



## PROJECT DIRECTORY

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## BUILDING DATA

Occupancy: R-Residential  
 Construction Type: V-B  
 Fire Sprinkler: No

## CODE ANALYSIS

APPLICABLE CODES:

2018 I-CODES  
 SUMMIT SUSTAINABLE BUILDING CODE  
 NFPA 70 NATIONAL ELECTRICAL CODE

### DUPLEX UNIT

R302.3 Two Family Dwelling  
 Dwelling Units shall be separated from each other by wall and floor assemblies having not less than 1-hour rating where tested in accordance with ASTM E119, UL 263 or Section 703.3 of the IBC. Fire-resistance-rated floor/ceiling and wall assemblies shall extend to and be tight against the exterior wall and wall assemblies shall extend from the foundation to the underside of the roof sheathing.

R302.4 Dwelling Unit rated penetrations  
 Through penetrations of fire-resistance-rated wall or floor assemblies shall comply with Section R302.4.1.1 or R302.4.1.2

R302.4.11.1 Penetrations shall be installed as tested in the approved fire-resistance-assembly

R302.4.2

## PROPERTY INFO

SCHEDULE: 1100276  
 PPI: 2097-3523-22-003  
 ZONING: RESIDENTIAL HIGH DENSITY DISTRICT (RH)

## PROJECT SUMMARY

THE EXISTING DUPLEX ON THE PROPERTY WILL BE REMOVED AND A NEW DUPLEX AND A SINGLE FAMILY HOME ARE PROPOSED. THE DUPLEX HAS ACCESS FROM THE TELLER ALLEY AND THE SINGLE FAMILY HOME HAS ACCESS FROM TELLER STREET.

## BUILDING DATA

Occupancy: R-Residential  
 Construction Type: V-B  
 Fire Sprinkler: No

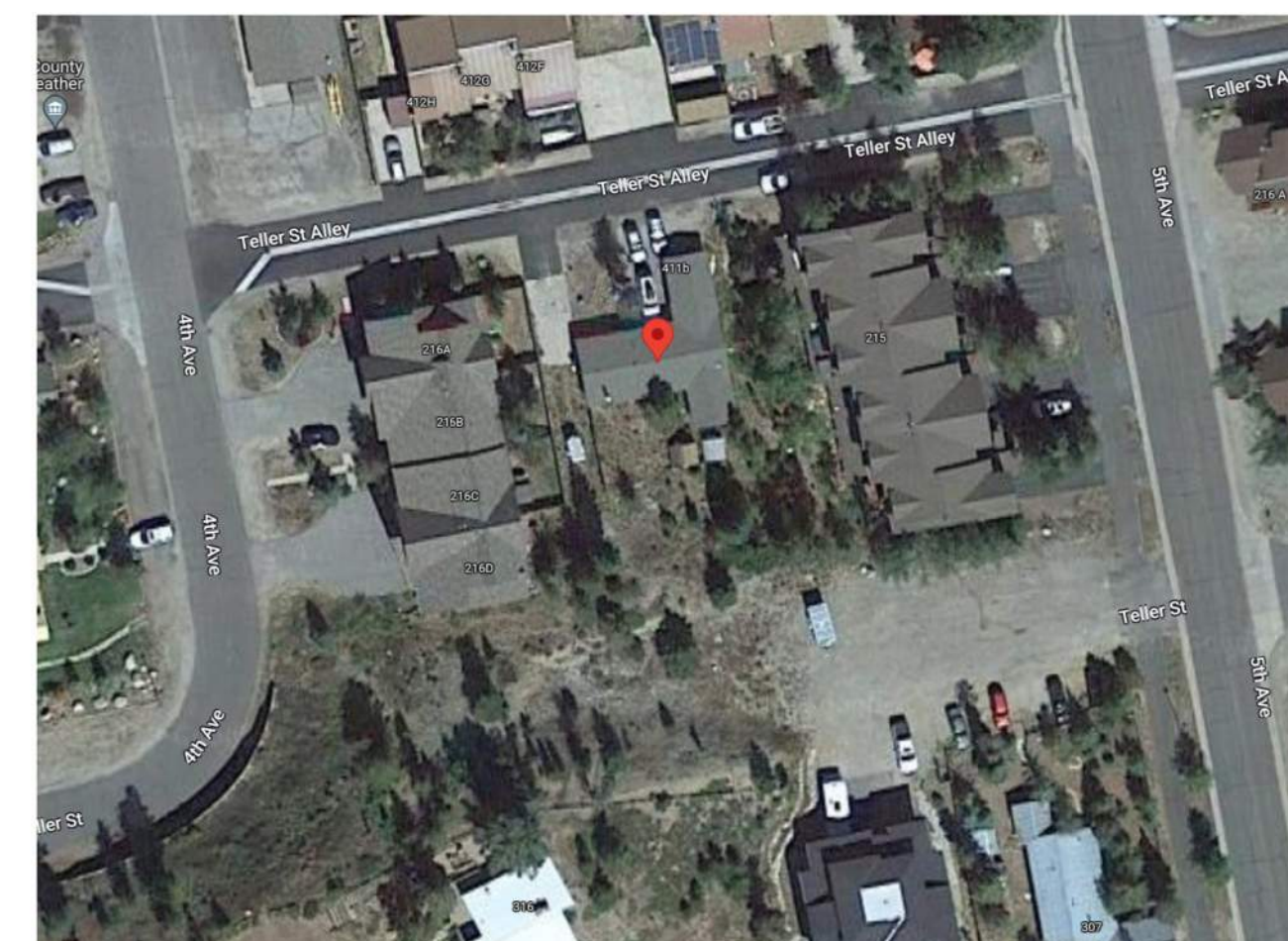
### PROPOSED BUILDING AREAS

East Duplex Garage	542 SF
East Duplex Lower Level	670 SF
EAST DUPLEX Main Level	1292 SF
EAST DUPLEX Upper Level	461 SF
SFH Garage	710 SF
SFH Lower Level	1341 SF
SFH Main Level	747 SF
SFH Upper Level	1212 SF
West Duplex Garage	547 SF
West Duplex Lower Level	663 SF
WEST DUPLEX Main Level	1279 SF
WEST DUPLEX Upper Level	461 SF

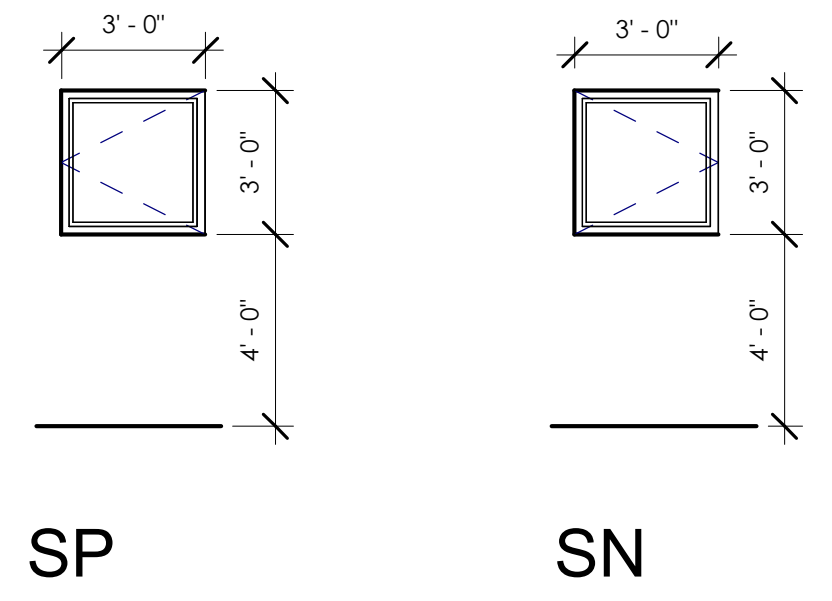
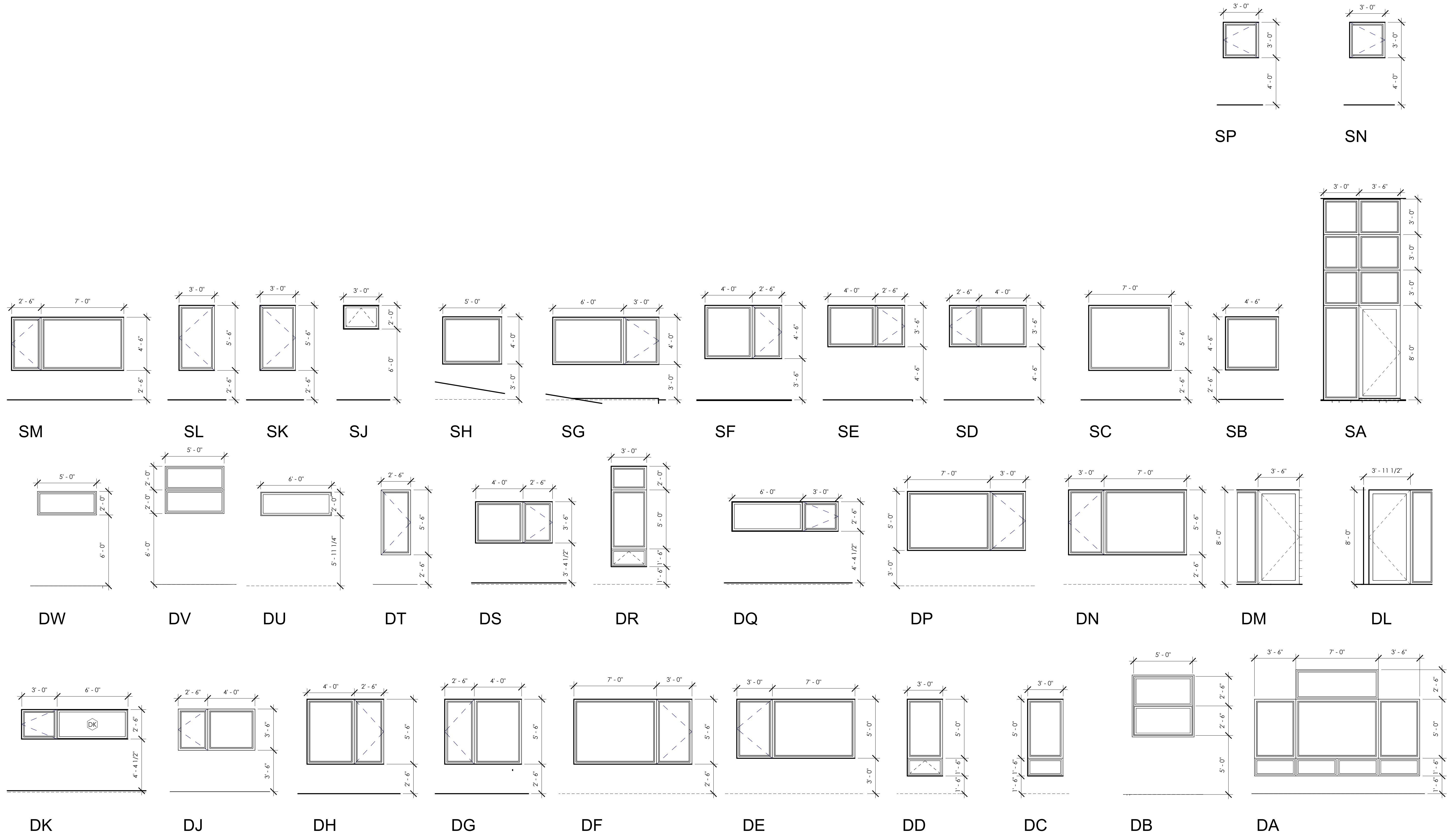
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## VICINITY MAP





