street	Arkansas Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						19		0			63	5		1	248	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							21							1		
Capacity, c (veh/h)							654							1526		
v/c Ratio							0.03							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							10.7							7.4		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						10.7								0.0		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

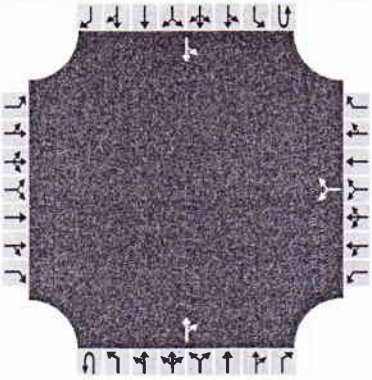
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	PM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Arkansas
Jurisdiction	Washoe County
East/West Street	Arkansas Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						10		1			305	27		1	147	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							12							1		
Capacity, c (veh/h)							535							1197		
v/c Ratio							0.02							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							11.9							8.0		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						11.9								0.1		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

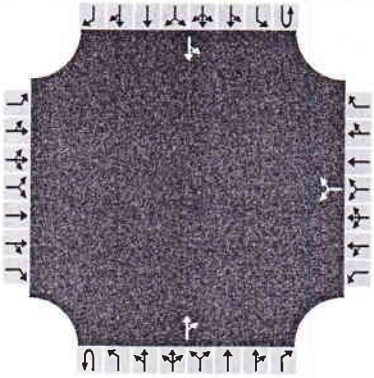
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	AM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Arkansas
Jurisdiction	Washoe County
East/West Street	Arkansas Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						19		0			158	5		1	531	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							21							1		
Capacity, c (veh/h)							377							1398		
v/c Ratio							0.06							0.00		
95% Queue Length, Q_{95} (veh)							0.2							0.0		
Control Delay (s/veh)							15.1							7.6		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						15.1								0.0		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

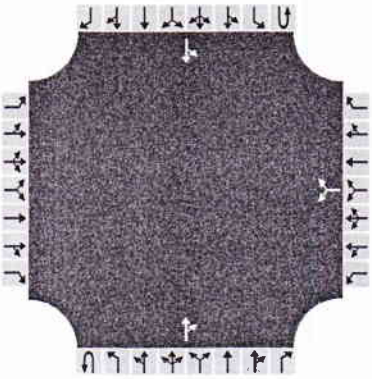
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	PM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Arkansas
Jurisdiction	Washoe County
East/West Street	Arkansas Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						10		1			600	27		1	320	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							12							1		
Capacity, c (veh/h)							273							911		
v/c Ratio							0.04							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							18.8							9.0		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						18.8								0.0		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

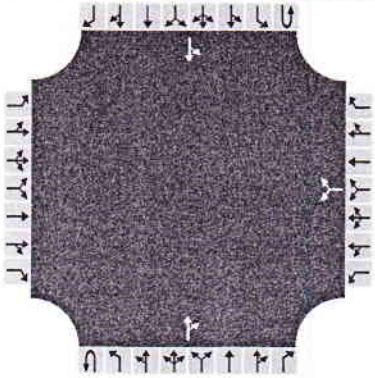
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2028
Time Analyzed	AM
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Arkansas
Jurisdiction	Washoe County
East/West Street	Arkansas Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						19		0			202	5		1	590	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							21							1		
Capacity, c (veh/h)							323							1343		
v/c Ratio							0.06							0.00		
95% Queue Length, Q_{95} (veh)							0.2							0.0		
Control Delay (s/veh)							16.9							7.7		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						16.9								0.0		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

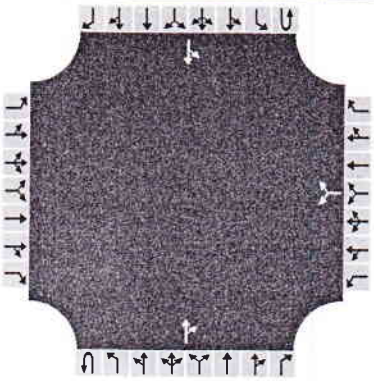
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2028
Time Analyzed	PM
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Arkansas
Jurisdiction	Washoe County
East/West Street	Arkansas Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						10		1			726	27		1	419	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							12							1		
Capacity, c (veh/h)							196							810		
v/c Ratio							0.06							0.00		
95% Queue Length, Q_{95} (veh)							0.2							0.0		
Control Delay (s/veh)							24.5							9.5		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						24.5								0.0		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

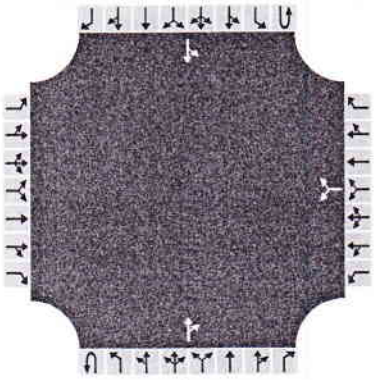
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	AM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Nectar
Jurisdiction	Washoe County
East/West Street	Nectar Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						29		1			61	2		1	220	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							33							1		
Capacity, c (veh/h)							690							1532		
v/c Ratio							0.05							0.00		
95% Queue Length, Q_{95} (veh)							0.2							0.0		
Control Delay (s/veh)							10.5							7.4		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						10.5								0.0		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

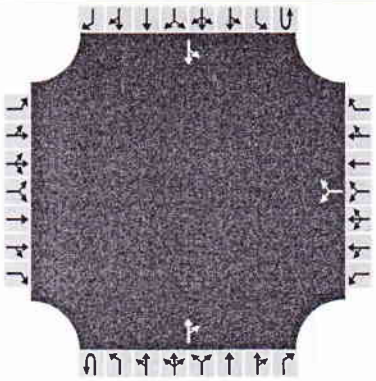
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	PM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Nectar
Jurisdiction	Washoe County
East/West Street	Nectar Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						25		3			259	47		3	123	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							30							3		
Capacity, c (veh/h)							580							1226		
v/c Ratio							0.05							0.00		
95% Queue Length, Q_{95} (veh)							0.2							0.0		
Control Delay (s/veh)							11.5							7.9		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						11.5								0.2		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

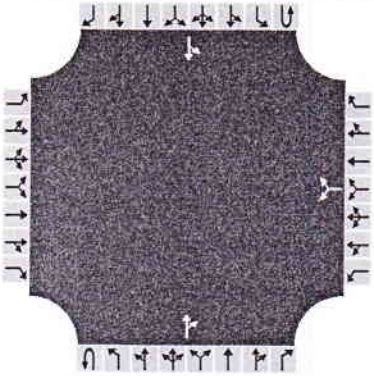
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	AM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Nectar
Jurisdiction	Washoe County
East/West Street	Nectar Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						185		3			104	54		2	347	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							204							2		
Capacity, c (veh/h)							516							1404		
v/c Ratio							0.40							0.00		
95% Queue Length, Q_{95} (veh)							1.9							0.0		
Control Delay (s/veh)							16.5							7.6		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						16.5								0.1		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

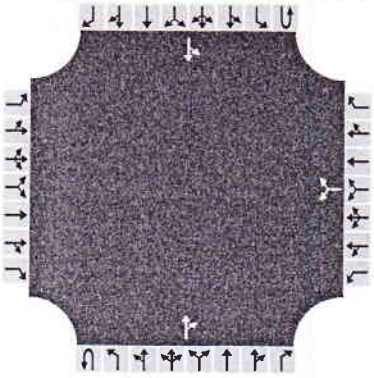
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	PM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Nectar
Jurisdiction	Washoe County
East/West Street	Nectar Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						120		5			392	209		5	201	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							135							5		
Capacity, c (veh/h)							372							933		
v/c Ratio							0.36							0.01		
95% Queue Length, Q_{95} (veh)							1.6							0.0		
Control Delay (s/veh)							20.1							8.9		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						20.1								0.3		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

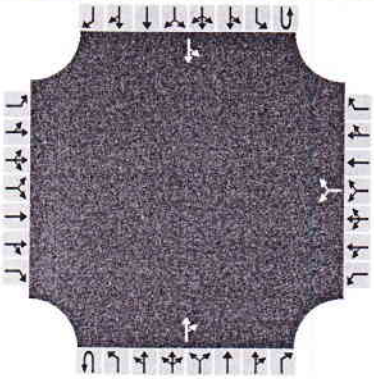
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2028
Time Analyzed	AM
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Nectar
Jurisdiction	Washoe County
East/West Street	Nectar Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						185		3			148	54		2	405	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							204							2		
Capacity, c (veh/h)							446							1348		
v/c Ratio							0.46							0.00		
95% Queue Length, Q_{95} (veh)							2.4							0.0		
Control Delay (s/veh)							19.7							7.7		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						19.7								0.0		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

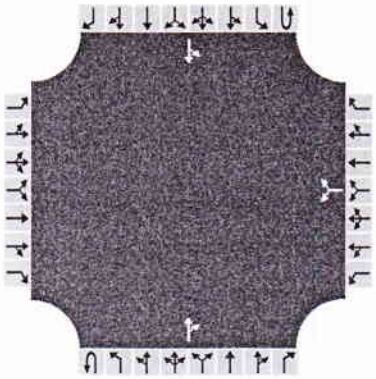
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2028
Time Analyzed	PM
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Nectar
Jurisdiction	Washoe County
East/West Street	Nectar Street
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						120		5			518	209		5	300	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							135							5		
Capacity, c (veh/h)							268							830		
v/c Ratio							0.50							0.01		
95% Queue Length, Q_{95} (veh)							2.6							0.0		
Control Delay (s/veh)							31.4							9.4		
Level of Service, LOS							D							A		
Approach Delay (s/veh)						31.4								0.2		
Approach LOS						D										

HCS7 Two-Way Stop-Control Report

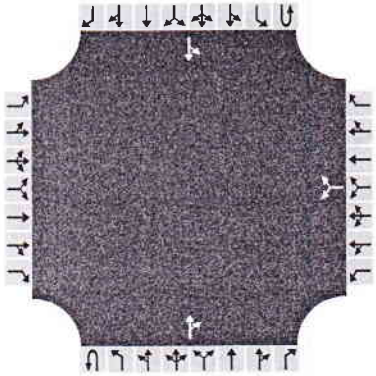
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	AM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Chickadee
Jurisdiction	Washoe County
East/West Street	Chickadee Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						15		2			59	3		1	206	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							18							1		
Capacity, c (veh/h)							722							1533		
v/c Ratio							0.02							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							10.1							7.3		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						10.1								0.0		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

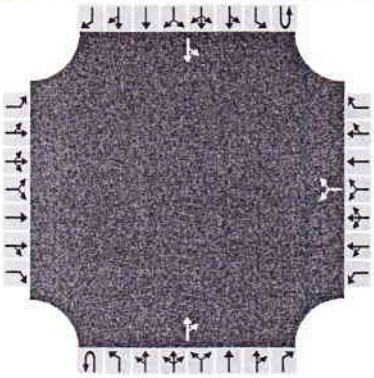
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	PM Existing
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Chickadee
Jurisdiction	Washoe County
East/West Street	Chickadee Drive
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						12		4			250	12		7	114	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							17							8		
Capacity, c (veh/h)							621							1276		
v/c Ratio							0.03							0.01		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							11.0							7.8		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						11.0								0.5		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

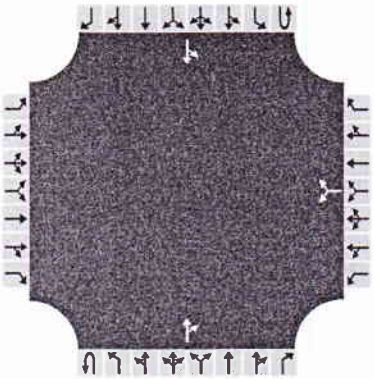
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	AM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Prado Ranch
Jurisdiction	Washoe County
East/West Street	Prado Ranch Boulevard
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						142		6			61	46		2	207	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							161							2		
Capacity, c (veh/h)							681							1472		
v/c Ratio							0.24							0.00		
95% Queue Length, Q_{95} (veh)							0.9							0.0		
Control Delay (s/veh)							11.9							7.4		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						11.9								0.1		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

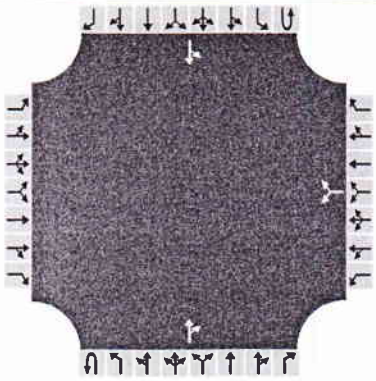
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2018
Time Analyzed	PM Existing + Project
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Prado Ranch
Jurisdiction	Washoe County
East/West Street	Prado Ranch Boulevard
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						90		6			252	145		11	116	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							105							12		
Capacity, c (veh/h)							531							1127		
v/c Ratio							0.20							0.01		
95% Queue Length, Q_{95} (veh)							0.7							0.0		
Control Delay (s/veh)							13.4							8.2		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						13.4								0.8		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

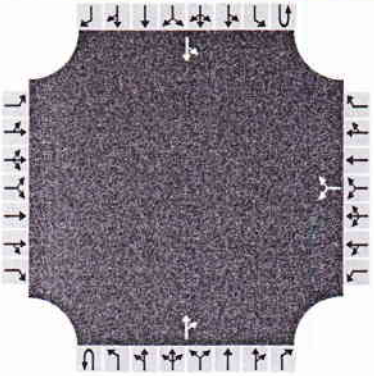
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2028
Time Analyzed	AM
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Prado Ranch
Jurisdiction	Washoe County
East/West Street	Prado Ranch Boulevard
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						142		6			105	46		2	265	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							161							2		
Capacity, c (veh/h)							590							1413		
v/c Ratio							0.27							0.00		
95% Queue Length, Q_{95} (veh)							1.1							0.0		
Control Delay (s/veh)							13.4							7.6		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						13.4								0.1		
Approach LOS						B										

HCS7 Two-Way Stop-Control Report

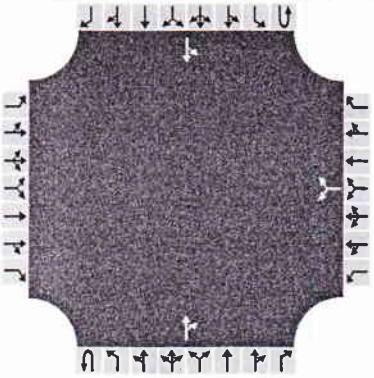
General Information

Analyst	MSH
Agency/Co.	Solaegui Engineers
Date Performed	1/2/2018
Analysis Year	2028
Time Analyzed	PM
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	Lemmon & Prado Ranch
Jurisdiction	Washoe County
East/West Street	Prado Ranch Boulevard
North/South Street	Lemmon Drive
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						90		6			378	145		11	215	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							105							12		
Capacity, c (veh/h)							384							1003		
v/c Ratio							0.27							0.01		
95% Queue Length, Q_{95} (veh)							1.1							0.0		
Control Delay (s/veh)							17.8							8.6		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						17.8								0.5		
Approach LOS						C										

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TO: Pam Parenti **DATE:** January 31, 2017

THRU: Scott Estes SJE

FROM: Brooke Long BL

RE: NVIG Annexation/Discovery, TMWA WO# 15-4763 (Revised)

SUMMARY:

The proposed project includes a large development in Lemmon Valley, Nevada including residential and commercial development.

- The overall project consists of several areas along Lemmon Valley Drive.
- TMWA can provide water service to the overall project.
- The entire project lies outside TMWA's service territory and will require annexation prior to a water service agreement.

The primary purpose of this Annexation/Discovery is to identify the major water facility improvements to serve the NVIG development. In addition to the off-site improvements, high level planning of the on-site infrastructure to support the development was evaluated and presented in this document. The planning level cost opinion of the identified major backbone infrastructure improvements for the project is $11,932,392.

Review of conceptual site plans or tentative maps by TMWA and/or agents of TMWA shall not constitute an application for service, nor implies a commitment by TMWA for planning, design or construction of the water facilities necessary for service. The extent of required off-site and on-site water infrastructure improvements will be determined by TMWA upon receiving a specific development proposal or complete application for service and upon review and approval of a water facilities plan by the local Health Authority. Because the NAC 445A Water System regulations are subject to interpretation, TMWA and/or agents of TMWA cannot guarantee that a subsequent water facility plan will be approved by the Health Authority or that a timely review and approval of the Project will be made. The Applicant should carefully consider the financial risk associated with committing resources to their Project prior to receiving all required approvals. After submittal of a complete Application for Service, the required facilities, the cost of these facilities, which could be significant, and associated fees will be estimated and will be included as part of the Water Service Agreement necessary for the Project. All fees must be paid to TMWA prior to water being delivered to the Project.