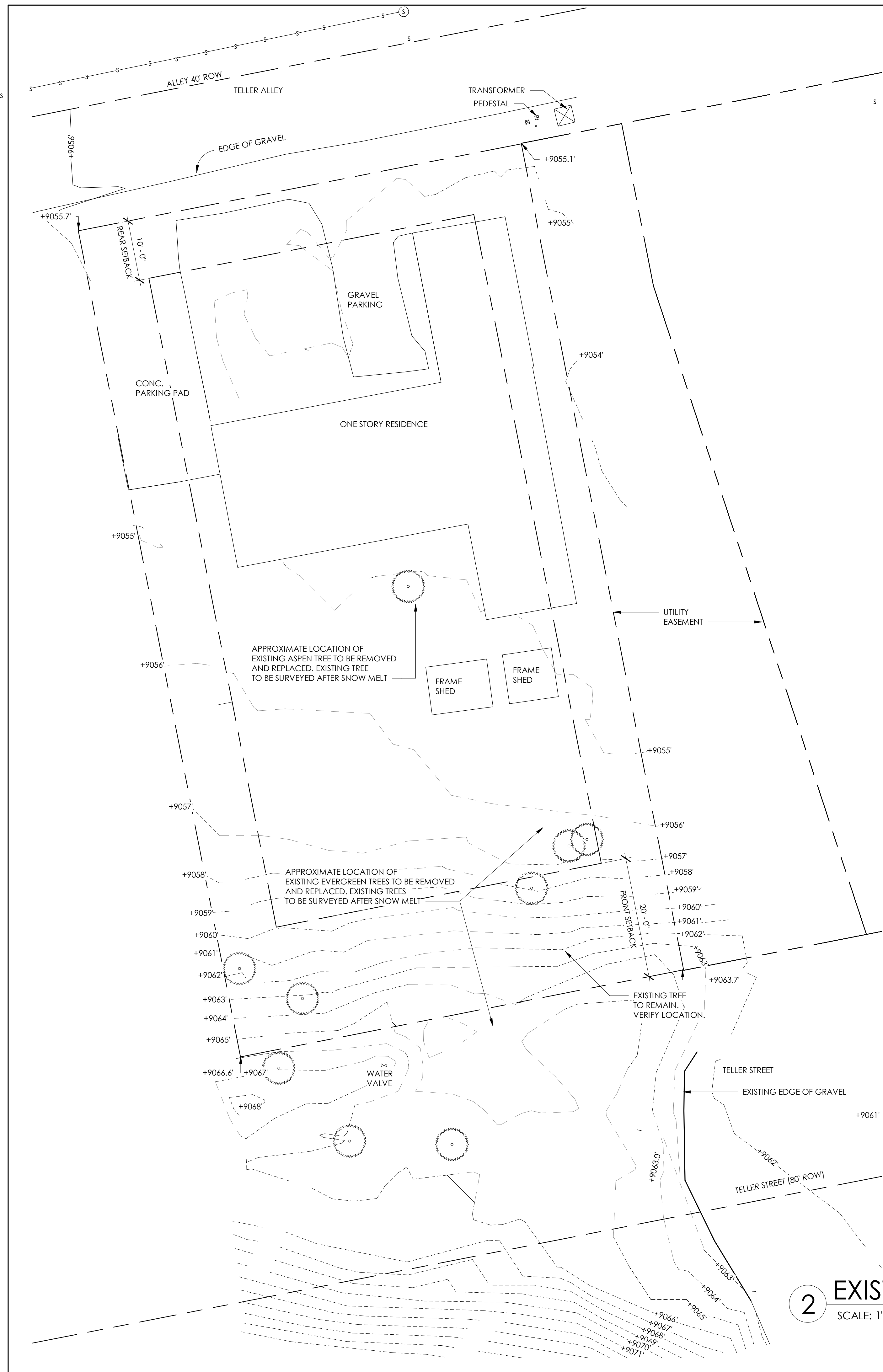


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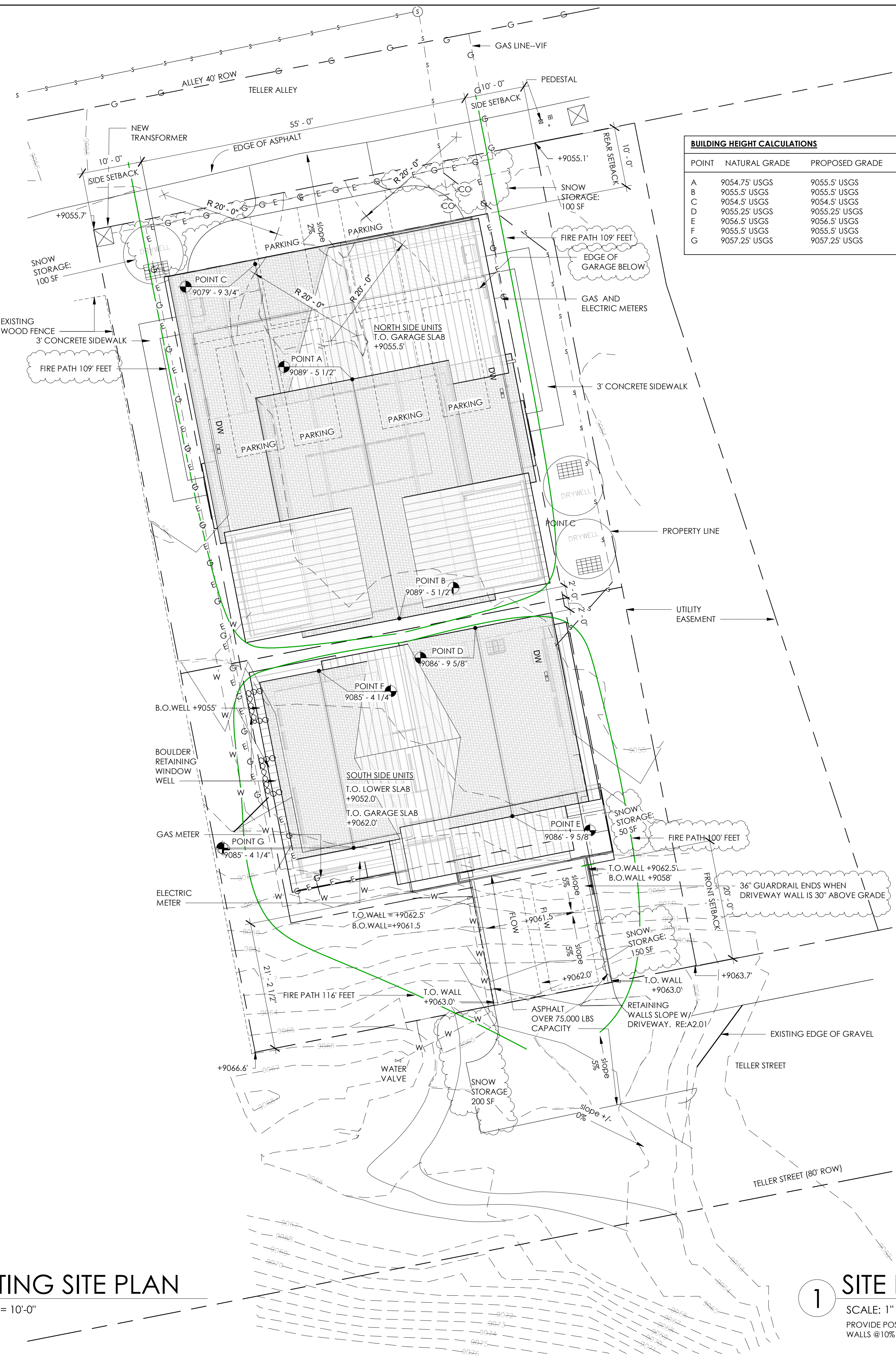
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FIRE DEPARTMENT 031723  
MAJOR SKETCH PLAN 041523  
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XCEL 020724  
MAJOR SITE FINAL 042524

WINDOW SCHEDULE





**2 EXISTING SITE PLAN**  
SCALE: 1" = 10'-0"



**1 SITE PLAN**  
SCALE: 1" = 10'-0"  
PROVIDE POSITIVE DRAINAGE FROM FOUNDATION WALLS @10%

BUILDING HEIGHT CALCULATIONS				
POINT	NATURAL GRADE	PROPOSED GRADE	ROOF ELEVATION	BUILDING HEIGHT
A	9054.75' USGS	9055.5' USGS	9089.5' USGS	9089.5'-9054.75' = 34.75'
B	9055.5' USGS	9055.5' USGS	9089.5' USGS	9089.5'-9055.5' = 34.0'
C	9054.5' USGS	9054.5' USGS	9079.8' USGS	9079.8'-9054.5' = 25.3'
D	9055.25' USGS	9055.25' USGS	9086.8' USGS	9086.8'-9055.25' = 31.55'
E	9056.5' USGS	9056.5' USGS	9086.8' USGS	9086.8'-9056.5' = 30.3'
F	9055.5' USGS	9055.5' USGS	9085.4' USGS	9085.4'-9055.5' = 29.9'
G	9057.25' USGS	9057.25' USGS	9085.4' USGS	9085.4'-9057.25' = 28.15'

**SNOW STORAGE CALCULATIONS**

**NORTH SIDE**  
 DRIVEWAY: 373 SF  
 CONCRETE PATH 260 SF  
 TOTAL HARDSCAPE: 633 SF  
 REQUIRED SNOW AREA: 180 SF  
 PROPOSED SNOW STORAGE: 200 SF

**SOUTH SIDE**  
 CONCRETE DRIVEWAY: 400SF  
 UNCOVERED ROOF DECK AND FRONT PATIO: 184 SF  
 TOTAL AREA: 584 SF  
 REQUIRED SNOW AREA: 100/350=167 SF  
 PROPOSED SNOW STORAGE: 200 SF

**SOUTH CONNECTION**  
 ASPHALT DRIVEWAY: 611 SF  
 REQUIRED SNOW STORAGE: 174 SF

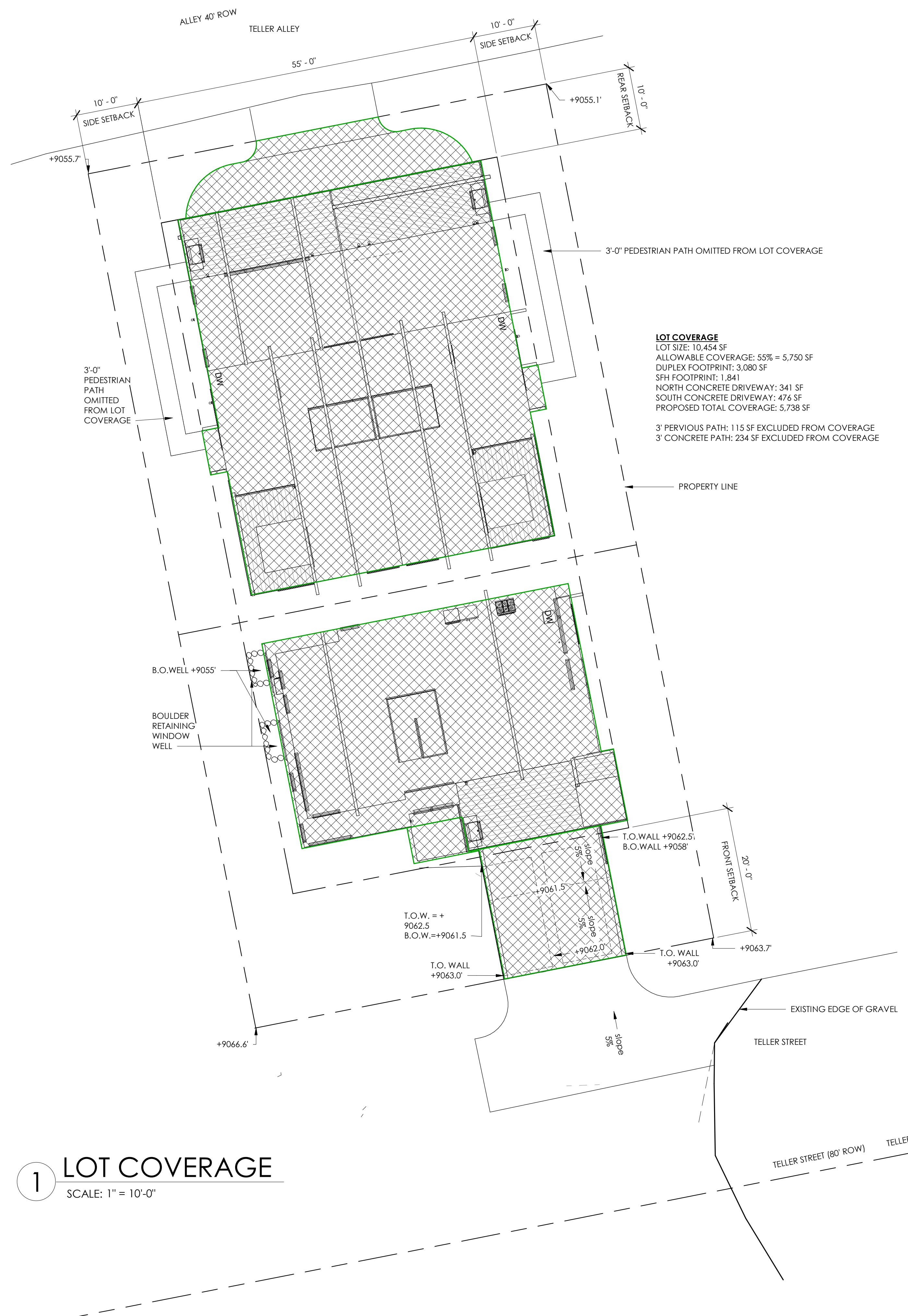
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SITE PLAN

**A1.0**





**LOT COVERAGE**  
 LOT SIZE: 10,454 SF  
 ALLOWABLE COVERAGE: 55% = 5,750 SF  
 DUPLEX FOOTPRINT: 3,080 SF  
 SFH FOOTPRINT: 1,841  
 NORTH CONCRETE DRIVEWAY: 341 SF  
 SOUTH CONCRETE DRIVEWAY: 476 SF  
 PROPOSED TOTAL COVERAGE: 5,738 SF

3' PERVIOUS PATH: 115 SF EXCLUDED FROM COVERAGE  
 3' CONCRETE PATH: 234 SF EXCLUDED FROM COVERAGE

**1 LOT COVERAGE**  
 SCALE: 1" = 10'-0"

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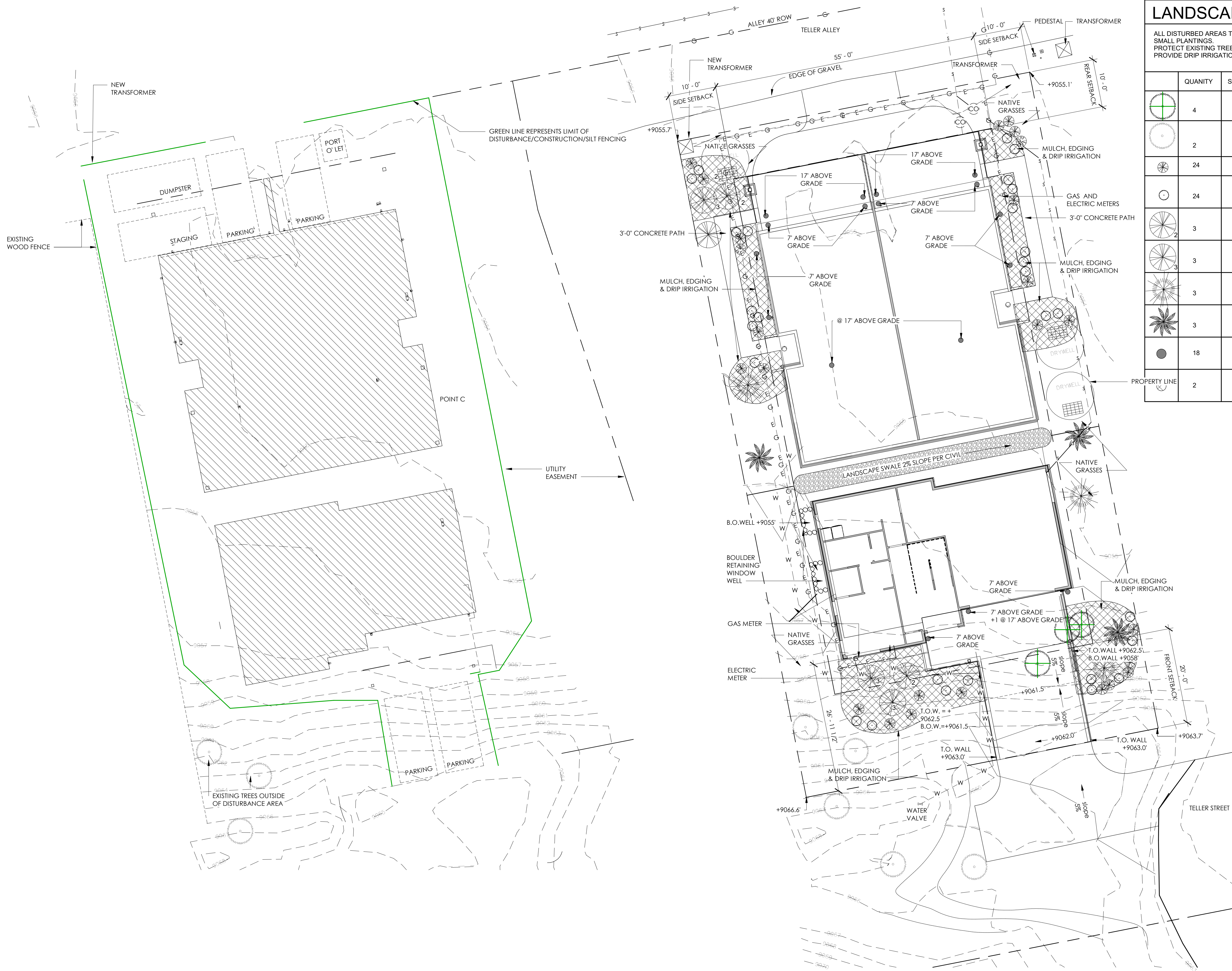
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LOT COVERAGE

**A1.1**





### LANDSCAPE LEGEND

ALL DISTURBED AREAS TO BE RETURNED TO THEIR NATURAL CONDITION WITH NATIVE GRASSES, FLOWERS AND SMALL PLANTINGS. PROTECT EXISTING TREES WITH CONSTRUCTION FENCING. PROVIDE DRIP IRRIGATION FOR NEW TREES.