PURPOSE:

The purpose of this Discovery is to identify a planning level water service plan and an opinion of cost for the off-site facilities required to serve the proposed NVIG Development in Lemmon Valley Nevada, Nevada.

LOCATION:

The NVIG project is located in Lemmon Valley, Nevada (see Figure 1). The entire project is located outside the Truckee Meadows Water Authority's (TMWA) retail service territory and will require annexation by TMWA prior to a water service agreement. The Project will be subject to TMWA's Area 10 facility charges.

Table 1. Project Parcel APNs and Acreage.

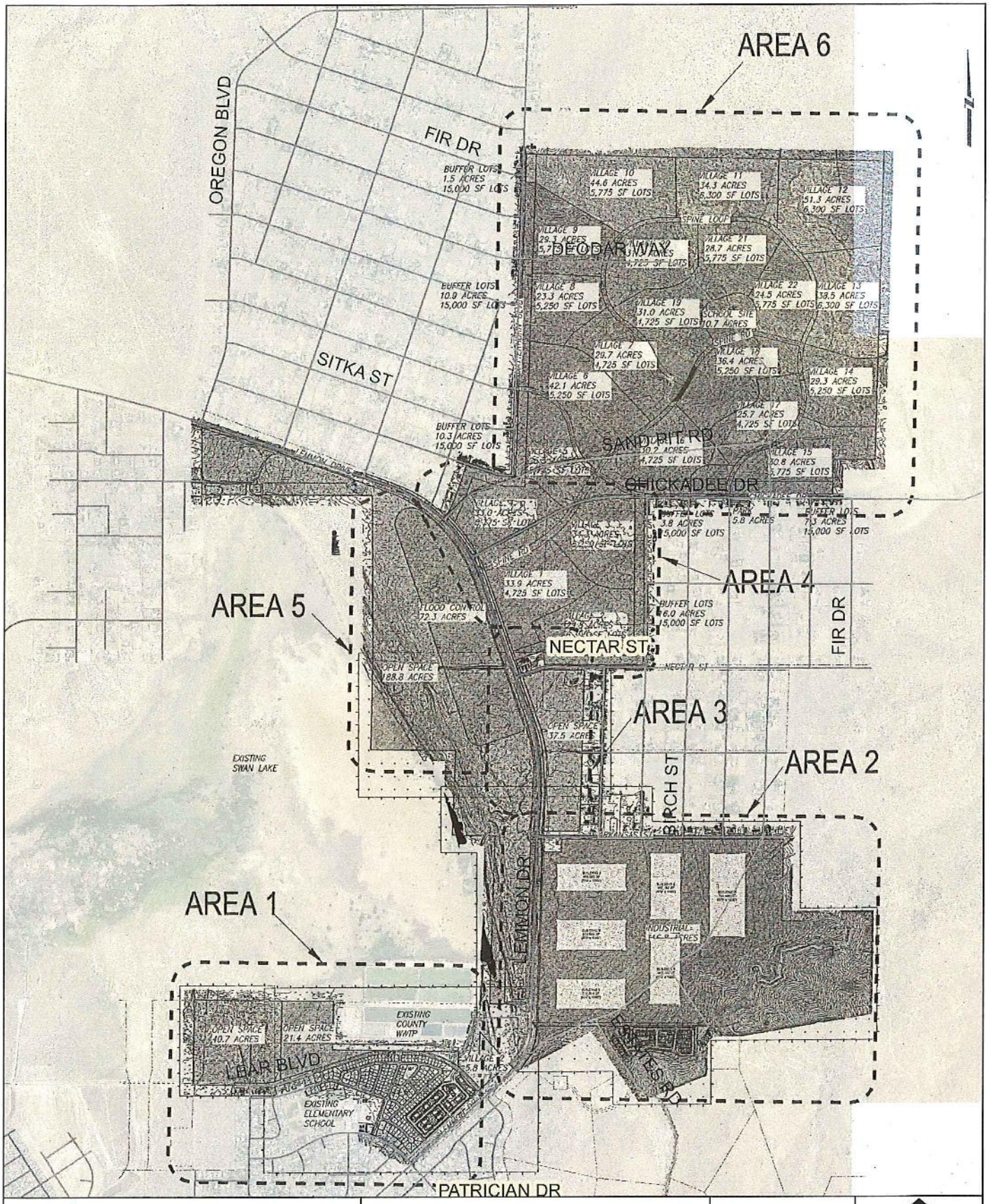
APNs	TOTAL ACREAGE
080-721-02 thru 08	1580
080-723-01 thru 03	
080-730-11 thru 17	
089-030-01 thru 09	
080-281-01	
080-461-04, 27, 30	
080-671-55 thru 57	
568-041-05	
080-722-0	

DISCUSSION:

The total proposed Project includes 3,316 single family residential units, 528 multi-family residential units and 6 warehouse buildings totaling 3,201,740 SF.

Supply to the entire project can be met from the Fish Springs Ranch (FSR) supply via TMWA's 24" high pressure main in Lemmon Drive. In the event that the FSR supply is interrupted, flow from TMWA's Raleigh Heights pressure zone can be used to provide a backup supply for the proposed NVIG project. This can be accomplished by opening the 18-inch normally closed valve located at Lemmon Dr and N Virginia St, allowing Raleigh Heights Tank Zone water to flow into the 24-inch Lemmon Dr transmission main.

For discussion purposes, the Project's water service plan was divided into six project areas shown in Figure 1.



TRUCKEE MEADOWS WATER AUTHORITY

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FIGURE 1 - NVIG PROJECT

AREA MAP

DATE	MAR 2016
MAP BY:	BEL
SCALE: 1 inch = 2,000 feet	

NORTH

NAD 83 NEVADA STATE PLANE WEST FEET

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NVIG Project, Area 1

Location: NVIG Area 1 is immediately west of Lemmon Dr, bordered to the north by Lear Drive and to the east by Lemmon Drive. The proposed NVIG Area 1 consists of 160 sfr units and 264 MFR units. In addition, Area 1 contains 62.1 acres of open space.

Demands:

The estimated NVIG Area 1 demand is 151.6 gpm (see Table 2).

Table 2. Estimated NVIG Area 1 Demands.

						Demand (gpm)		
Area	Name	Area		Average Lot Size (sf)	Units	MDD	ADD	Usage Type
1	Village 1	31.8	Acres	5,195	160	112.0	42.9	sfr
1	Village 1A	12.7	Acres	-	264	39.6	15.2	mfr
1	Village 1	62.1	Acres	-	0	0	0	Open Space
			Totals		**424**	**151.6**	**58.1**	

Project Storage:

The estimated storage volume required for NVIG Area 1 is 116,387 gallons. The storage volume is based on the project max day demand as follows:

Operating Storage Volume (15% of MDD)= 32,746 gallons
Emergency Storage Volume (1 ADD)= 83,641 gallons
Total NVIG Area 1 Storage Volume: = 116,387 gallons

Project Pressures:

NVIG Area 1 topography is relatively level ranging in elevation from approximately 4918' to 4920'. Area 1 pressures will be on the order of 80-85 psi.

Dead Ends and Looping:

Nevada Administrative Code section 445A.6712 requires systems to be designed, to the extent possible, to eliminate dead ends (greater than 400-500 LF). As planned, Area 1 meets these conditions.

Project Fire Flow:

Fire flow requirements are established by the local fire authority. The maximum Area 1 fire flow is assumed to be 3,000 gpm for 3 hours (540,000 gallons) for the multi-family residential portion of the development. TMWA has adequate storage to accommodate the project.

Major Water System Improvements and Cost Opinion

The major water system improvements to serve Area 1 and a planning level cost opinion are listed in Table 3 and shown in Figure 2.

Table 3. Area 1 Major Water System Improvements and Associated Costs

NVIG Area 1				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Area 10 Facility Charge	151.6	MDD, gpm	$5,057	$766,641
Tie in to 8" stub (off high pressure main) and install a SCADA controlled PRS at Patrician Dr and Lemmon Dr.	1	L.S.	$175,000	$175,000
Remove 10" main within Area 1 from Compton St to Lemmon Drive. A dedicated replacement main is not required, rather Project mains with an equivalent capacity, can be used. (see Figure 2).	1	L.S.	$30,000	$30,000
Tie-in to the 12" Lemmon main (part of 10" main relocation)	1	L.S.	$30,000	$30,000
8" main to Patrician Dr (Looping)	300	L.F.	$144	$43,200
			Sub Total	**$1,044,841**

MDD = Maximum Day Demand, L.F. = Linear Feet, L.S. = Lump Sum

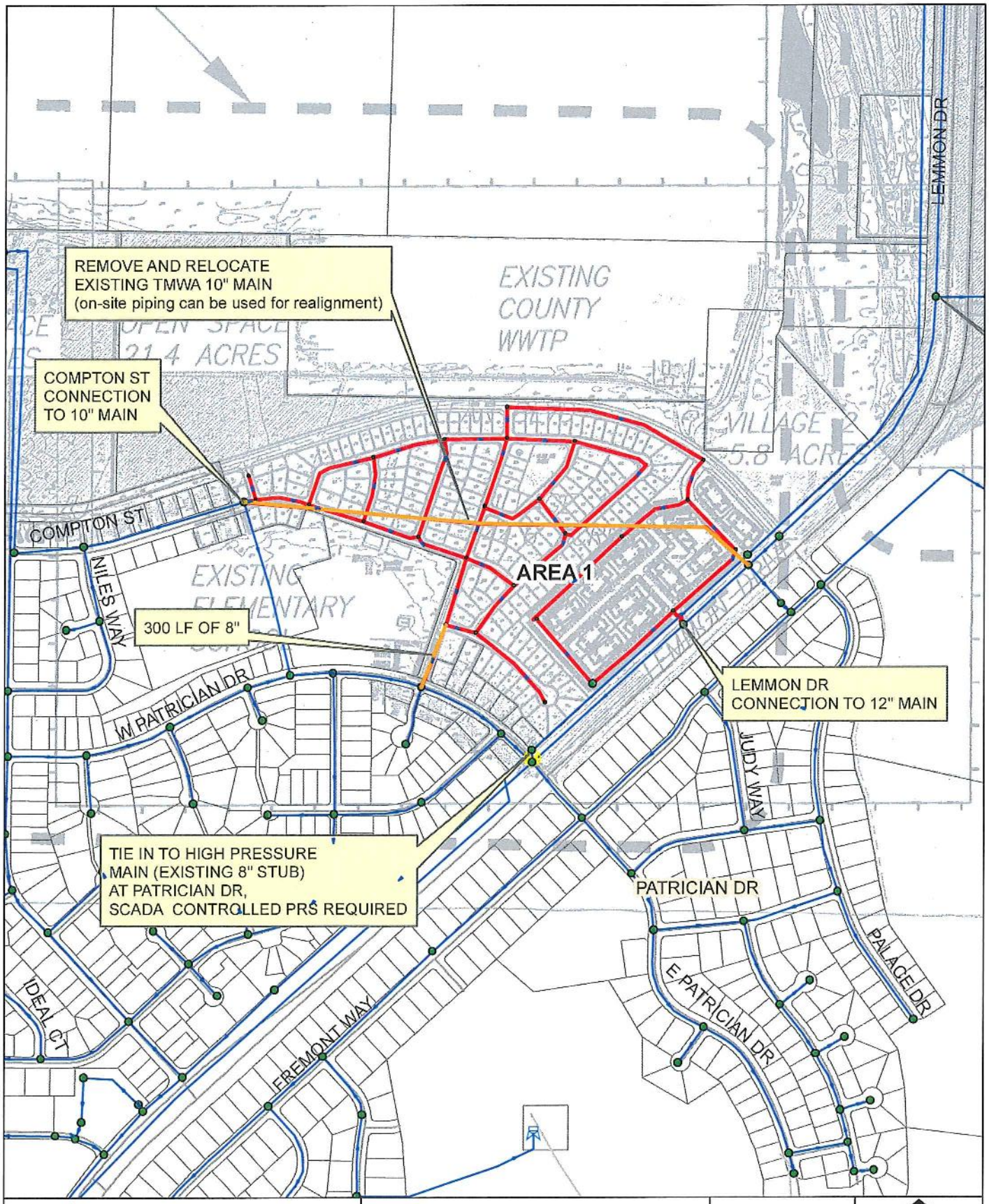

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FIGURE 2
NVIG AREA 1
WATER SERVICE PLAN

DATE	MAR 2016
MAP BY:	BEL
SCALE: 1 inch = 600 feet	

NORTH

NAD 83 NEVADA STATE PLANE WEST FEET

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NVIG Project, Area 2

Location: NVIG Area 2 is east of Lemmon Dr bordered to the north by Arkansas Drive. The proposed NVIG Area 2 consists of 6 warehouses and 264 MFR units (Village 1B).

Demands:

The total estimated NVIG Area 2 demand is 62.0 gpm. Demand details are shown in Table 4.

Table 4. Estimated NVIG Area 2 Demands.

					Demand (gpm)		
Area	Name	Area		Units	MDD	ADD	Usage Type
2	Bldng 1	458,560	ft^2	1	3.2	2.7	Ind/Com
2	Bldng 2	512,560	ft^2	1	3.6	3.1	Ind/Com
2	Bldng 3	512,580	ft^2	1	3.6	3.1	Ind/Com
2	Bldng 4	487,180	ft^2	1	3.4	2.9	Ind/Com
2	Bldng 5	487,180	ft^2	1	3.4	2.9	Ind/Com
2	Bldng 6	743,680	ft^2	1	5.2	4.4	Ind/Com
2	Village 1B	12.5	Acres	264	39.6	15.2	mfr
			Total	**270**	**62.0**	**34.3**	

Project Storage:

The estimated storage volume required for NVIG Area 1 is 62,810 gallons. The storage volume is based on the project max day demand as follows:

Operating Storage Volume (15% of MDD)= 13,392 gallons
Emergency Storage Volume (1 ADD)= 49,418 gallons
Total NVIG Area 2 Storage Volume: = 62,810 gallons

Project Pressures:

Area 2 lies within TMWA's Lemmon Valley 1 pressure zone. NVIG Area 2 service elevations range from approximately 4919' to 4967'. Area 2 pressures range from 65-90 psi, due to elevation and demand variations.

Dead Ends and Looping:

Nevada Administrative Code section 445A.6712 requires systems to be designed, to the extent possible, to eliminate dead ends (greater than 400-500 LF). As planned, Area 2 meets these conditions.

Project Fire Flow:

Fire flow requirements are established by the local fire authority. The maximum Area 2 fire flow is assumed to be 4,000 gpm for 4 hours (960,000 gallons). This fire flow can be achieved with the proposed plan.

Major Water Facility Improvements Required:

Major water facility improvements and an opinion of cost are listed in Table 5 and shown on Figure 3.

Table 5. Area 2, Major Water Facility Improvements and Associated Costs

NVIG Area 2				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Area 10 Facility Charge	62.0	MDD, gpm	$5,057	$313,534
Tap or cut in a tee to the 24" high pressure main and 12" stub to project (Arkansas and Lemmon)	1	L.S.	$50,000	$50,000
SCADA controlled pressure reducing station near Arkansas and Lemmon Dr. (260 PSI to 80 psi)	1	L.S.	$150,000	$150,000
Tie-in to existing 8" and 8" stub-out to property	1	L.S.	$50,000	$50,000
8" main to Patrician Dr (Looping)	300	L.F.	$144	$43,200
Tie-in to the 12" Lemmon main (part of 10" main relocation)	1	L.S.	$30,000	$30,000
			Sub Total	**$636,734**

MDD = Maximum Day Demand, L.F. = Linear Feet, L.S. = Lump Sum

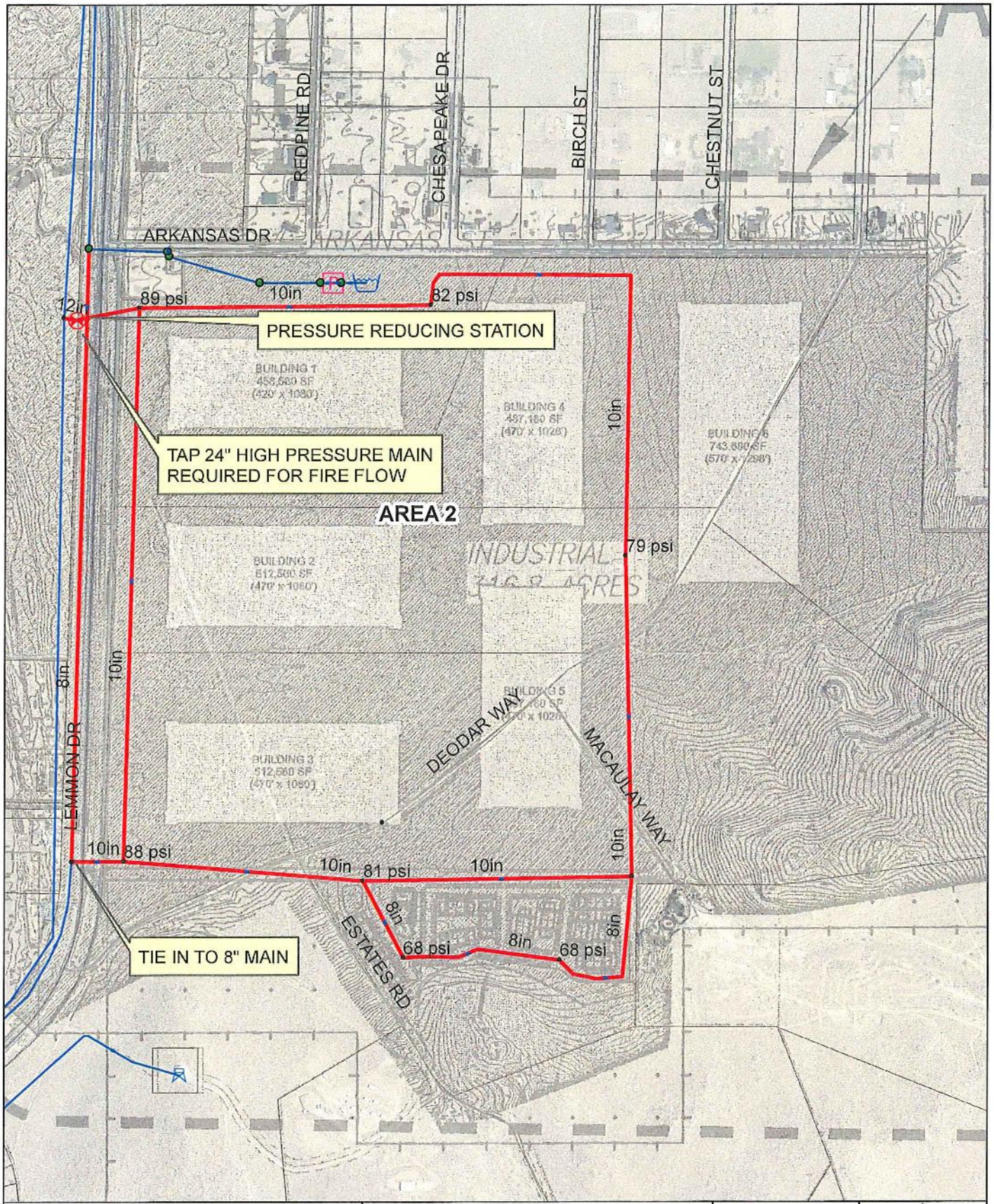

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FIGURE 3
NVIG AREA 2
WATER SERVICE PLAN

DATE	MAR 2016
MAP BY:	BEL
SCALE: 1 inch = 600 feet	

NORTH

NAD 83 NEVADA STATE PLANE WEST FEET

NVIG Project, Areas 3 and 5

No water service was planned for Area 3 or Area 5. If water service is desired for the proposed park, the existing 8" main aligned on the west side of Lemmon Drive can be tapped.

Location:

NVIG Area 3 consists of 37.5 acres, split by Lemmon Dr, and is bordered to the north and south by Nectar St and Arkansas Drive, respectively (see Figure 1).

NVIG Area 5 consists of 194.6 acres, bordered by Swan Lake to the West and Lemmon Drive to the east.

Demands:

The total estimated NVIG Area 3 and 5 demand is 0 gpm (see Table 6).

Table 6. Estimated NVIG Area 3 and 5 Demands.

						Demand (gpm)		
Area	Name	Area		Average Lot Size (sf)	Units	MDD	ADD	Usage Type
3	-	37.5	Acres	-	0	-	-	Open Space
5	-	188.8	Acres	-	0	-	-	Open Space
5	-	5.8	Acres	-	0	-	-	Park
			Total		**0**	**0.0**	**0.0**	

NVIG Project, Areas 4 and 6

NVIG areas 4 and 6 are adjacent with shared water infrastructure.

Location:

Area 4 is east of Lemmon Dr, bordered to the north by Chickadee, south by Nectar Street and east by Chesapeake (Figure 1).

Area 6 is located immediately north of area 4.

Water Supply:

Supply to NVIG areas 4 and 6 can be met from the Fish Springs Ranch high pressure supply main in Matterhorn Blvd. Two supply points are planned including one at the northwest corner of NVIG Area 6 and the other at Matterhorn Blvd and Pepper Way (see Figure 4). The proposed tie-in at Pepper Way can be made to an existing 10" flanged outlet. There is no stub-out at the second connection location. The tie-in at this location will require a 30"x12" TEE or a tapping sleeve capable of withstanding the main pressures of 250 psi.

Demands:

The total estimated maximum day demands for NVIG Areas 4 and 6 are 529.3 gpm and 1661.2 gpm, respectively. Demand details are shown in Tables 7 and 8.

Table 7. Estimated NVIG Area 4 Demands.

						Demand (gpm)		
Area	Name	Area		Average Lot Size (sf)	Units	MDD	ADD	Usage Type
4	Village 1	33.9	Acres	4,725	142	85.2	32.6	sfr
4	Village 2	29.8	Acres	6,300	125	87.5	33.5	sfr
4	Village 3	34.3	Acres	5,250	144	100.8	38.6	sfr
4	Village 4	33	Acres	5,775	139	97.3	37.3	sfr
4	Village 5	25.5	Acres	5,775	107	74.9	28.7	sfr
4	Buffer Lots	26.3	Acres	15,000	76	83.6	32.0	
			Total		**733**	**529.3**	**202.8**	

Table 8. Estimated NVIG Area 6 Demands.

						Demand		
Area	Village	Size	Units	Average Lot Size (sf)	Units	MDD (gpm)	ADD (gpm)	Usage Type
6	14	29.3	Acres	5,250	123	86.1	33.0	sfr
6	15	30.8	Acres	5,775	129	90.3	34.6	sfr
6	16	30.2	Acres	4,725	127	76.2	29.2	sfr
6	17	25.7	Acres	4,725	108	64.8	24.8	sfr
6	18	36.4	Acres	5,250	153	107.1	41.0	sfr
6	6	42.1	Acres	5,250	177	123.9	47.5	sfr
6	7	29.7	Acres	4,725	125	75.0	28.7	sfr
6	8	23.3	Acres	5,250	98	68.6	26.3	sfr
6	9	29.3	Acres	5,775	123	86.1	33.0	sfr
6	19	31	Acres	4,725	130	78.0	29.9	sfr
6	20	31.1	Acres	4,725	131	78.6	30.1	sfr
6	21	28.7	Acres	5,775	120	84.0	32.2	sfr
6	22	24.5	Acres	5,775	103	72.1	27.6	sfr
-	-	10.7	Acres	-	0	-	-	School
6	10	44.6	Acres	5,775	187	130.9	50.2	sfr
6	11	34.3	Acres	6,300	144	100.8	38.6	sfr
6	12	51.3	Acres	6,300	215	150.5	57.7	sfr
6	13	38.5	Acres	6,300	162	113.4	43.4	sfr
6	Buffer Lots	23.5	Acres	15,000	68	74.8	28.7	sfr
			Total	**107400**	**2423**	**1661.2**	**636.5**	

Project Storage:

The estimated storage volume required for NVIG Areas 4 and 6 is 1,681,700 gallons. The storage volume is based on the project max day demand as follows:

Operating Storage Volume (15% of MDD)= 473,148 gallons
Emergency Storage Volume (1 ADD)= 1,208,552 gallons
Total NVIG Area 4 and 6 Storage Volume: = 1,681,700 gallons

Project Pressures:

Two pressure zones are required to serve the elevation range of Areas 4 and 6 and maintain a service pressure range of 80 psi to 45 psi. Service elevations range from approximately 4916' to 5075'.

Dead Ends and Looping:

Nevada Administrative Code section 445A.6712 requires systems to be designed, to the extent possible, to eliminate dead ends (greater than 400-500 LF).

Project Fire Flow:

Fire flow requirements are established by the local fire authority. The maximum area fire flow is assumed to be 1500 gpm for 2 hours (180,000 gallons). This fire flow can be achieved with the proposed plan.

Major Water Facility Improvements Required:

The major improvements required for water service to NVIG areas 4 and 6 are listed in Table 8 and shown on Figure 4.

The major off-site project improvements to serve the NVIG Areas 4 and 6, and associated costs, are listed in Table 9.

Table 9. Areas 4 and 6, Major Water Facility Improvements and Associated Costs

NVIG Areas 4 and 6				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Area 10 Facility Charge, reduced*	831.0	MDD, gpm	$3,575	$2,970,825
Area 10 Facility Charge, non-reduced*	1,359.5	MDD, gpm	$5,057	$6,874,992
INSTALL 30"x12" TEE (PROJECT SUPPLY) AND STUB TO PROJECT	1	L.S.	$50,000	$50,000
CONNECT TO EXISTING 10" FLANGED OUTLET OFF 30" MAIN AT MATTERHORN AND PEPPER AND STUB TO PROJECT (PROJECT SUPPLY)	1	L.S.	$15,000	$15,000
ON-SITE PRESSURE REDUCING STATIONS	2	L.S.	$70,000	$140,000
OFF-SITE PRESSURE REDUCING STATIONS	2	L.S.	$100,000	$200,000
			Sub Total	**$10,250,817**
			Total	**$11,932,392**

MDD = Maximum Day Demand, L.F. = Linear Feet, L.S. = Lump Sum

*TMWA's Area 10 Water Facility Charge (WFC) is $5057 per gpm of maximum day demand (MDD). However, there is a reduced/modified TMWA Area 10 WFC for development served directly from the terminal tank (Fish Springs Ranch supply) of $3,575 per GPM of MDD. This reduced charge is limited to 831 gpm of MDD and will be applied on a first come first served basis.

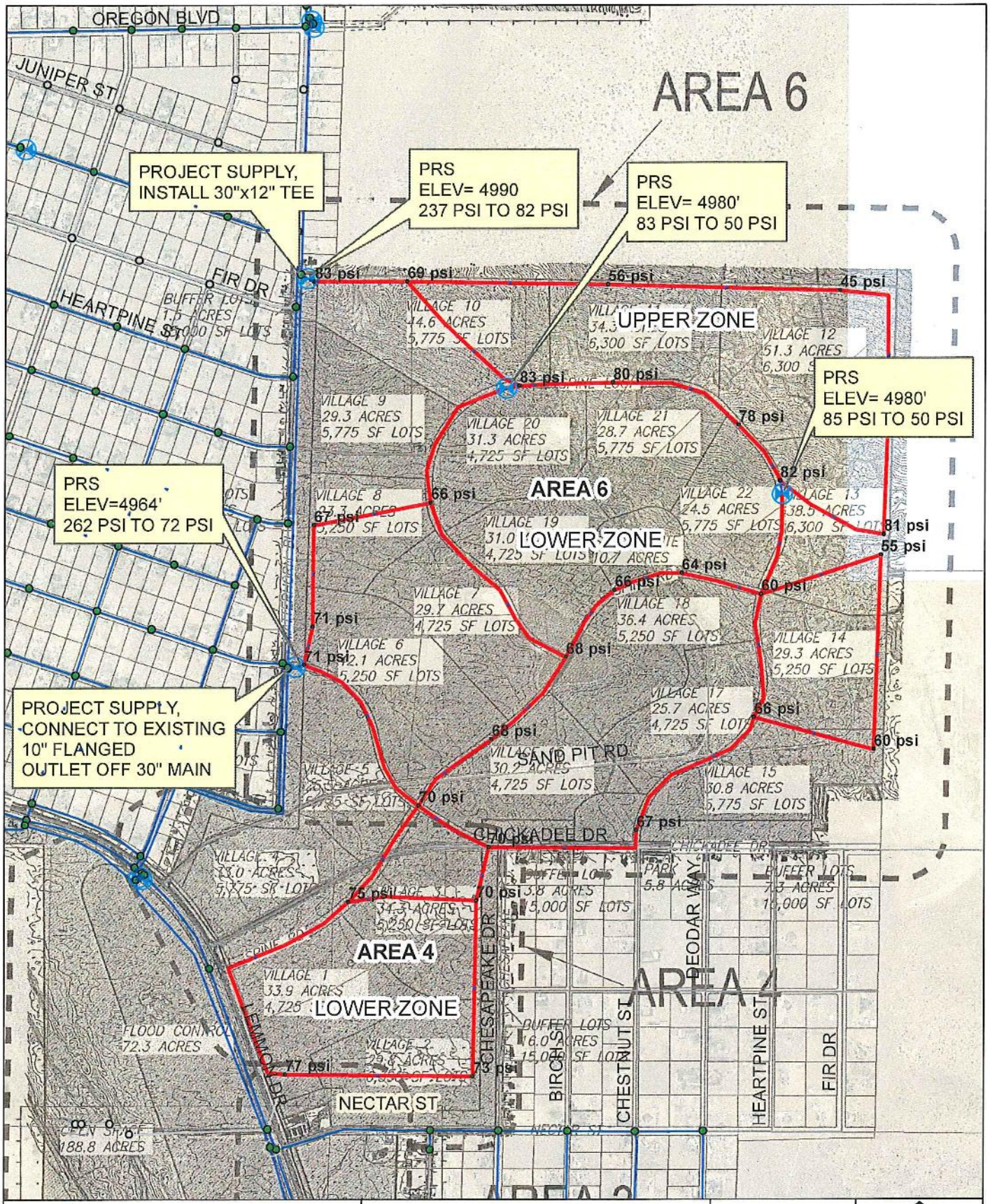

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FIGURE 4
NVIG AREA 4 AND 6
WATER SERVICE PLAN

DATE	MAR 2016
MAP BY:	BEL
SCALE: 1 inch = 1,200 feet	

NORTH

NAD 83 NEVADA STATE PLANE WEST FEET

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Project Summary:

The total project demands, required storage and major water system improvements and planning level costs are summarized in Tables 10 through 12.

Table 10. Total Project Demands

						Demand (gpm)		
Area	Name	Area		Average Lot Size (sf)	Units	MDD	ADD	Usage Type
1	Village 1	31.8	Acres	5,195	160	112.0	42.9	sfr
1	Village 1A	12.7	Acres	-	264	39.6	15.2	mfr
1	Village 1	62.1	Acres	-	0	0	0	Open Space
2	Bldng 1	458,560	ft^2	-	1	3.2	2.7	Ind/Com
2	Bldng 2	512,560	ft^2	-	1	3.6	3.1	Ind/Com
2	Bldng 3	512,580	ft^2	-	1	3.6	3.1	Ind/Com
2	Bldng 4	487,180	ft^2	-	1	3.4	2.9	Ind/Com
2	Bldng 5	487,180	ft^2	-	1	3.4	2.9	Ind/Com
2	Bldng 6	743,680	ft^2	-	1	5.2	4.4	Ind/Com
2	Village 1B	12.5	Acres	-	264	39.6	15.2	mfr
3	-	37.5	Acres	-	0	-	-	Open Space
4	Village 1	33.9	Acres	4,725	142	85.2	32.6	sfr
4	Village 2	29.8	Acres	6,300	125	87.5	33.5	sfr
4	Village 3	34.3	Acres	5,250	144	100.8	38.6	sfr
4	Village 4	33	Acres	5,775	139	97.3	37.3	sfr
4	Village 5	25.5	Acres	5,725	107	74.9	28.7	sfr
4	Buffer Lots	26.3	Acres	15,000	76	83.6	32.0	sfr
5	-	188.8	Acres	-	0	-	-	Open Space
5	-	5.8	Acres	-	0	-	-	Park
6	14	29.3	Acres	5,250	123	86.1	33.0	sfr
6	15	30.8	Acres	5,775	129	90.3	34.6	sfr
6	16	30.2	Acres	4,725	127	76.2	29.2	sfr
6	17	25.7	Acres	4,725	108	64.8	24.8	sfr
6	18	36.4	Acres	5,250	153	107.1	41.0	sfr
6	6	42.1	Acres	5,250	177	123.9	47.5	sfr
6	7	29.7	Acres	4,725	125	75.0	28.7	sfr
6	8	23.3	Acres	5,250	98	68.6	26.3	sfr
6	9	29.3	Acres	5,775	123	86.1	33.0	sfr
6	19	31	Acres	4,725	130	78.0	29.9	sfr
6	20	31.1	Acres	4,725	131	78.6	30.1	sfr
6	21	28.7	Acres	5,775	120	84.0	32.2	sfr
6	22	24.5	Acres	5,775	103	72.1	27.6	sfr
-	-	10.7	Acres	-	0	-	-	School
6	10	44.6	Acres	5,775	187	130.9	50.2	sfr
6	11	34.3	Acres	6,300	144	100.8	38.6	sfr
6	12	51.3	Acres	6,300	215	150.5	57.7	sfr
6	13	38.5	Acres	6,300	162	113.4	43.4	sfr
6	Buffer Lots	23.5	Acres	15,000	68	74.8	28.7	sfr
			Total		3850	2404.1	931.7	