	QUANTITY	SIZE	NAME	LATIN
	4		PINE TREE TO BE REMOVED	
	2		PINE TREE TO REMAIN	
	24	5 GALLON	SERVICEBERRY	AMELANCHIER AIMIFOLIA
	24	10 GALLON	SILVER BUFFALOBERRY	SHEPHERDIA ARGENTIA
	3	2" DIA. @ 12" FROM GRADE	QUAKING ASPEN	POPULOUS TREMULA
	3	3" DIA. @ 12" FROM GRADE	QUAKING ASPEN	POPULOUS TREMULA
	3	10'	COLORADO BLUE SPRUCE	PICEA PUNGENS
	3	6'	ROCKY MOUNTAIN BRISTLECONE PINE	PINUS ARISTATA
	18	7' MOUNTING HT.	ERLENMEYER DARK SCONCE OUTDOOR SCONCE	120 V/4.5 W
	2	9' MOUNTING HT.	RECESSED CAN	

**3 CONSTRUCTION STAGING**  
SCALE: 1" = 10'-0"

**1 LANDSCAPE AND LIGHTING PLAN**  
SCALE: 1" = 10'-0"

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**1** SFH LOWER LEVEL PLAN  
SCALE: 1/4" = 1'-0"

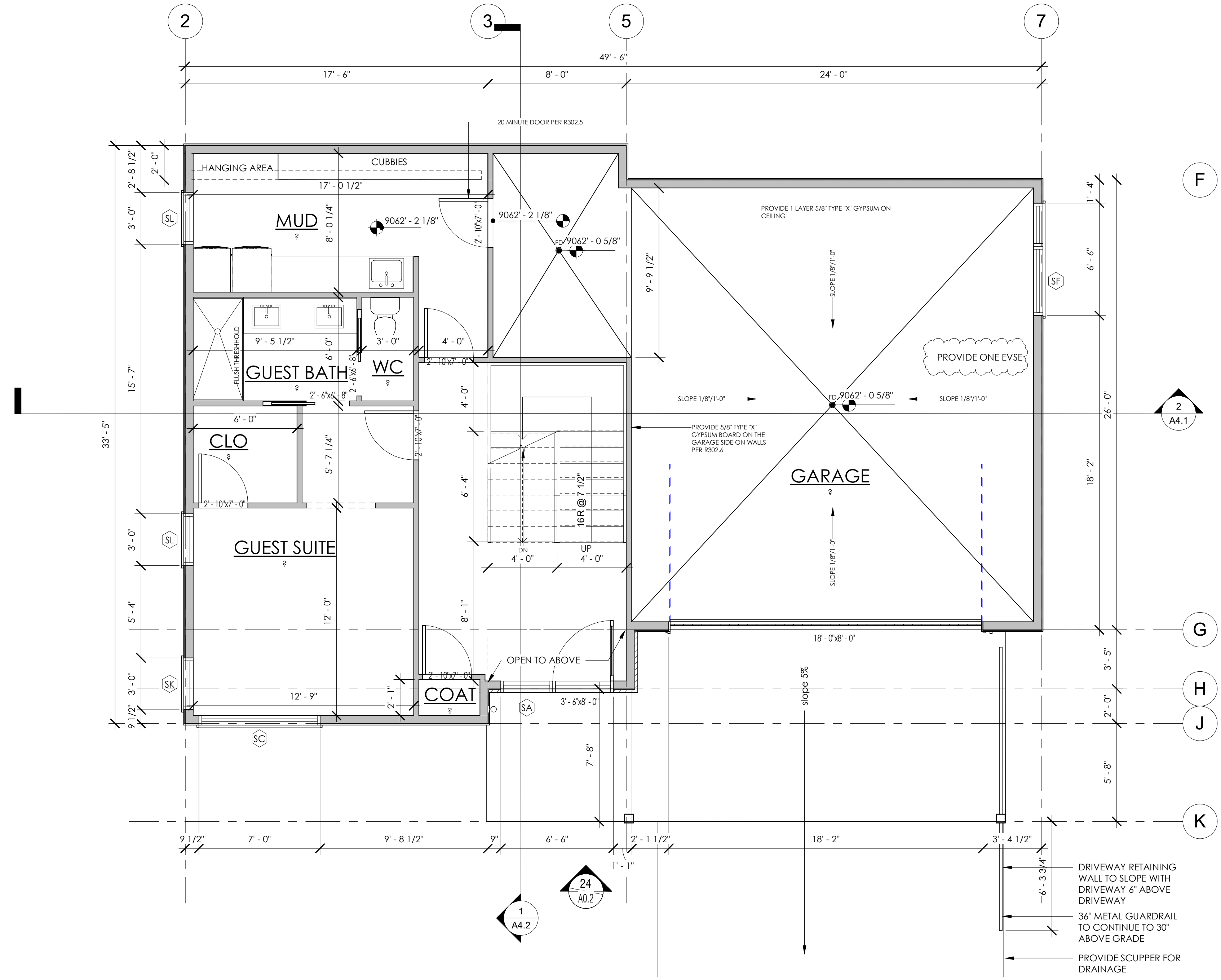
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SFH LOWER LEVEL

**A2.00**





**1 SFH MAIN LEVEL PLAN**  
SCALE: 1/4" = 1'-0"

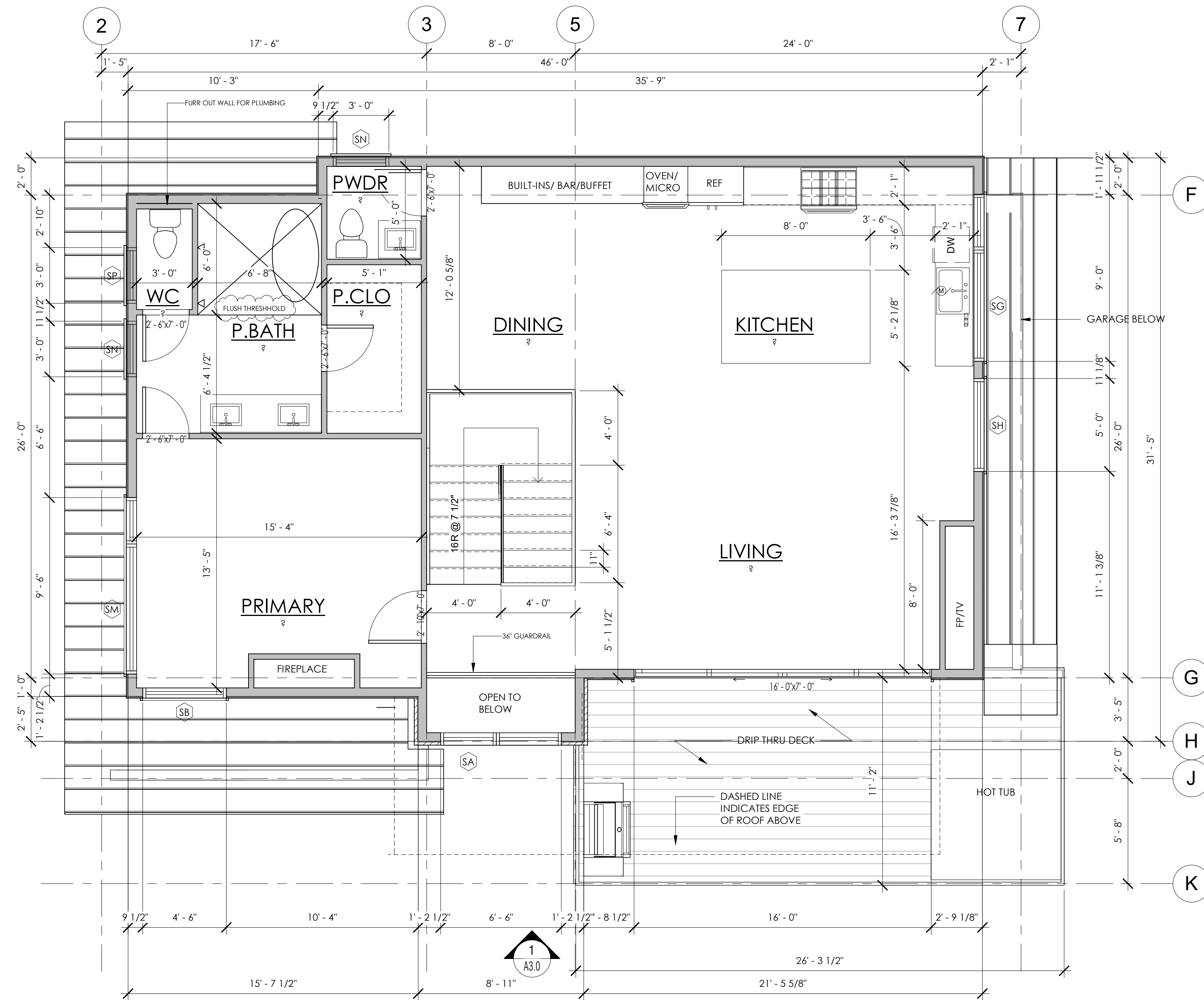
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SFH MAIN LEVEL

**A2.01**





**1 SFH UPPER LEVEL PLAN**  
SCALE: 1/4" = 1'-0"

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SFH UPPER LEVEL

**A2.02**

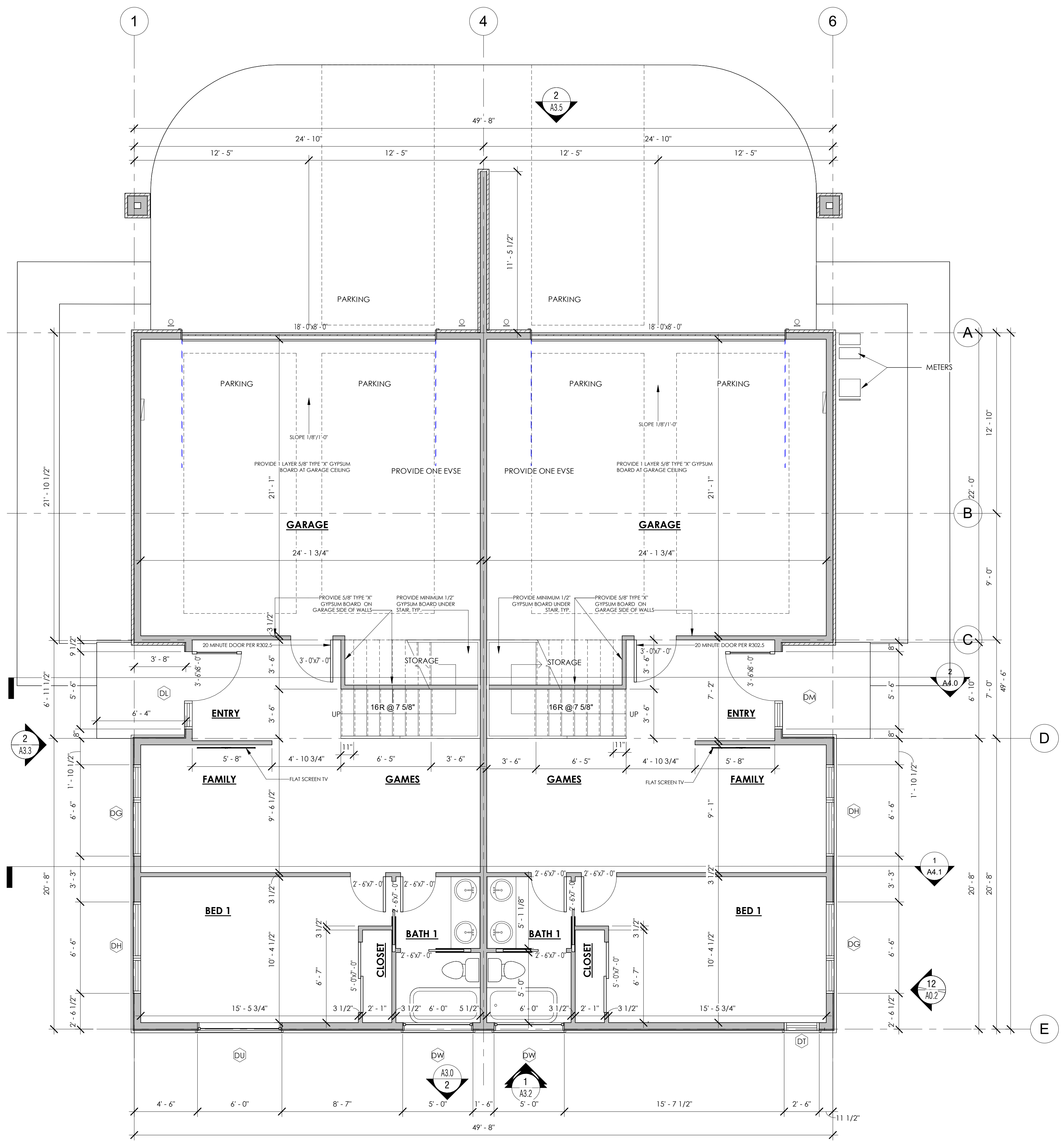


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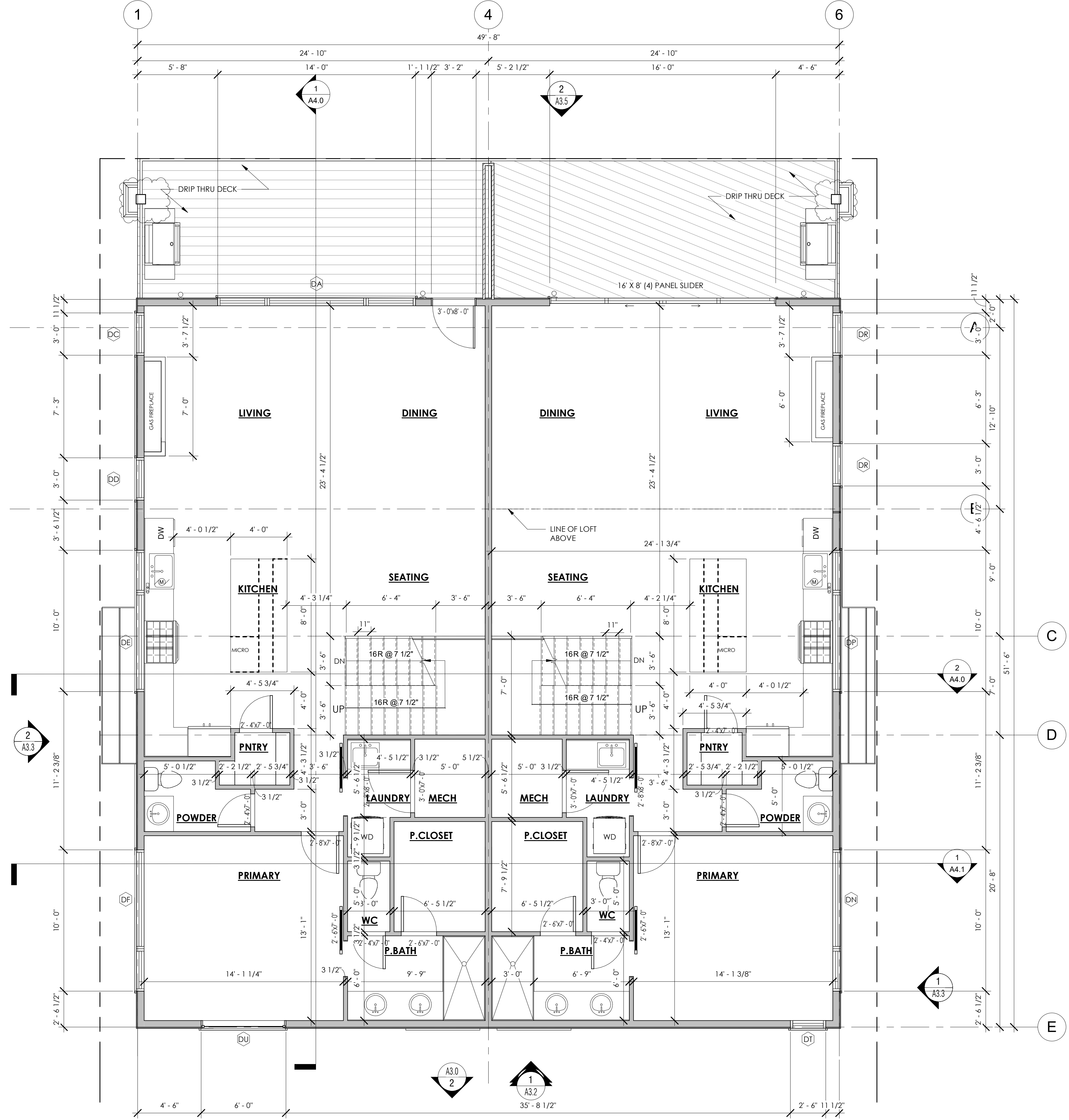
DUPLEX LOWER LEVEL PLAN