Table 11. Major Project Water Facility Improvements

NVIG Area 1				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Area 10 Facility Charge	151.6	MDD, gpm	$5,057	$766,641
Tie in to 8" stub (off high pressure main) and install a SCADA controlled PRS at Patrician Dr and Lemmon Dr.	1	L.S.	$175,000	$175,000
Remove 10" main within Area 1 from Compton St to Lemmon Drive. A dedicated replacement main is not required, rather Project mains with an equivalent capacity, can be used. (see Figure 2).	1	L.S.	$30,000	$30,000
Tie-in to the 12" Lemmon main (part of 10" main relocation)	1	L.S.	$30,000	$30,000
8" main to Patrician Dr (Looping)	300	L.F.	$144	$43,200
			Sub Total	**$1,044,841**
NVIG Area 2				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Area 10 Facility Charge	62.0	MDD, gpm	$5,057	$313,534
Tap or cut in a tee to the 24" high pressure main and 12" stub to project (Arkansas and Lemmon)	1	L.S.	$50,000	$50,000
SCADA controlled pressure reducing station near Arkansas and Lemmon Dr. (260 PSI to 80 psi)	1	L.S.	$150,000	$150,000
Tie-in to existing 8" and 8" stub-out to property	1	L.S.	$50,000	$50,000
8" main to Patrician Dr (Looping)	300	L.F.	$144	$43,200
Tie-in to the 12" Lemmon main (part of 10" main relocation)	1	L.S.	$30,000	$30,000
			Sub Total	**$636,734**
NVIG Areas 4 and 6				
Description	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**
Area 10 Facility Charge, reduced*	831.0	MDD, gpm	$3,575	$2,970,825
Area 10 Facility Charge, non-reduced*	1,359.5	MDD, gpm	$5,057	$6,874,992
INSTALL 30"x12" TEE (PROJECT SUPPLY) AND STUB TO PROJECT	1	L.S.	$50,000	$50,000
CONNECT TO EXISTING 10" FLANGED OUTLET OFF 30" MAIN AT MATTERHORN AND PEPPER AND STUB TO PROJECT (PROJECT SUPPLY)	1	L.S.	$15,000	$15,000
ON-SITE PRESSURE REDUCING STATIONS	2	L.S.	$70,000	$140,000
OFF-SITE PRESSURE REDUCING STATIONS	2	L.S.	$100,000	$200,000
			Sub Total	**$10,250,817**
			Total	**$11,932,392**

*TMWA's Area 10 Water Facility Charge (WFC) is $5057 per gpm of maximum day demand (MDD). However, there is a reduced/modified TMWA Area 10 WFC for development served directly from the terminal tank (Fish Springs Ranch supply) of $3,575 per GPM of MDD. This reduced charge is limited to 831 gpm of MDD and will be applied on a first come first served basis. In general, the entire NVIG project is directly served from TMWA's Terminal Tank.

Table 12. Project Water Storage Requirements

Area	Maximum Day Demand	Average Day Demand	Operating Storage	Emergency Storage	Total Storage Required
1	151.6	58.1	32,746	83,641	116,387
2	62.0	34.3	13,392	49,418	62,810
3	0	0	0	0	0
4	529.3	202.8	114,329	292,028	406,356
5	0	0	0	0	0
6	1661.2	636.5	358,819	916,524	1,275,343
Totals	**2,404.1**	**931.7**	**519,286**	**1,341,611**	**1,860,896**

TMWA's Fish Springs Tank 1 has 1 MG of available distribution storage. An additional 2.5 MG tank is planned for year 2022.

PROJECT ASSUMPTIONS:

1. The applicant shall be responsible for all application, review, inspection, storage, treatment, permits, easements, and other fees pertinent to the Project as adopted by the TMWA at the time of execution of a water service agreement.
2. The cost opinions contained herein do not include new business fees, cost of water rights and related fees, or contribution to the water meter retrofit fund.
3. Demand calculations, and fees based on demands, are estimates; actual fees will be determined at the time of application for service.
4. The assumed fire flow requirements for this project are as follows:
    - 1,500 gpm in single family residential areas.
    - 2,500 gpm for 2 hours in MFR areas.
    - 4,000 gpm for 4 hours in commercial areas.
5. Project pressure criteria are:
    a. Maximum day pressure of at least 45 pounds per square inch (psi) at the ground surface elevation at the service connection with tank level at top of fire storage,
    b. Peak hour pressure of at least 40 psi at building pad elevation with tank level at top of emergency storage,
    c. Maximum day plus fire flow pressure of at least 20 psi at center of street elevation with tank level at bottom of fire storage, and
    d. TMWA does not calculate pressures for multi-story buildings. Confirmation that pressure will be adequate for upper stories is the responsibility of the Applicant.
6. A site grading plan with elevations was not provided. Elevations used for this discovery were from the existing Washoe County topographic information.
7. Facility requirements for the Project are based on the site topography, maximum day demand, and fire flow requirements. Changes in these may affect facility requirements.
8. Easements, permits and all pertinent Agency approvals are obtained for the design and construction of the water infrastructure necessary to serve the proposed Project.

9. All cost opinions are preliminary and subject to change. The costs presented in this study are planning level estimates based on the information available. Actual costs will be determined at the time of application for service. Cost opinions do not include on-site improvements made by the applicant.
10. This discovery is based on the current status of TMWA's system. Future development may alter the conclusions of this discovery. Capacity in TMWA's system is available on a first-come, first-served basis, and commitment to provide service is not established until a contract for service is executed and all fees are paid.
11. Water resources for the project will be obtained from the Vidler Water Company's Fish Spring's Ranch. Although the Fish Springs Ranch water rights are held by Vidler, TMWA owns the importation water infrastructure, originating at the Fish Springs Ranch and terminating in Lemmon Valley.
12. The costs of the Vidler Water Resource are not included in this Annexation/Discovery.
13. No water demands were included for the open space areas, public facilities or parks.
14. Project maximum day demands were calculated using the following equations:

Single-Family Units: Domestic *Maximum* Day Usage

$Y = 0.009^{*}\sqrt{x}$

Y = *maximum* day demand in gpm
x = lot size in square feet

Add irrigation for common areas as needed

Multi-Family Units: Domestic *Maximum* Day Usage

0.15 gpm per unit

Add irrigation for common areas as needed

Commercial/Industrial: Domestic *Maximum* Day Usage

Multiply water rights demand (in acre-feet) by 1.17

Add irrigation for common areas as needed

Potable Irrigation: *Maximum* Day Usage

Multiply water rights demand (in acre-feet) by 0.38

15. TMWA plans to reevaluate the maximum day demand equations for all customer usage types within the next 12 months, as part of a Water Facility Plan Update.

TRUCKEE MEADOWS WATER AUTHORITY
www.tmwa.com

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1355 Capital Blvd. • P.O. Box 30013 • Reno, NV 89520-3013
P 775.834.8080 • F 775.834.8003

Date: Revised January 4, 2017
To: Pam Parenti
From: David Nelson

RE: 15-4763, NVIG D2 & Annexation, Residential & Industrial (APN 080-281-01, 080-461-04, 080-461-27, 080-461-30, etc.)

The New Business/Water Resource team will answer the following assumptions on each new discovery:

- Is the property within Truckee Meadows Water Authority's water service territory?
- Does the property have Truckee River water rights appurtenant to the property, groundwater or resource credits associated with the property?
  - If yes, what is the status of the water right: Agricultural or Municipal and Domestic use?
- Estimated water demand for residential and or commercial projects.
- Any special conditions, or issues, that are a concern to TMWA or the customer.

The following information is provided to complete the Discovery as requested:

- These subject parcels (APN (APN 080-281-01, 080-461-04, 080-461-27, 080-461-30, etc.) are not within Truckee Meadows Water Authority's (TMWA's) service territory. An annexation is required.

- There are no resource credits or Truckee River decreed water rights appurtenant to these properties. The developer will be required to follow TMWA's current rules, specifically Rule 7, and pay all fees for water rights needed in order to obtain a will serve commitment letter.

- Based on the information provided by the applicant this project "NVIG" is estimated to require a domestic demand of **1196.13 acre feet (AF)**. Landscaping, park, and school plans were not provided to TMWA; therefore, an additional demand could not be determined. Please see the attached demand calculation sheet for the **estimated** demand and water resource fees. Once final plans are submitted a more accurate demand will be calculated. *Note: Water rights held or banked by the applicant must be dedicated to a project before any rule 7 water rights are purchased from TMWA. TMWA's resources are limited in this area and are first come first serve. If applicant dedicates surface water for this project additional fees and dedications will apply.*

- Any existing right of ways and public easements would need to be reviewed, and if needed the property owner will need to grant TMWA the proper easements and/or land dedications to provide water service to the subject properties. Property owner will be required, at its sole expense, to provide TMWA with a current preliminary title report for all subject properties. Owner will represent and warrant such property offered for dedication or easements to TMWA shall be free and clear of all liens and encumbrances. Owner is solely responsible for obtaining all appropriate permits, licenses, construction easements, subordination agreements, consents from lenders, and other necessary rights from all necessary parties to dedicate property or easements with title acceptable to TMWA.

TRUCKEE MEADOWS WATER AUTHORITY

WATER RIGHTS AND METER FUND CONTRIBUTION
CALCULATION WORKSHEET FOR MULTI-TENANT/COMMERCIAL APPLICATIONS

					Demand (Acre Feet)		
1	Existing demand (current usage) at Service Property				**0.00**		
2	Number of units	**528**	x .12 (Apartments)	63.36			
3	Warehouse floor space:	**3,201,740**	x 0.000006 per sq.ft.	19.21			
4	Number of Lots (SFR)	**3,316**	x .0.34 avg. per. lot	1113.56			
5	Landscaping:	Turf _____	sq ft x 3.41/ 43,560	TBD			
6	Drip			TBD			
7	Other calculated demand			TBD			
8	New or additional demand at Service Property (lines 2+3+4+5+6)				**1196.13**		
9	**Total Demand at Service Property (lines 1+8)**				**1196.13**		
10	Less: Prior demand commitments at service property			**0.00**			
11	Less: Other resource credits: on subject parcel			**0.00**			
12	**Total Credits (lines 10+11)**				**0.00**		
13	Subtotal: Required resource dedication/commitment (lines 9-12)				**1196.13**		
14	Factor amount (0.11 x Line 13)				0.00		
15	No return flow required				0.00		
16	**TOTAL RESOURCES REQUIRED (lines 13+14+15)**				**1196.13**		
17	Price of Water Rights per AF	$7,500				$	TBD
18	Will Serve Commitment Letter Preparation Fee ($100 per letter)					$	100
19	Due Diligence Fee ($150.00 per parcel)					$	TBD
20	Document Preparation Fees ($100.00 per document)					$	TBD
21	Meter Contribution ($1,830 x 1196.13 acre feet of demand)					$	TBD
22	**TOTAL FEES DUE (lines 17+18+19+20+21)**					$	**100**

Project: NVIG D2 and Annexation

Applicant: NVIG, LLC - Attn Dustin Barker **Quote date:** Revised 1/4/2017

Phone: 775-815-8425 **Tech contact:** David 834-8021

APN: 080-281-01, 080-461-04, 080-461-27, 080-461-30, etc. **Project No:** 15-4763

Remarks: **Fees quotes are valid only within 15 calendar days of Quote Date. Esitmate only displays demand.**

The 1196.13 acre feet may result in the assessment of facility fees pursuant to TMWA's Rules and Rates.

This estimate displays water demand off information received from applicant. At time of project submittal

a more exact demand will be calculated and resources for dedication will be reviewed for approval.

PRADO RANCH NORTH

TENTATIVE MAP

TITLE SHEET

OWNER:

NORTH VALLEYS INVESTMENT GROUP, LLC
C/O LENNAR
10345 PROFFESIONAL CIRCLE, SUITE 100
RENO, NV 89521-3100

DEVELOPER:

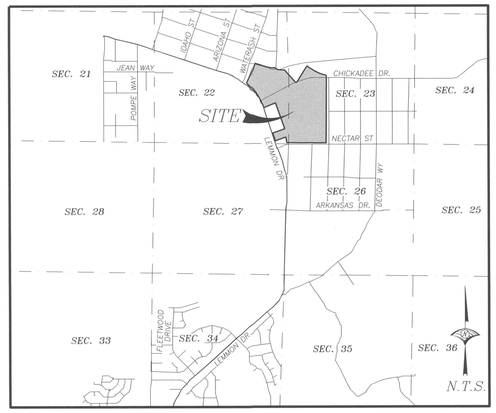
LANSING COMPANIES
12671 HIGH BLUFF DRIVE, SUITE 150
SAN DIEGO, CA 92130

BASIS OF BEARINGS

NEVADA STATE PLANE COORDINATE SYSTEM, WEST ZONE, NORTH AMERICAN DATUM OF 1983/1994, HIGH ACCURACY REFERENCE NETWORK (NAD 83/94-HARN), AS DETERMINED USING REAL TIME KINEMATIC (RTK) GPS OBSERVATIONS WITH CORRECTIONS TRANSMITTED BY THE NORTHERN NEVADA COOPERATIVE REAL TIME NETWORK GPS (NNCRN GPS). THE BEARING BETWEEN GPS REFERENCE STATION "RSTEAD" - N22SM01037 AND "SSB2" - S52SM10000 IS TAKEN AS SOUTH 86°59'47" EAST. ALL DIMENSIONS SHOWN ARE GROUND DISTANCES. COMBINED GRID-TO-GROUND FACTOR = 1.000197939.

BASIS OF ELEVATION

THE BASIS OF ELEVATION IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1983 (NAVD 88) AS TAKEN FROM CITY OF RENO BENCHMARK 379, WITH A PUBLISHED ELEVATION OF 5110.785 FT. BENCHMARK 379 IS DESCRIBED AS BEING A USC AND GS CAP -APPROX. 800 FT N OF INTERS. OF US 395 AND STEAD BLVD -50 FT S'LY OF OVERHEAD SCHOOL SIGNAL - W OF STEAD BLVD AND 25 FT W'LY OF BW - 4" X 4" WOOD POST.



VICINITY MAP

SITE PLAN
NOT TO SCALE

SITE INFORMATION:

SITE PLAN STATISTICS:
- TOTAL NUMBER OF LOTS = 506
- OVERALL AREA = 154.5± AC
- LOT AREA = 102.5± AC
- ROADWAY AREA = 34.5± AC
- COMMON AREA/OPEN SPACE = 17.5± AC
- LAND USE = MDS 4
- ZONING = MDS 4

PROJECT DENSITY:
- GROSS DENSITY = 3.28± DU/AC
- NET DENSITY = 4.94± DU/AC

LOT SUMMARY:
- MINIMUM LOT SIZE = 5,500 S.F.
- MAXIMUM LOT SIZE = 24,060 S.F.
- AVERAGE LOT SIZE = 8,825 S.F.

ASSESSOR PARCEL NUMBERS:
080-723-01, 080-723-02, 080-723-03, 080-721-04

ENGINEERS STATEMENT:

I, TODD W. GAMMILL, DO HEREBY CERTIFY THAT THIS PLAN HAS BEEN PREPARED BY ME OR UNDER MY SUPERVISION AND WAS COMPLETED ON THE 16th DAY OF APRIL, 2018.

TODD W. GAMMILL, P.E. #13693

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD W. GAMMILL
Expr. 6/30/19
CIVIL
No. 13693

4/16/18

SHEET INDEX

TITLE SHEET
PRADO RANCH NORTH

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
1361 Corporate Blvd
Reno, NV 89502
Tel 775.823.4068
Fax 775.823.4066

1669011 APRIL, 2018

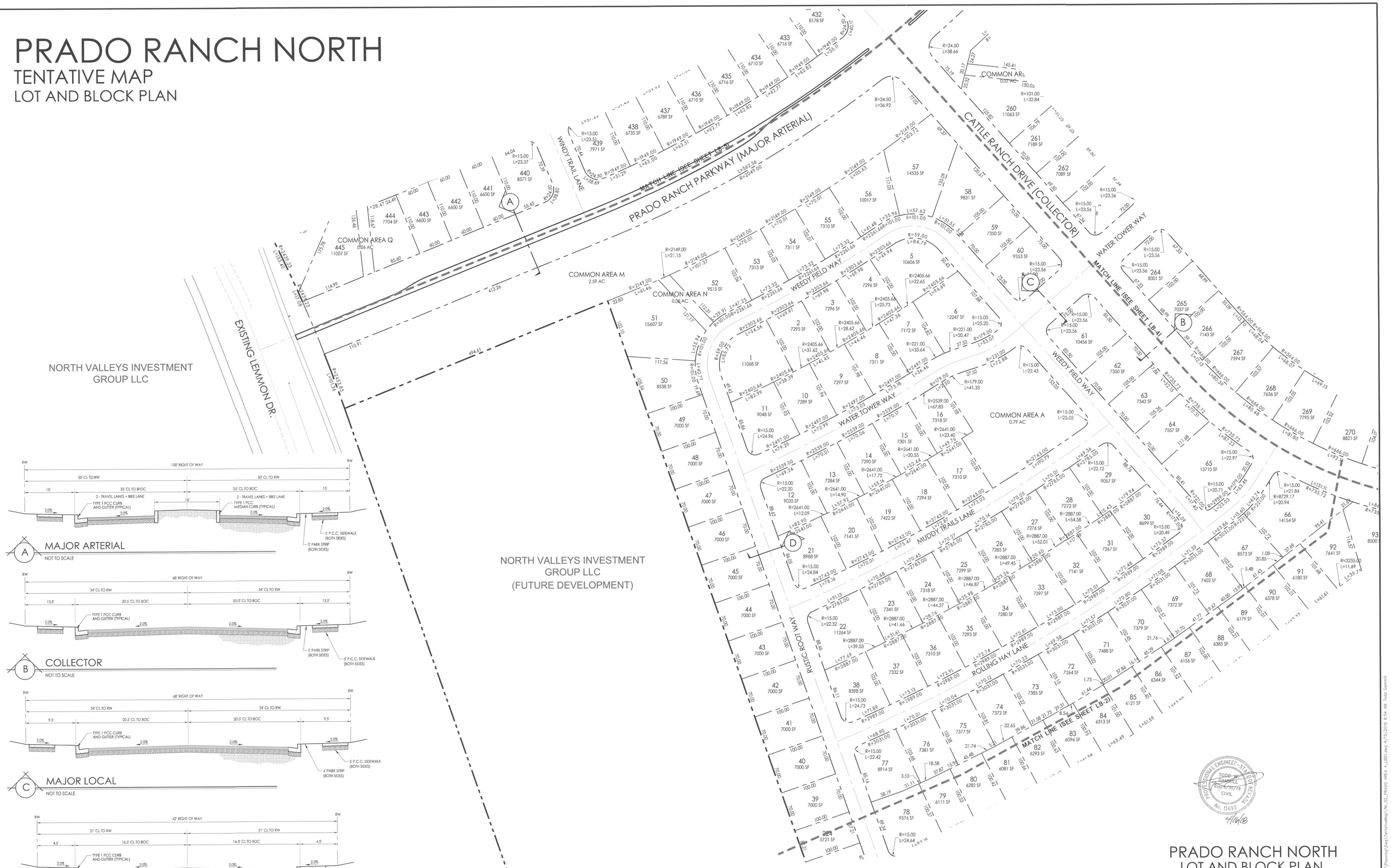
SHEET T-1 OF19

J:\Jobs\1669_Villages At Swan Lake\Private_Blocks_Area 4\Planning\Dwg\Tentativemaps\TM_01_PRADO AREA 4_T01.dwg 4/15/2018 8:34 AM Todd Gammill

PRADO RANCH NORTH

TENTATIVE MAP

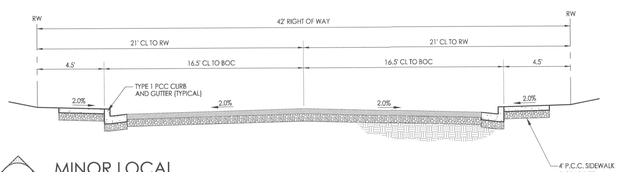
LOT AND BLOCK PLAN



A MAJOR ARTERIAL
NOT TO SCALE

B COLLECTOR
NOT TO SCALE

C MAJOR LOCAL
NOT TO SCALE



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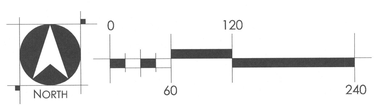

PROFESSIONAL ENGINEER - STATE OF NEBRASKA
TODD W. CAMPBELL
Date 6/30/19
CIVIL
No. 11693
4/16/18

PRADO RANCH NORTH
LOT AND BLOCK PLAN

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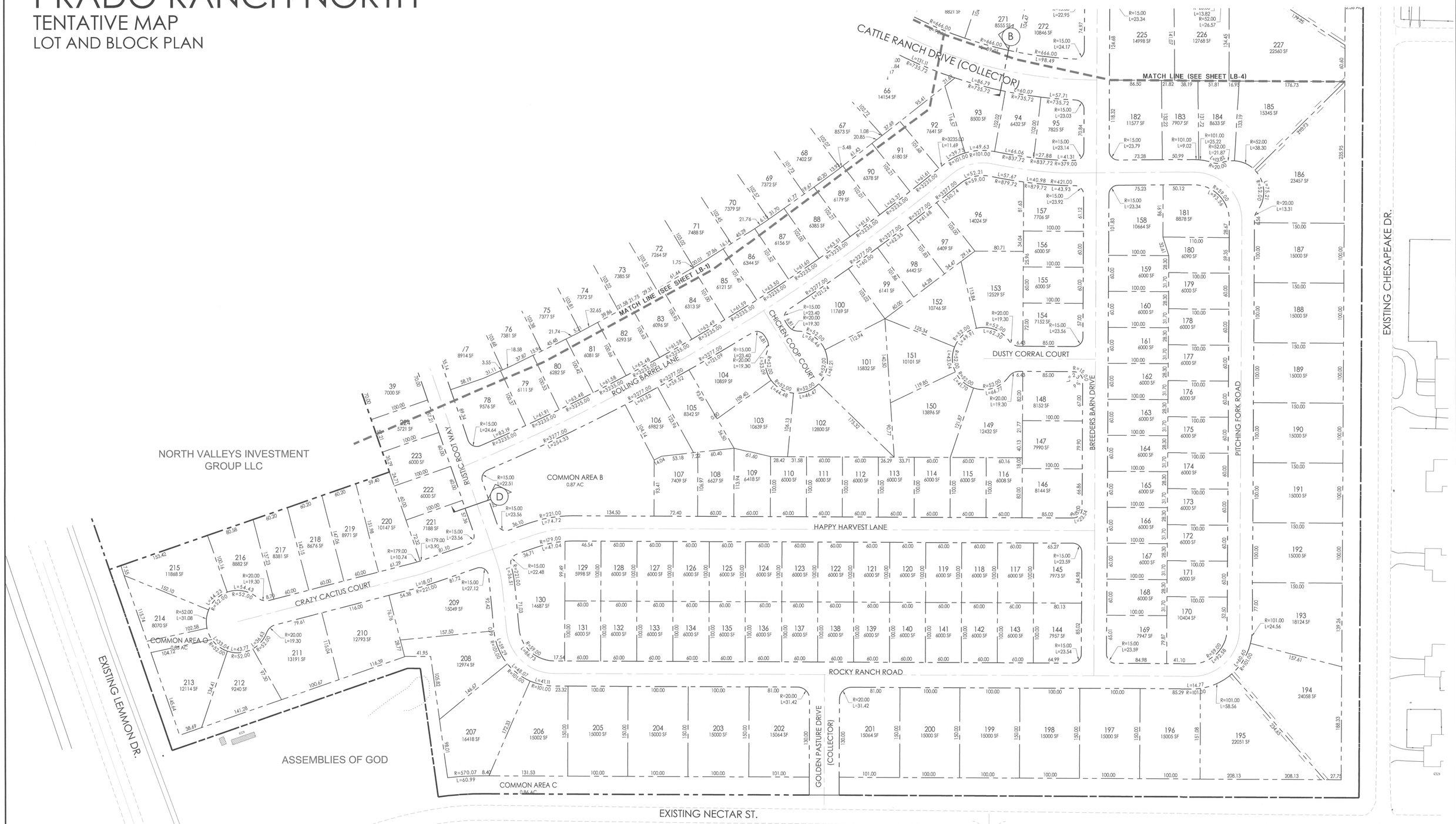
PRADO RANCH NORTH

TENTATIVE MAP

LOT AND BLOCK PLAN



NORTH

0 120

60 240

PROFESSIONAL ENGINEER – STATE OF NEVADA
Todd Campbell
Exp: 6/30/19
CIVIL
No. 13695
4/16/18

PRADO RANCH NORTH
LOT AND BLOCK PLAN

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SHEET LB-2 OF 19

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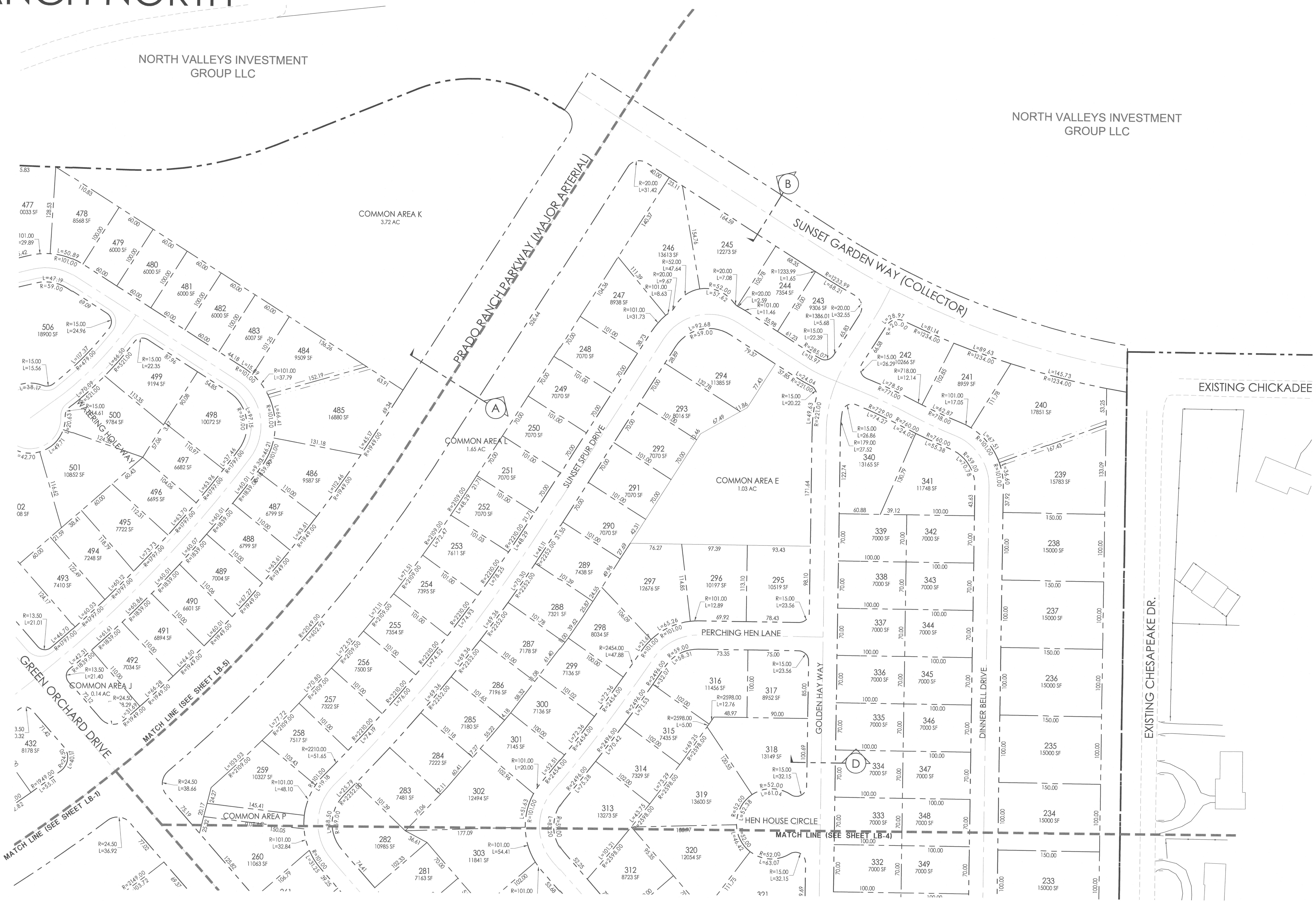
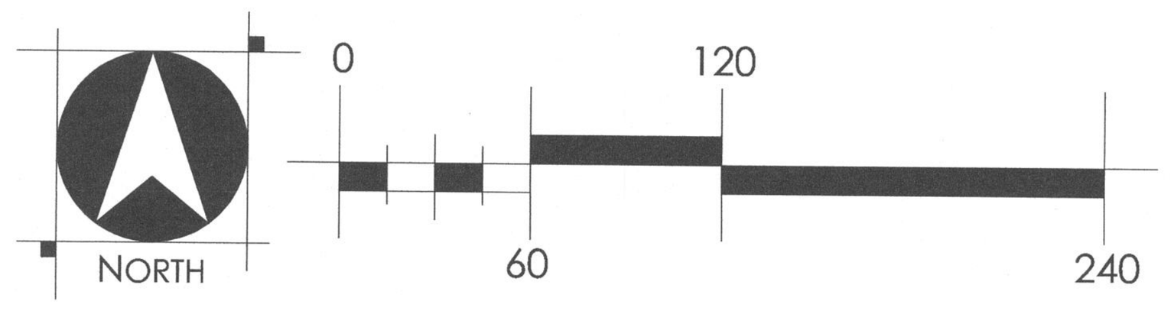
PRADO RANCH NORTH
TENTATIVE MAP
LOT AND BLOCK PLAN



NORTH VALLEYS INVESTMENT GROUP LLC
NORTH VALLEYS INVESTMENT GROUP LLC
COMMON AREA K
3.72 AC
PRADO RANCH PARKWAY (MAJOR ARTERIAL)
SUNSET GARDEN WAY (COLLECTOR)
EXISTING CHICKADEE DR.
EXISTING CHESAPEAKE DR.
COMMON AREA L
1.65 AC
COMMON AREA E
1.03 AC
SUNSET SPUR DRIVE
PERCHING HEN LANE
GOLDEN HAY WAY
DINNER BELL DRIVE
HEN HOUSE CIRCLE
GREEN ORCHARD DRIVE
WATERING HOLE WAY
COMMON AREA J
0.14 AC
COMMON AREA P
MATCH LINE (SEE SHEET LB-5)
MATCH LINE (SEE SHEET LB-1)
MATCH LINE (SEE SHEET LB-4)



PRADO RANCH NORTH
LOT AND BLOCK PLAN

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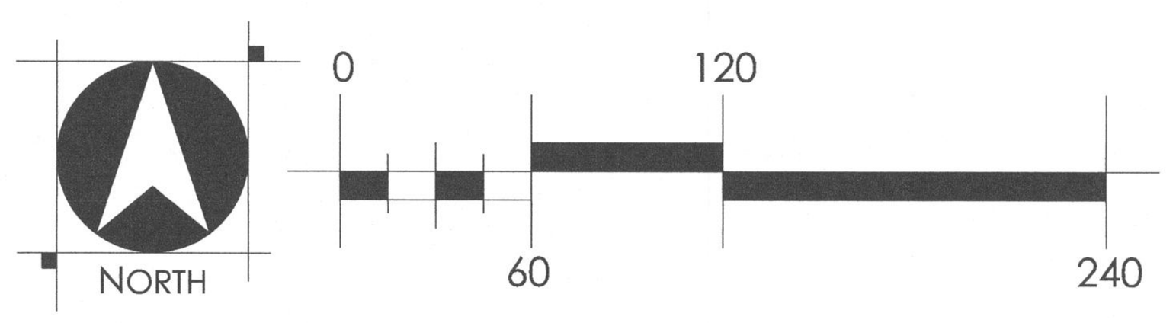
SHEET LB-3 OF 19

PRADO RANCH NORTH
TENTATIVE MAP
LOT AND BLOCK PLAN



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LOT AND BLOCK PLAN

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APRIL, 2018

PRADO RANCH NORTH

TENTATIVE MAP

LOT AND BLOCK PLAN

EXISTING TUPELO ST.

COMMON AREA F
1.93 AC

WATERING HOLE WAY

NORTH VALLEYS INVESTMENT GROUP LLC

COMMON AREA H
0.37 AC

COMMON AREA I
1.21 AC

COMMON AREA G
0.68 AC

COMMON AREA J
0.14 AC

COMMON AREA Q
0.06 AC

RUSTIC HORSESHOE DRIVE

SHIP LAP LANE

DUSTY STABLE COURT

GREEN ORCHARD DRIVE

RIDGED LASSO LANE

WINDY TRAIL LANE

EXISTING LEMMON DR.