**A2.10**



**1** DUPLEX LOWER LEVEL PLAN  
SCALE: 1/4" = 1'-0"





**1** DUPLEX MAIN LEVEL PLAN  
 SCALE: 1/4" = 1'-0"

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DUPLEX MAIN FLOOR PLAN

**A2.11**

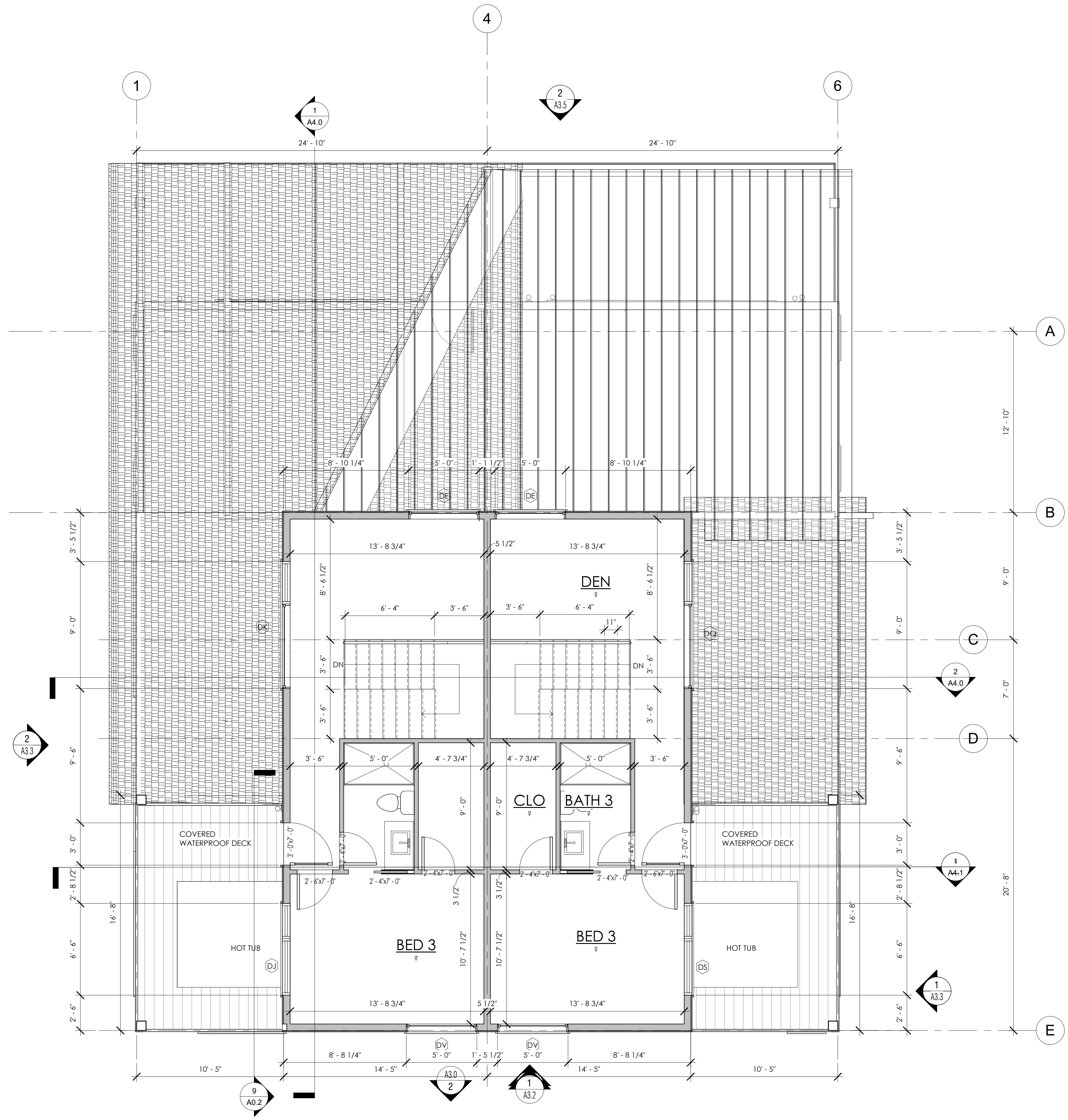


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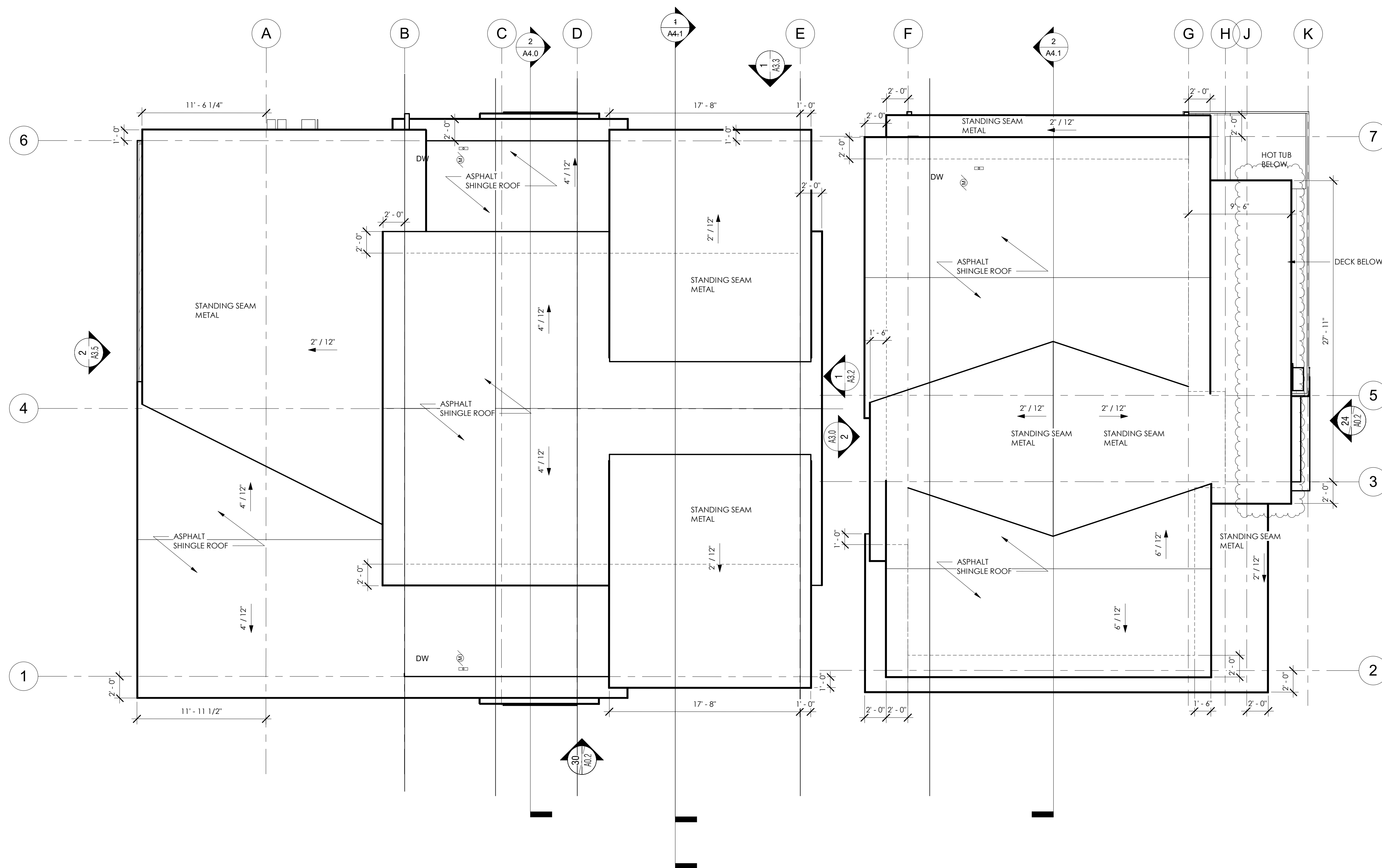
DUPLEX UPPER  
LEVEL PLAN

**A2.12**



**1** DUPLEX UPPER LEVEL PLAN  
SCALE: 1/4" = 1'-0"











- EXTERIOR MATERIAL LEGEND**
1. EXTERIOR LIGHT FIXTURE
  2. STONE VENEER--MOOSE'S TOOTH
  3. 8" COMPOSITE HORIZONTAL SIDING-- LDC
  4. BOARD AND REVERSE BATTEN SIDING-- DIAMOND KOTE SMOKY ASH
  5. 8" VERTICAL SIDING --LDC
  6. ASPHALT ROOF
  7. STANDING SEAM METAL ROOF
  8. 4X4 METAL POST
  9. EXPOSED STEEL BEAM
  10. 3/4" HORIZONTAL METAL RAILING POWDER COATED BLACK
  11. ALUMINUM CLAD WOOD WINDOWS-- BATTLESHIP GRAY
  12. 2X2 COMPOSITE WINDOW AND DOOR TRIM
  13. STAINED WOOD ENTRY DOORS--BATTLESHIP GRAY
  14. STAINED 10" TIMBER HEADER
  15. 12" COMPOSITE BAND BOARD--SMOKY ASH
  16. 4" COMPOSITE BAND BOARD--SMOKY ASH
  17. 8" COMPOSITE FASCIA--SMOKY ASH
  18. HORIZONTAL SIDED GARAGE DOOR
  19. 6X6 STAINED TIMBER POST
  20. STAINED GLULAM BEAM