PRADO RANCH PARKWAY (MAJOR ARTERIAL)

MATCH LINE SEE SHEET LB-4

MATCH LINE SEE SHEET LB-6

NORTH VALLEYS INVESTMENT GROUP LLC

NORTH 0 60 120 240

PRADO RANCH NORTH
LOT AND BLOCK PLAN

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SHEET LB-5 OF 19

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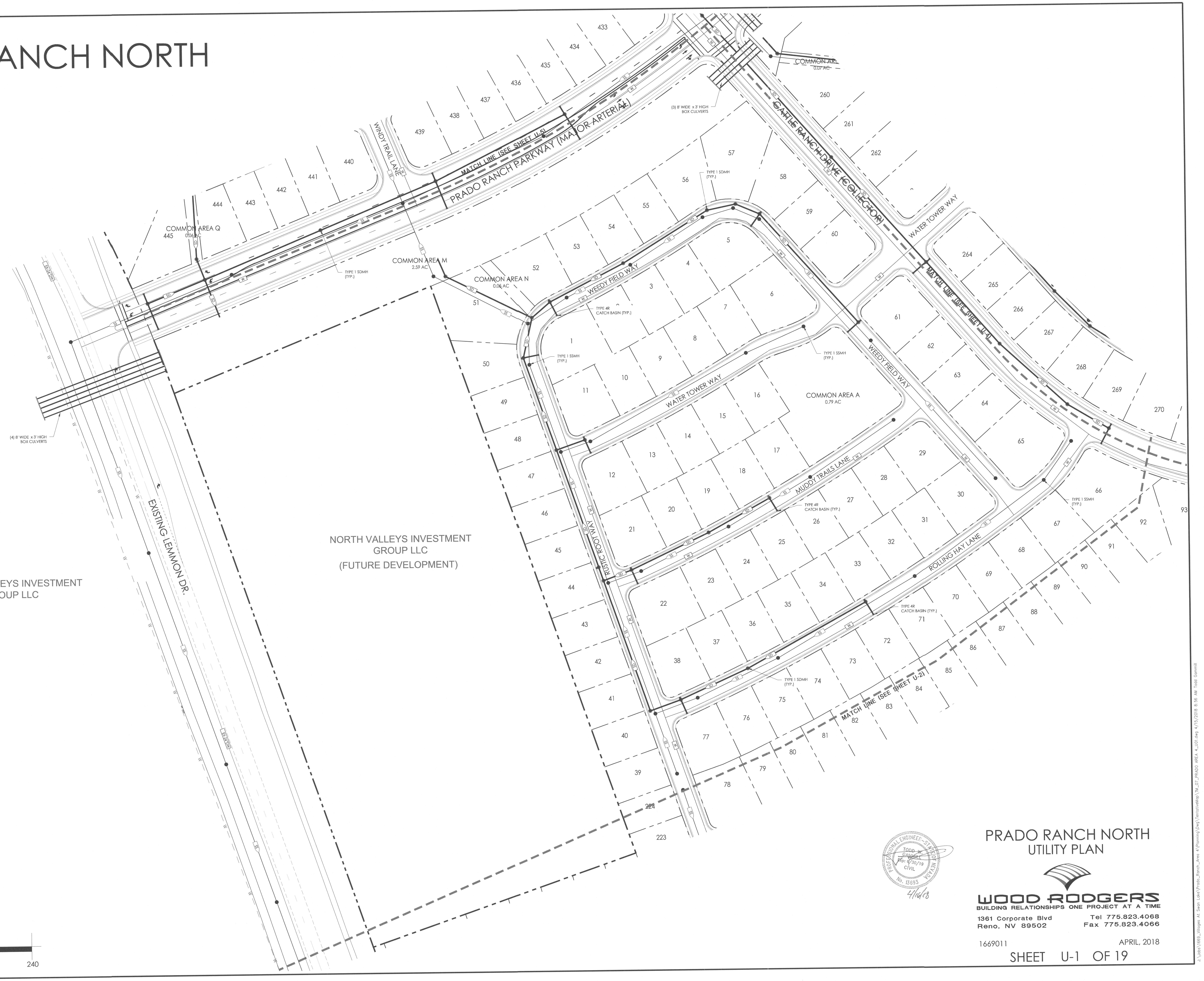
PRADO RANCH NORTH
TENTATIVE MAP
UTILITY PLAN



PRADO RANCH NORTH
UTILITY PLAN

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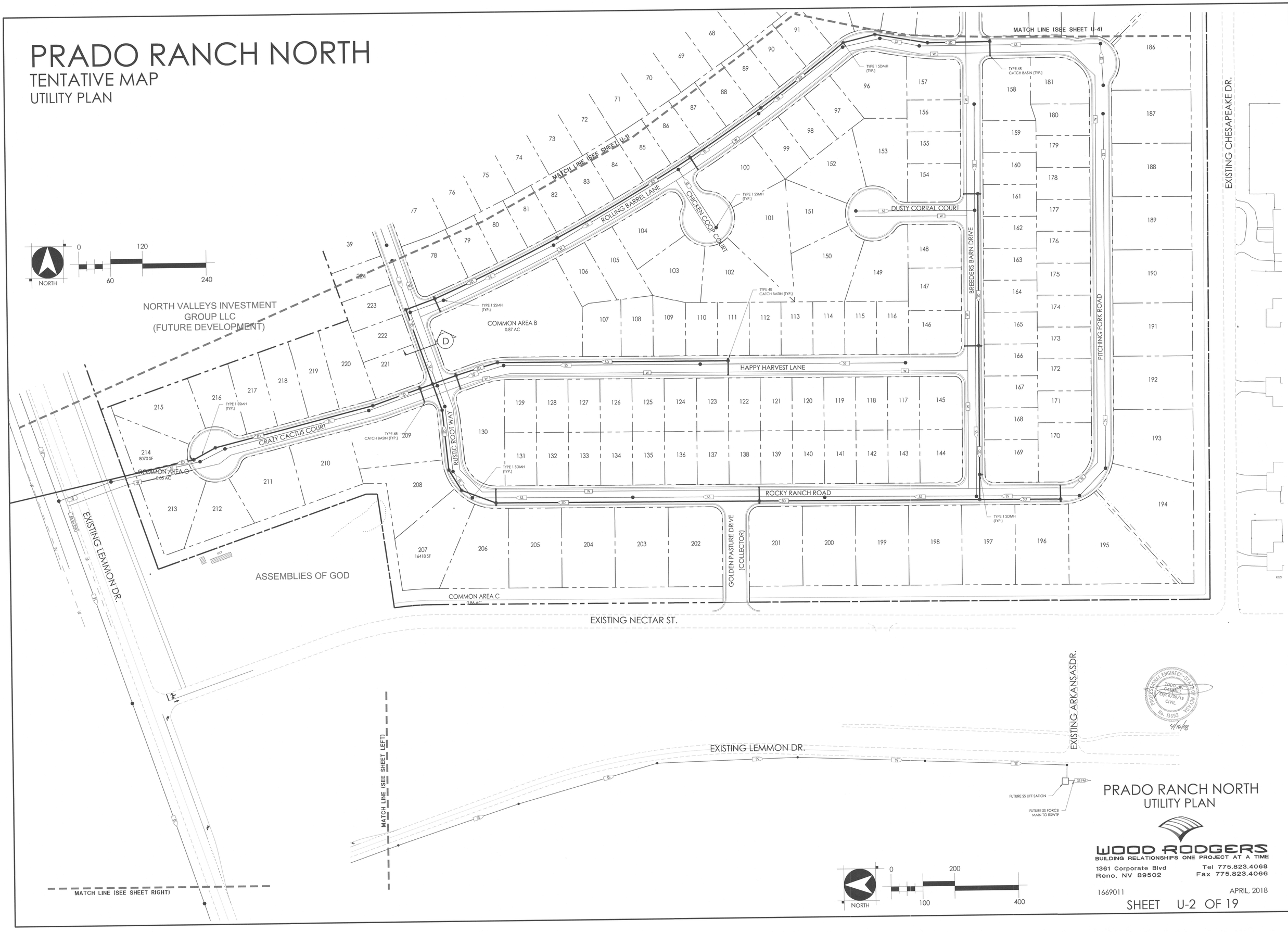
SHEET U-1 OF 19

PRADO RANCH NORTH

TENTATIVE MAP

UTILITY PLAN



PROFESSIONAL ENGINEER STATE OF NEVADA
Todd M. Grimmell
Exp. 6/30/19
CIVIL
No. 13693
4/16/18

PRADO RANCH NORTH
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SHEET U-2 OF 19

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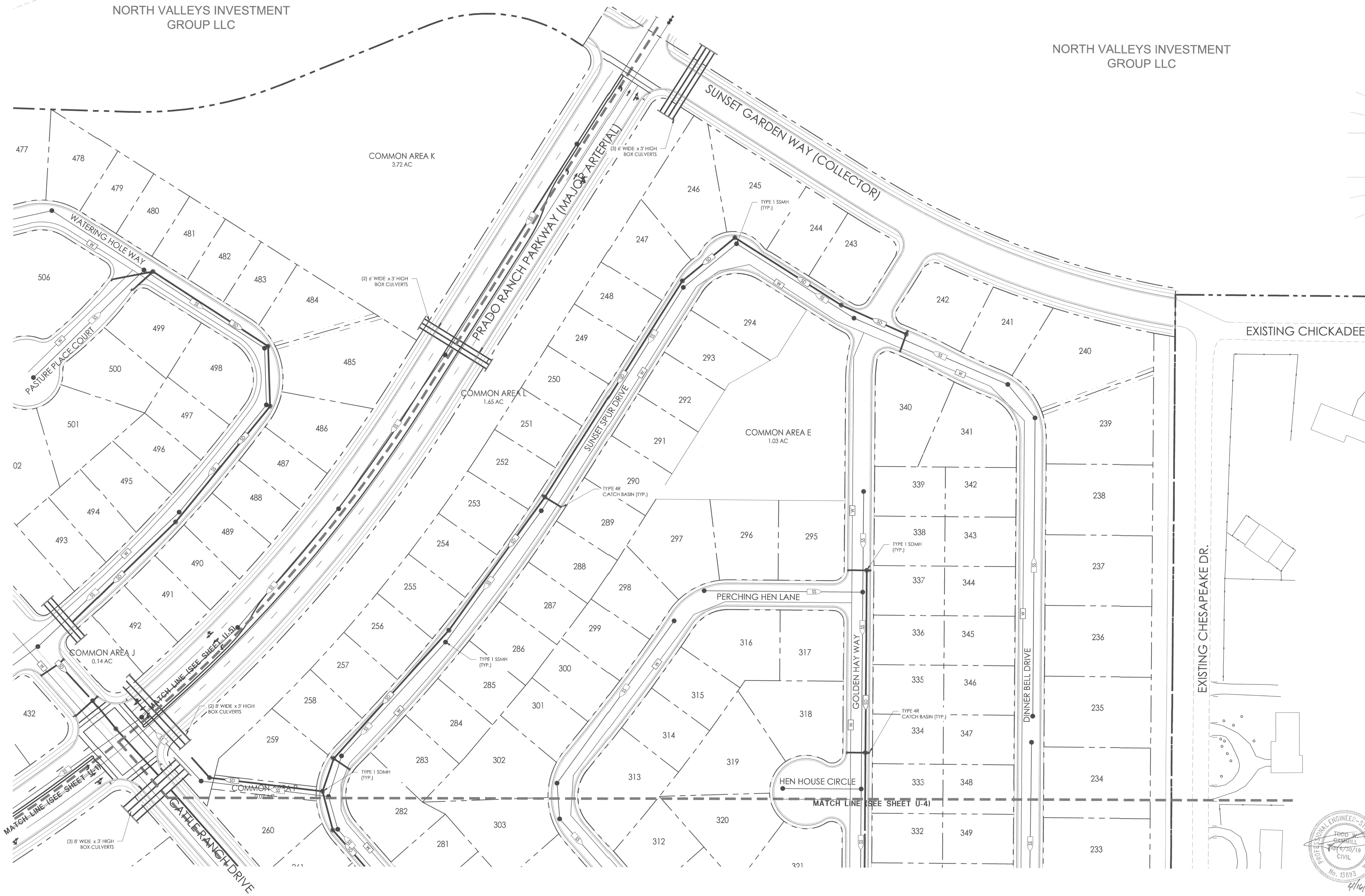
PRADO RANCH NORTH
TENTATIVE MAP
UTILITY PLAN



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PRADO RANCH NORTH

TENTATIVE MAP

UTILITY PLAN

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APRIL, 2018

PRADO RANCH NORTH
TENTATIVE MAP
UTILITY PLAN

EXISTING TUPELO ST.

NORTH VALLEYS INVESTMENT GROUP LLC

COMMON AREA F
1.03 AC

COMMON AREA H
0.37 AC

COMMON AREA I
1.21 AC

COMMON AREA G
0.68 AC

COMMON AREA J
0.14 AC

COMMON AREA Q
0.04 AC

TYPE 1 SSMH (TYP.)

TYPE 1 SDMH (TYP.)

TYPE 4R CATCH BASIN (TYP.)

[2] 6' WIDE x 3' HIGH BOX CULVERTS

[2] 8' WIDE x 3' HIGH BOX CULVERTS

WATERING HOLE WAY

PASTURE PLACE COURT

RUSTIC HORSESHOE DRIVE

SHIP LAP LANE

DUSTY STAPLE COURT

GREEN ORCHARD DRIVE

RIDGED LASSO LANE

WINDY TRAIL LANE

PRADO RANCH PARKWAY

EXISTING LEMMON DR.

MATCH LINE (SEE SHEET U-5)

MATCH LINE (SEE SHEET U-6)

NORTH VALLEYS INVESTMENT GROUP LLC

NORTH

0 60 120 240

4/16/18

PRADO RANCH NORTH
UTILITY PLAN

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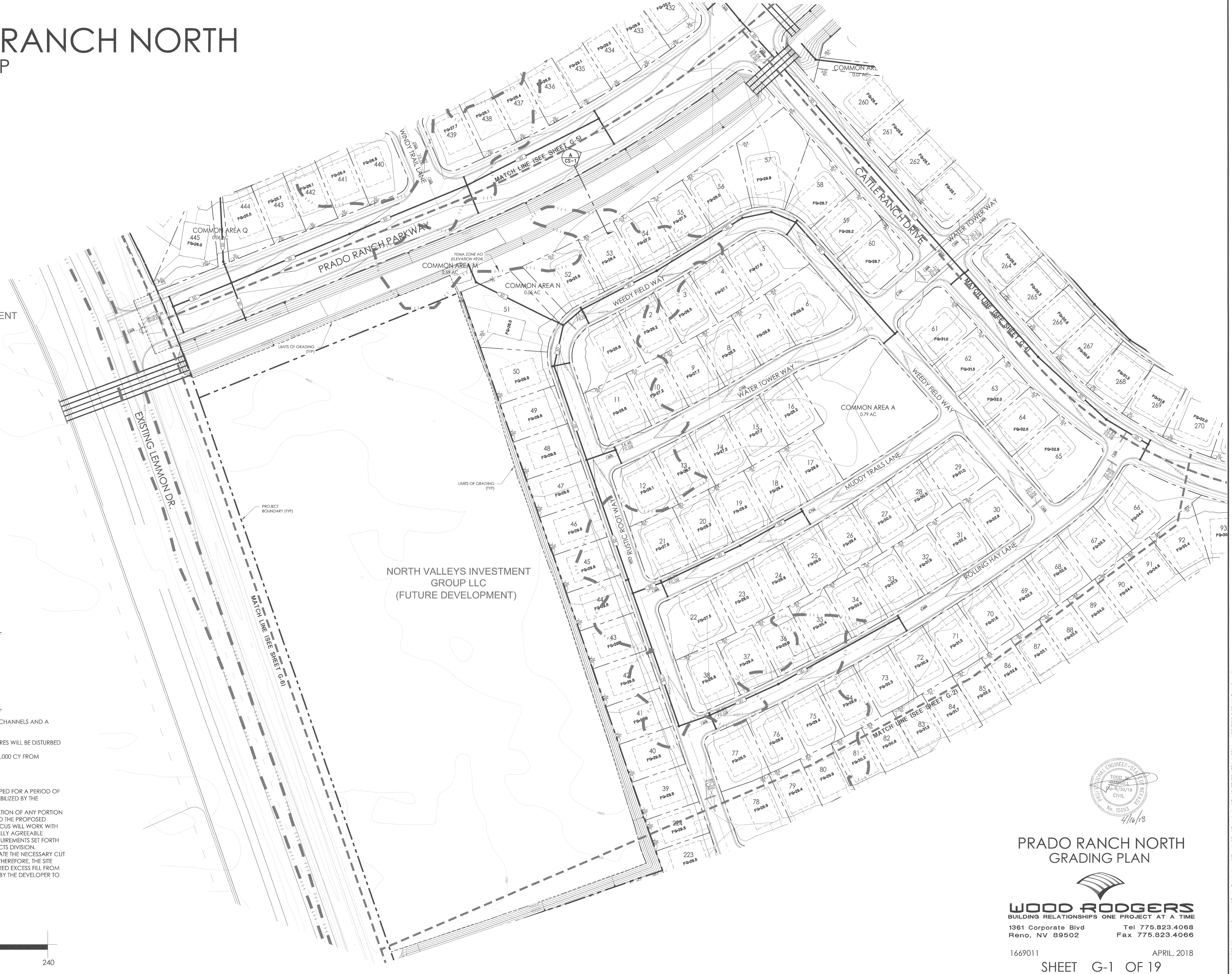
PRADO RANCH NORTH
TENTATIVE MAP
GRADING PLAN