**1 SFH EAST ELEVATION**  
SCALE: 1/4" = 1'-0"



**2 SFH WEST ELEVATION**  
SCALE: 1/4" = 1'-0"

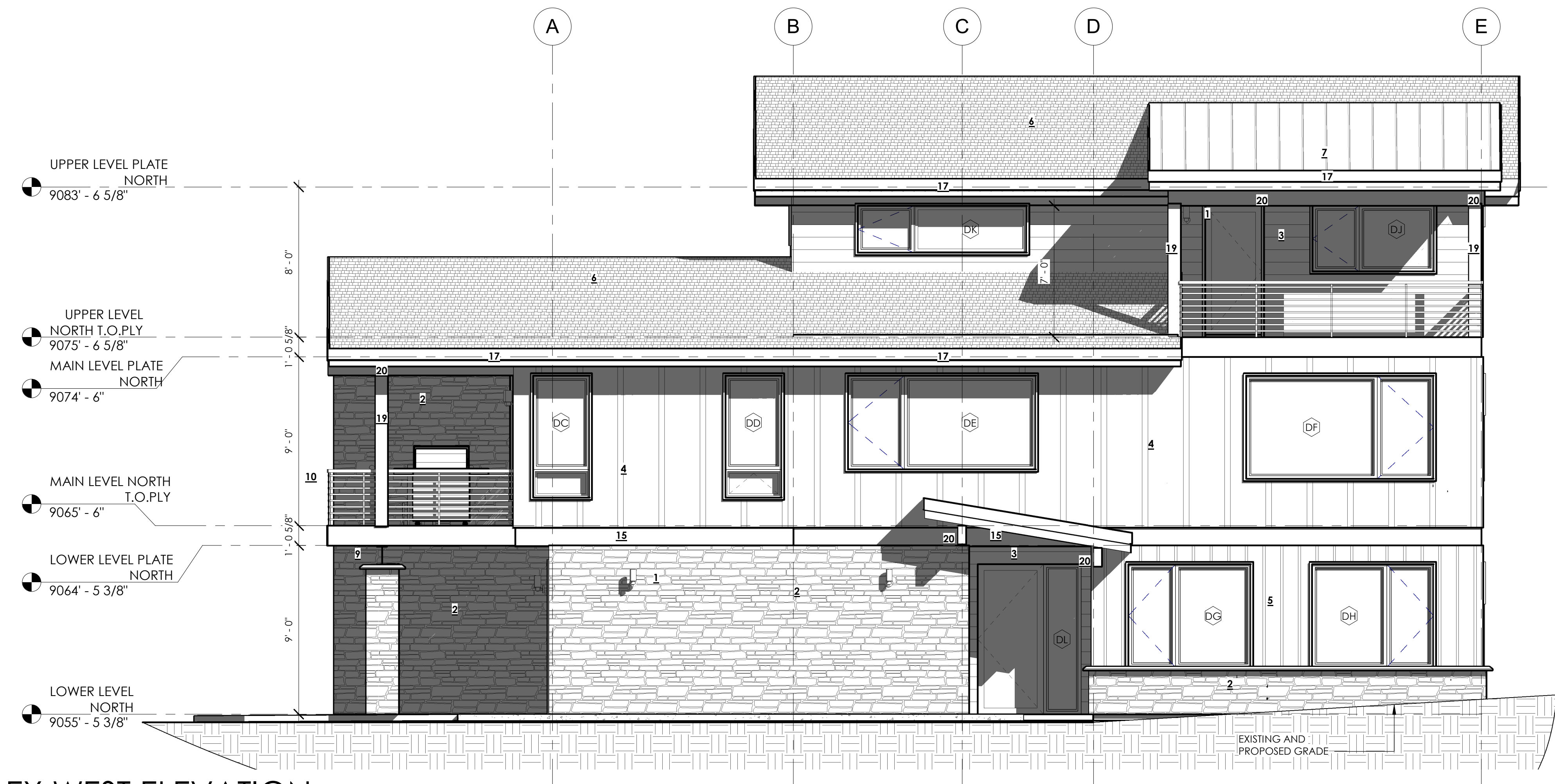
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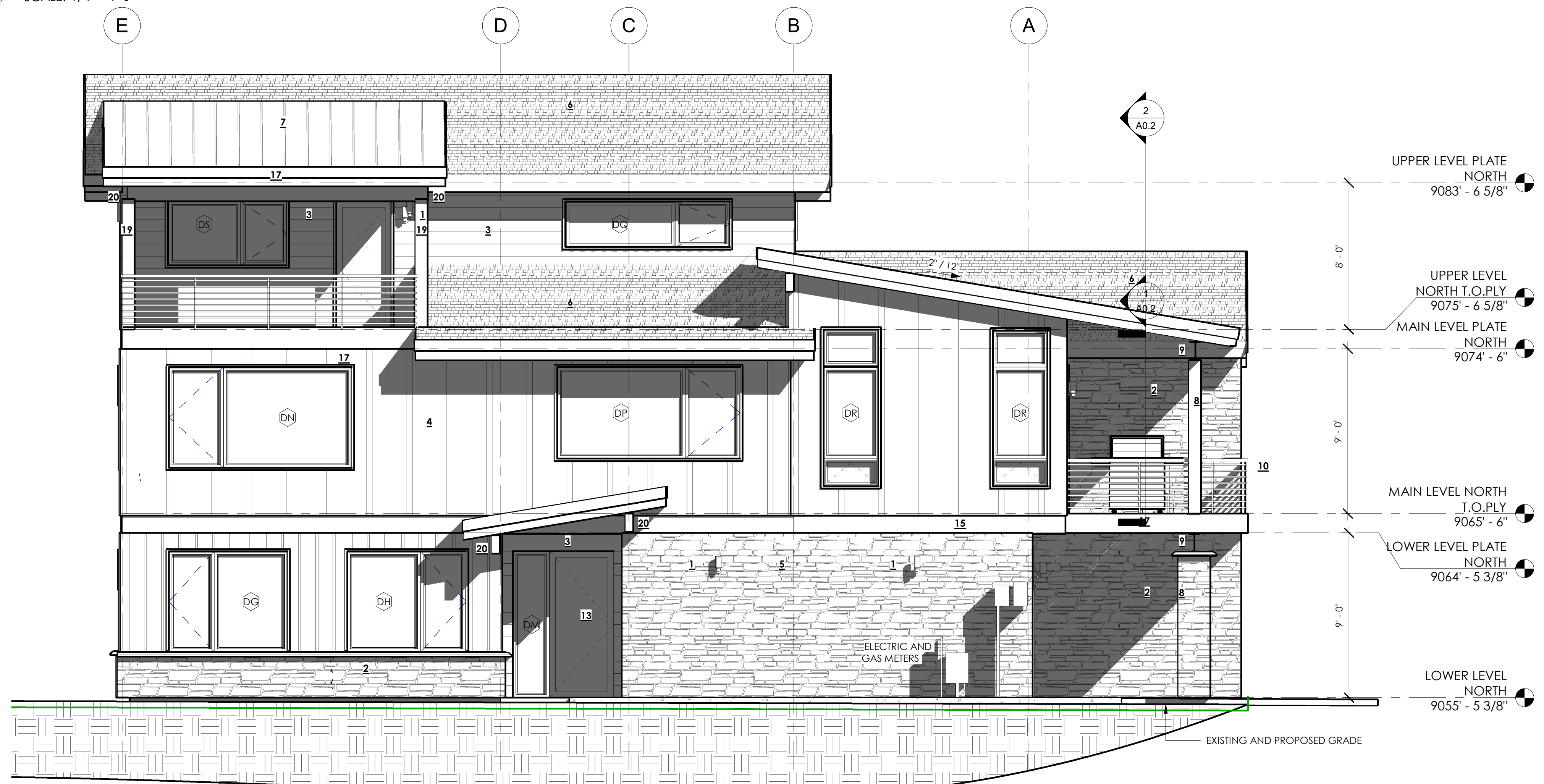
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2 DUPLEX WEST ELEVATION  
SCALE: 1/4" = 1'-0"



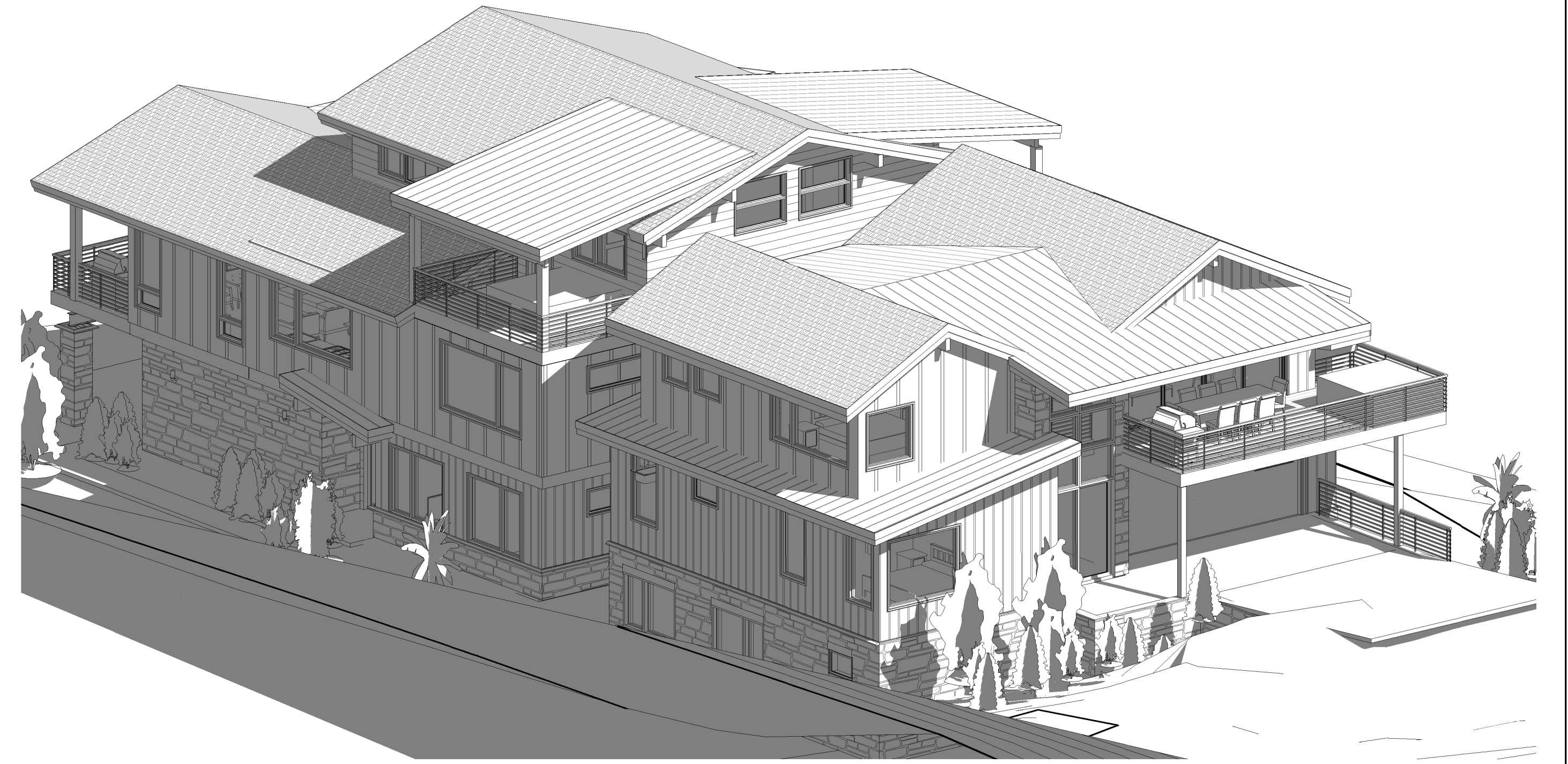
1 DUPLEX EAST ELEVATION  
SCALE: 1/4" = 1'-0"