LEGEND:

100 YEAR FLOOD LIMIT LINE

GRADING NOTES:

1. CUT AREAS: VOLUME REPLACEMENT AREA, CHANNELS AND A PORTION OF STREET J
2. FILL AREAS: REMAINDER OF THE SITE
3. DISTURBED AREAS: APPROXIMATELY 225 ACRES WILL BE DISTURBED
4. APPROXIMATE CUT AND FILL
   APPROXIMATE CUT: 35,000 CY ON-SITE, 246,000 CY FROM VOLUME REPLACEMENT AREA
   APPROXIMATE FILL: 1,070,000 CY
   EXPORT NEEDED: NONE
   IMPORT NEEDED: 789,000 CY
5. ALL AREAS DISTURBED AND LEFT UNDEVELOPED FOR A PERIOD OF MORE THAN THIRTY (30) DAYS SHALL BE STABILIZED BY THE APPLICATION OF DUST PALLIATIVE
6. IF IT IS DETERMINED THAT RAISING THE ELEVATION OF ANY PORTION OF LEMMON DRIVE DIRECTLY ADJACENT TO THE PROPOSED PROJECT IS NECESSARY, THEN LANSING-ARCUS WILL WORK WITH WASHOE COUNTY TO DETERMINE A MUTUALLY AGREEABLE ELEVATION TO SATISFY ANY POTENTIAL REQUIREMENTS SET FORTH BY THE ENGINEERING AND CAPITAL PROJECTS DIVISION.
7. GRADING OF THE SITE IS UNABLE TO GENERATE THE NECESSARY CUT REQUIRED TO OFFSET FILL REQUIREMENTS. THEREFORE, THE SITE WILL REQUIRE IMPORTATION OF THE REQUIRED EXCESS FILL FROM OTHER PROPERTIES OWNED/CONTROLLED BY THE DEVELOPER TO COMPLETE ONSITE GRADING.

NORTH

0 60 120 240

PRADO RANCH NORTH
GRADING PLAN

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
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Tel 775.823.4068
Fax 775.823.4066

1669011 APRIL, 2018

PRADO RANCH NORTH

TENTATIVE MAP
GRADING PLAN

LEGEND:

100 YEAR FLOOD LIMIT LINE

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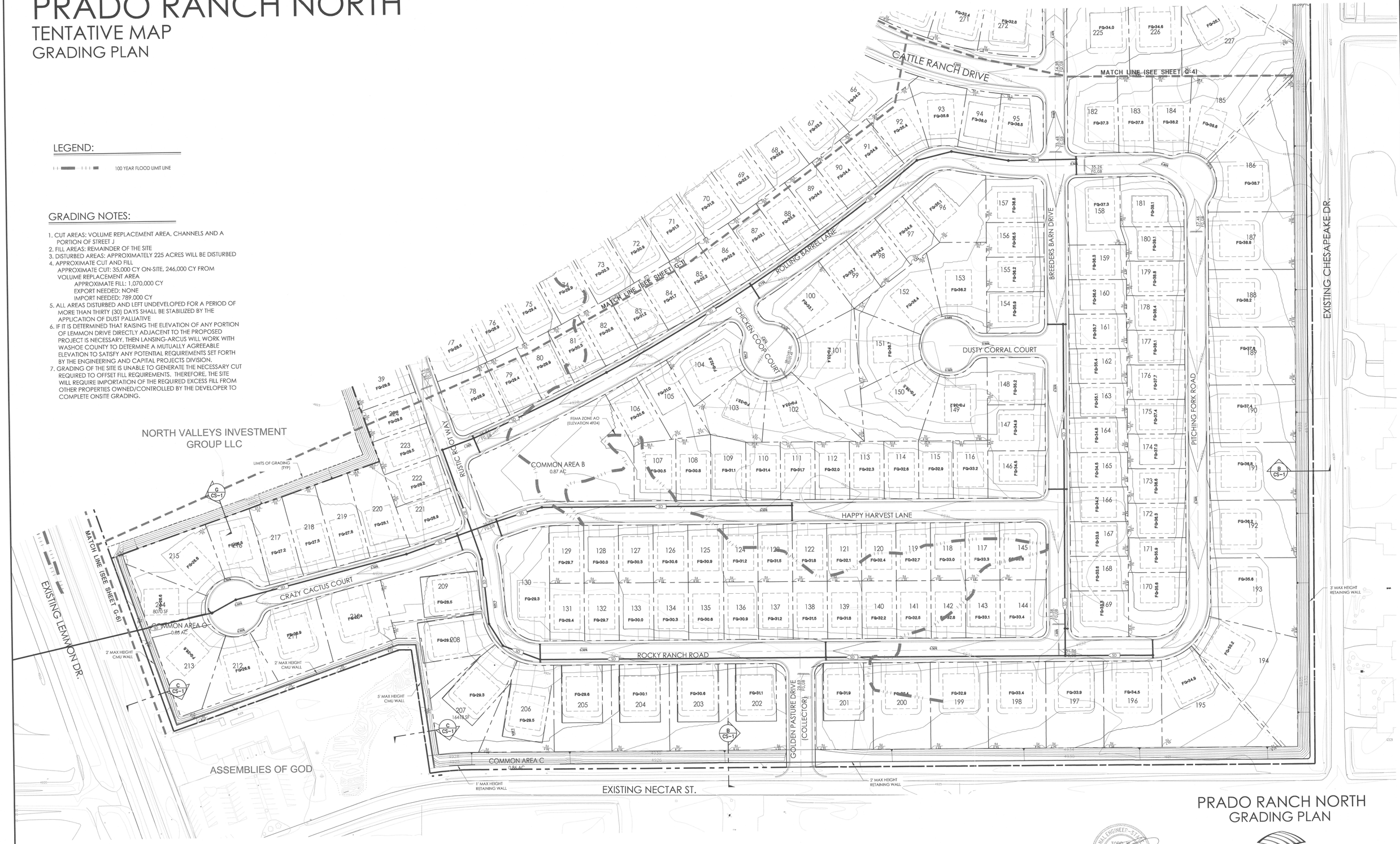

PRADO RANCH NORTH
GRADING PLAN

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APRIL, 2018

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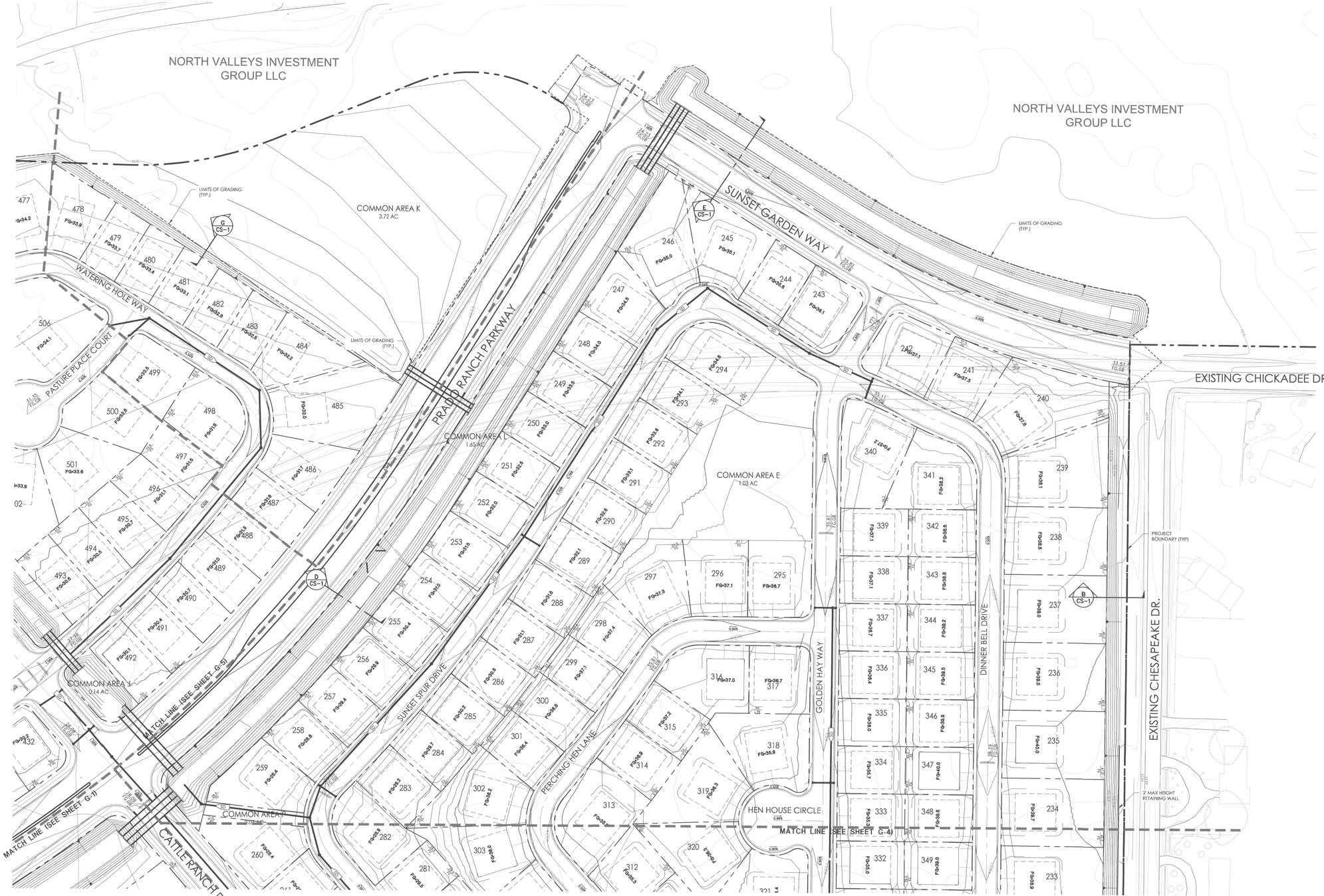
GRADING PLAN



LEGEND:

100 YEAR FLOOD LIMIT LINE

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7. GRADING OF THE SITE IS UNABLE TO GENERATE THE NECESSARY CUT REQUIRED TO OFFSET FILL REQUIREMENTS. THEREFORE, THE SITE WILL REQUIRE IMPORTATION OF THE REQUIRED EXCESS FILL FROM OTHER PROPERTIES OWNED/CONTROLLED BY THE DEVELOPER TO COMPLETE ONSITE GRADING.

NORTH
0 60 120 240

PRADO RANCH NORTH
GRADING PLAN

TODD M. GAMMILL
PROFESSIONAL ENGINEER - STATE OF NEVADA
EXP. 6/30/19
CIVIL
No. 13693
4/16/18

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
1361 Corporate Blvd
Reno, NV 89502
Tel 775.823.4068
Fax 775.823.4066

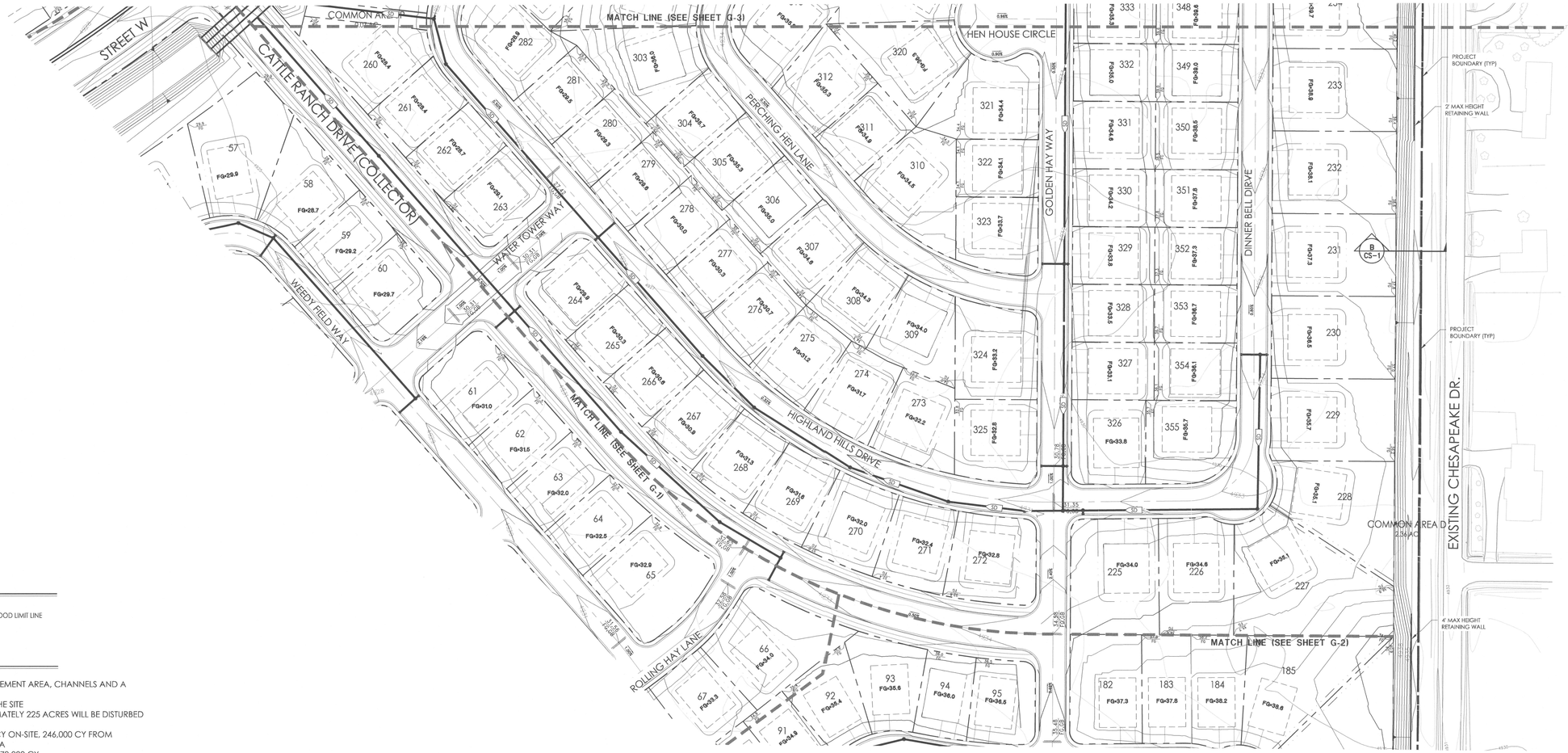
1669011
APRIL, 2018

J:\Jobs\1669_Villages At Swan Lake\Prado_Ranch_Area 4\Planning\Dwg\TentativeMap\TM_14_PRADO AREA 4_G03.dwg 4/15/2018 9:00 AM Todd Gammill

PRADO RANCH NORTH

TENTATIVE MAP

GRADING PLAN



LEGEND:

100 YEAR FLOOD LIMIT LINE

GRADING NOTES:

1. CUT AREAS: VOLUME REPLACEMENT AREA, CHANNELS AND A PORTION OF STREET J
2. FILL AREAS: REMAINDER OF THE SITE
3. DISTURBED AREAS: APPROXIMATELY 225 ACRES WILL BE DISTURBED
4. APPROXIMATE CUT AND FILL
   APPROXIMATE CUT: 35,000 CY ON-SITE, 246,000 CY FROM VOLUME REPLACEMENT AREA
   APPROXIMATE FILL: 1,070,000 CY
   EXPORT NEEDED: NONE
   IMPORT NEEDED: 789,000 CY
5. ALL AREAS DISTURBED AND LEFT UNDEVELOPED FOR A PERIOD OF MORE THAN THIRTY (30) DAYS SHALL BE STABILIZED BY THE APPLICATION OF DUST PALLIATIVE
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NORTH

0 60 120 240

PROFESSIONAL ENGINEER - STATE OF NEVADA
TODD W. DANIELL
Exp. 6/30/19
CIVIL
No. 13933
4/16/18

PRADO RANCH NORTH
GRADING PLAN

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1669011 APRIL, 2018

SHEET G-4 OF 19

PRADO RANCH NORTH

TENTATIVE MAP

GRADING PLAN

LEGEND:

100 YEAR FLOOD LIMIT LINE

GRADING NOTES:

1. CUT AREAS: VOLUME REPLACEMENT AREA, CHANNELS AND A PORTION OF STREET J
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NORTH

0 60 120 240

PROFESSIONAL ENGINEER—STATE OF NEVADA
TODD W. CUMMINS
Exp. 6/30/19
CIVIL
No. 13695
4/16/18

PRADO RANCH NORTH
GRADING PLAN

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PRADO RANCH NORTH
TENTATIVE MAP
GRADING PLAN

LEGEND:

100 YEAR FLOOD LIMIT LINE

GRADING NOTES:

1. CUT AREAS: VOLUME REPLACEMENT AREA, CHANNELS AND A PORTION OF STREET J
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NORTH — 0 100 200 400

PRADO RANCH NORTH
GRADING PLAN

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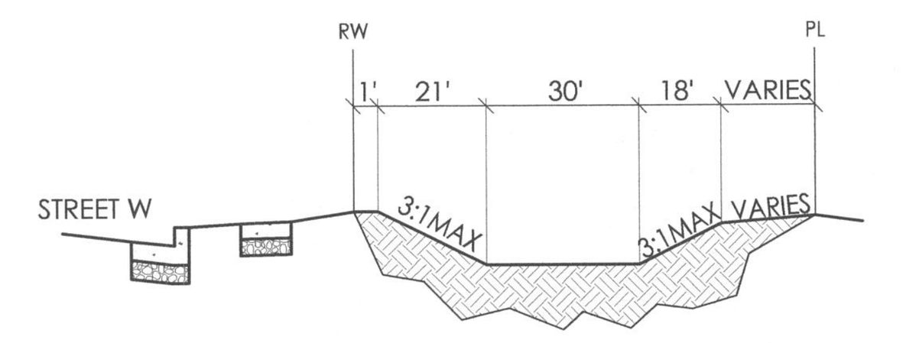
1669011 APRIL, 2018

SHEET G-6 OF 19

PRADO RANCH NORTH

TENTATIVE MAP

PRELIMINARY CROSS SECTIONS



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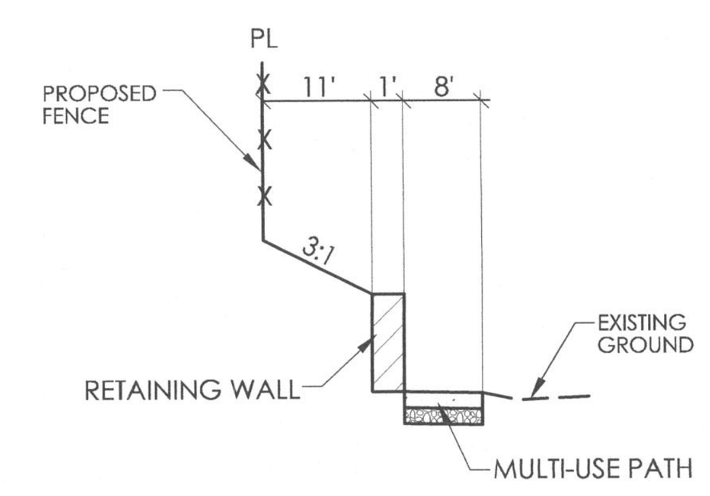
NOT TO SCALE



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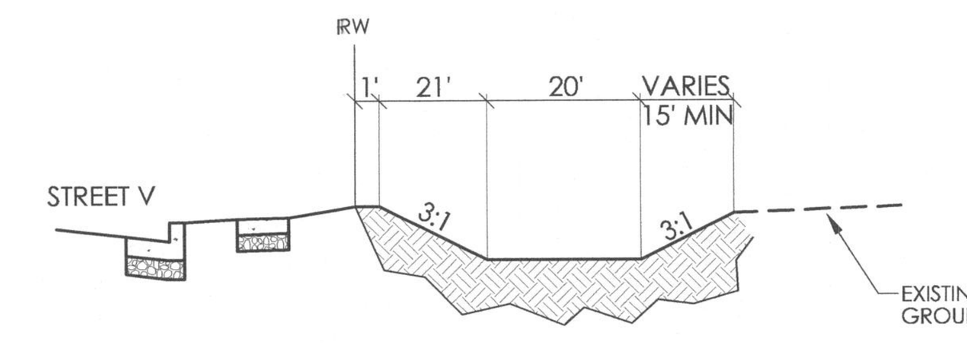

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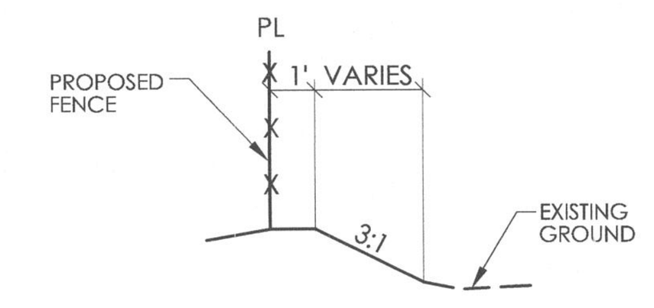

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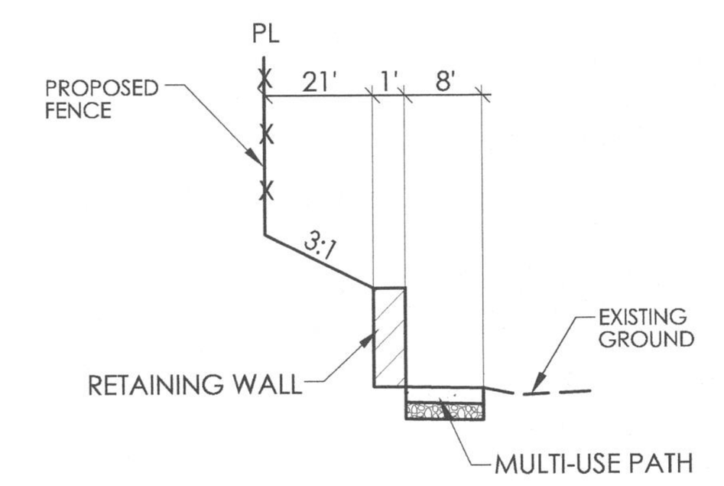

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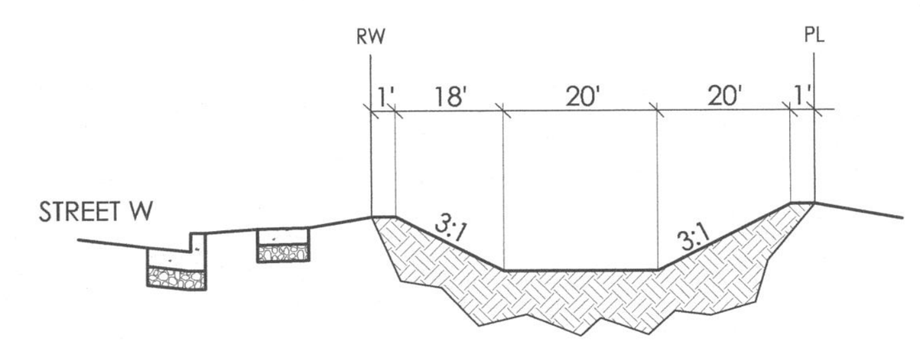

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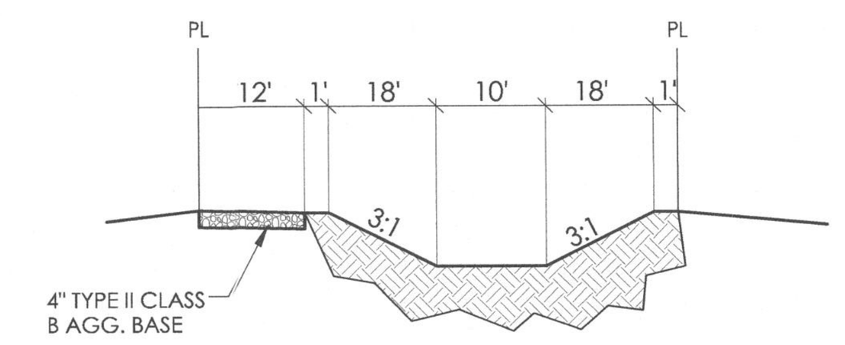
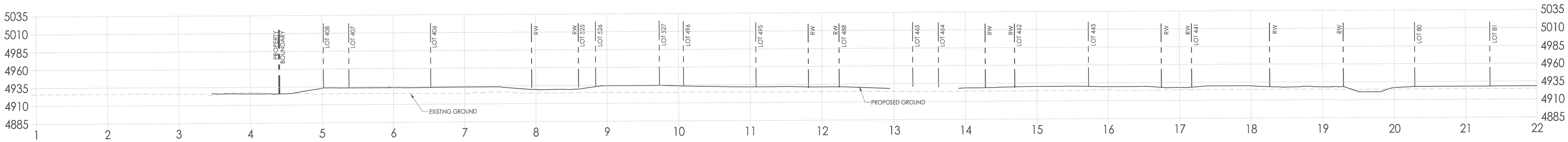
NOT TO SCALE

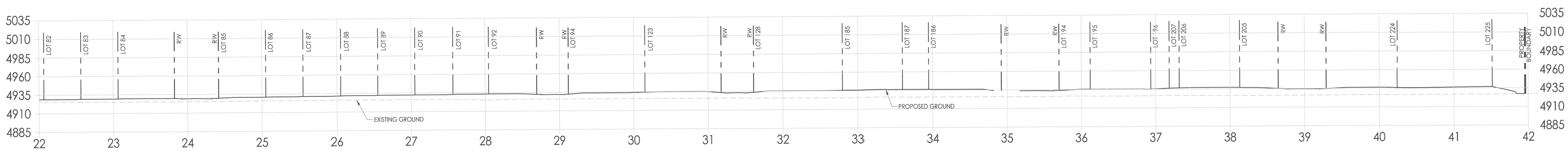


F CS-1 TYPICAL SECTION
NOT TO SCALE

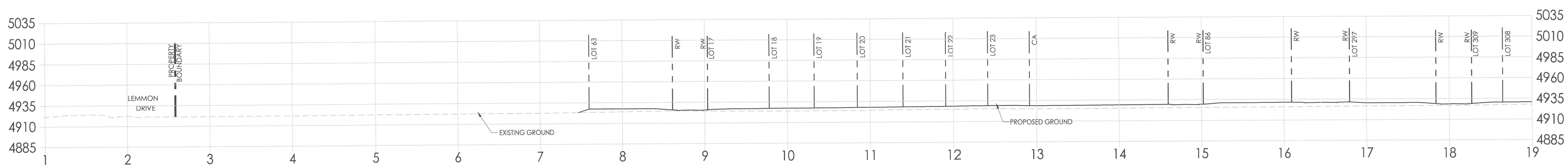
SITE PLAN
NOT TO SCALE



CROSS SECTION A
SCALE: 1"=60' HORZ.
1"=60' VERT.



CROSS SECTION A
SCALE: 1"=60' HORZ.
1"=60' VERT.



CROSS SECTION B
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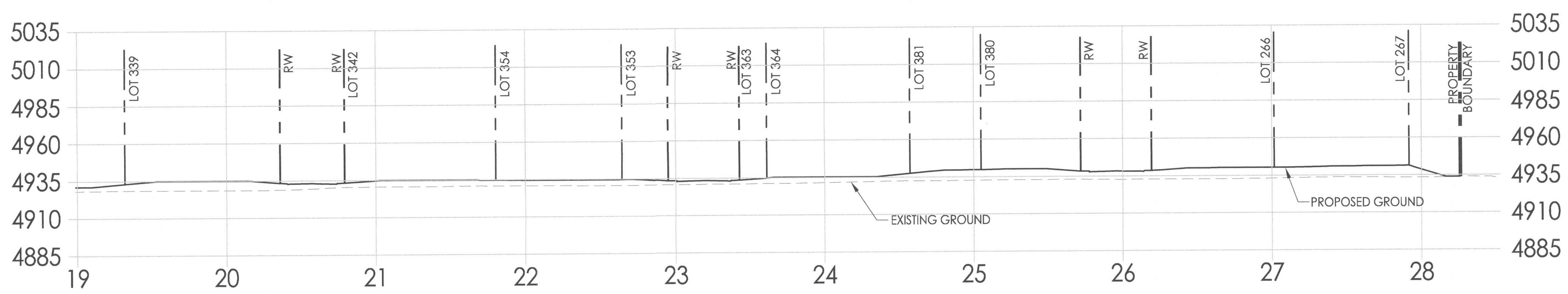
1"=60' VERT.



CROSS SECTION B
SCALE: 1"=60' HORZ.
1"=60' VERT.

PRELIMINARY CROSS SECTIONS
PRADO RANCH NORTH

PROFESSIONAL ENGINEER STATE OF NEVADA
TODD W. GAMMILL
Exp. 6/30/19
CIVIL
No. 13693
4/16/18

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APRIL, 2018

SHEET CS-1 OF 19

LANDSCAPE LEGEND/REQUIREMENTS

REQUIRED YARDS ADJOINING STREETS - ALL REQUIRED FRONT, REAR, AND SIDE YARDS WHICH ADJOIN A PUBLIC STREET SHALL BE LANDSCAPED AND SHALL INCLUDE AT LEAST ONE (1) TREE FOR EVERY FIFTY (50) LINEAR FEET OF STREET FRONTAGE, OR FRACTION THEREOF.

SUBDIVISION PERIMETERS - NEW RESIDENTIAL SUBDIVISION, REGARDLESS OF THE NUMBER OF DWELLING UNITS PER PARCEL, SHALL PROVIDE AT LEAST ONE (1) TREE FOR EVERY FIFTY (50) LINEAR FEET OF PERIMETER FRONTAGE ADJOINING AN ARTERIAL OR COLLECTOR IDENTIFIED IN THE WASHOE COUNTY COMPREHENSIVE PLAN STREETS AND HIGHWAYS SYSTEM PLAN MAP.

COMMON AREA LANDSCAPE

NOTE: THE COMPOSITION OF TREES SHALL REPRESENT A MIXTURE OF DECIDUOUS AND CONIFEROUS VARIETIES AS FOLLOWS:

- AT LEAST ONE-HALF (1/2) OF ALL EVERGREEN TREES SHALL BE AT LEAST SEVEN (7) FEET IN HEIGHT, AND THE REMAINDER MUST BE AT LEAST FIVE (5) FEET IN HEIGHT AT THE TIME OF PLANTING.
- AT LEAST ONE-HALF (1/2) OF THE REQUIRED NUMBER OF DECIDUOUS TREES SHALL BE AT LEAST TWO (2) INCH CALIPER PER AMERICAN NURSERY STANDARDS AT THE TIME OF PLANTING. THE REMAINING NUMBER OF REQUIRED DECIDUOUS TREES SHALL BE AT LEAST ONE (1) INCH CALIPER AT THE TIME OF PLANTING.
- ALL PLANTING AND IRRIGATION SHALL BE INSTALLED PER LOCAL GOVERNING CODES.
- FINAL PLANT SELECTION AND LAYOUT WILL BE BASED ON SOUND HORTICULTURAL PRACTICES RELATING TO MICRO-CLIMATE, SOIL, AND WATER REGIMES. ALL TREES WILL BE STAKED SO AS TO REMAIN UPRIGHT AND PLUMB FOLLOWING INSTALLATION. PLANT SIZE AND QUALITY AT TIME OF PLANTING WILL BE PER CURRENT EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z60.1).
- ALL PLANTER BEDS WILL RECEIVE 3" MINIMUM DEPTH OF MULCH WITH WEED CONTROL.
- ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED UNLESS NOTED OTHERWISE ON THE PLAN. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A REDUCED-PRESSURE-TYPE BACKFLOW PREVENTER WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.

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the landscape architecture studio
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Sparks, NV 89431
(775) 323-2223
NV RLA #440
www.lastudionevada.com

PRADO RANCH NORTH

Wood Rodgers

Washoe County Unincorporated Nevada

Preliminary Landscape Plan

No.	Revision Date

HLA No: 022-544-11-17
Designed: RAH
Drawn: LA
Checked: RAH
Date: 1/12/18

Sheet L1 of 1