- EXTERIOR MATERIAL LEGEND**
- EXTERIOR LIGHT FIXTURE
  - STONE VENEER--MOSES TOOTH
  - 8" COMPOSITE HORIZONTAL SIDING-- LDC
  - BOARD AND REVERSE BATTEN SIDING-- DIAMOND KOTE SMOKY ASH
  - 8" VERTICAL SIDING --LDC
  - ASPHALT ROOF
  - STANDING SEAM METAL ROOF
  - 4X4 METAL POST
  - EXPOSED STEEL BEAM
  - 36" HORIZONTAL METAL RAILING POWDER COATED BLACK
  - ALUMINUM CLAD WOOD WINDOWS-- BATTLESHIP GRAY
  - 2X2 COMPOSITE WINDOW AND DOOR TRIM
  - STAINED WOOD ENTRY DOORS--BATTLE SHIP GRAY
  - STAINED 10" TIMBER HEADER
  - 12" COMPOSITE BAND BOARD-- SMOKY ASH
  - 4" COMPOSITE BAND BOARD--SMOKY ASH
  - 8" COMPOSITE FASCIA--SMOKY ASH
  - HORIZONTAL SIDED GARAGE DOOR
  - 6X6 STAINED TIMBER POST
  - STAINED GLULAM BEAM





4 Perspective 4  
SCALE:



2 Perspective 1  
SCALE:



3 Perspective 3  
SCALE:



1 Perspective 2  
SCALE:

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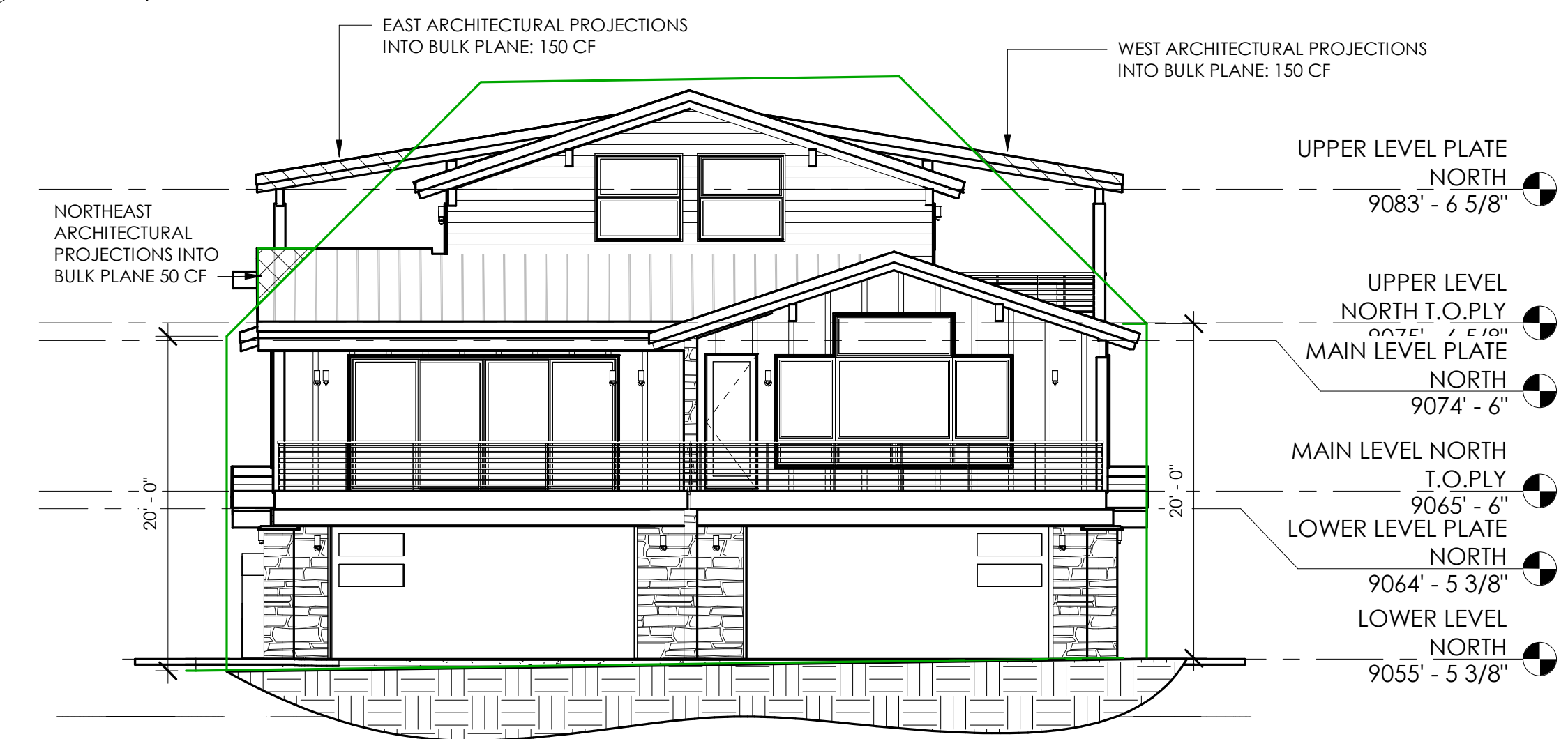
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PERSPECTIVES

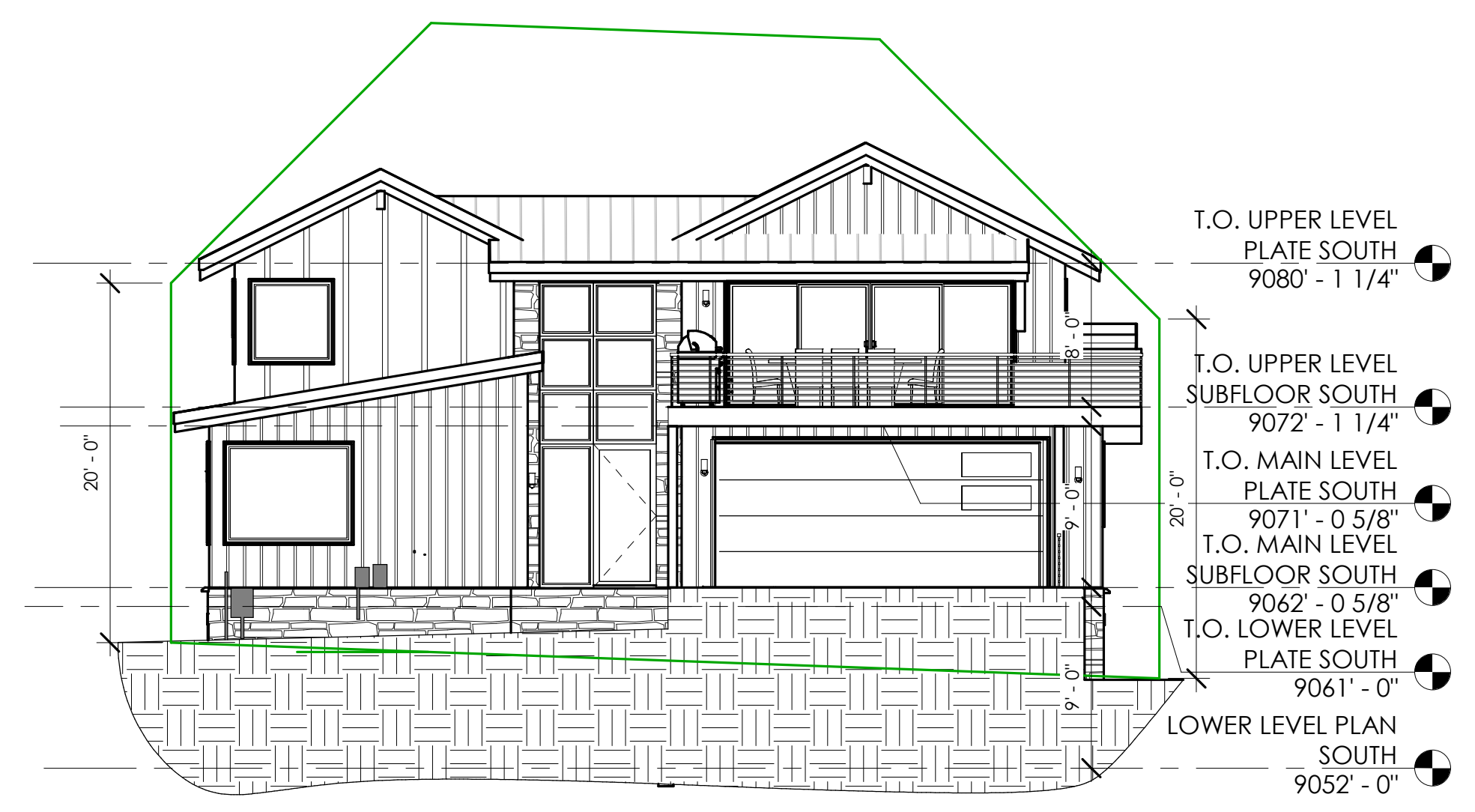




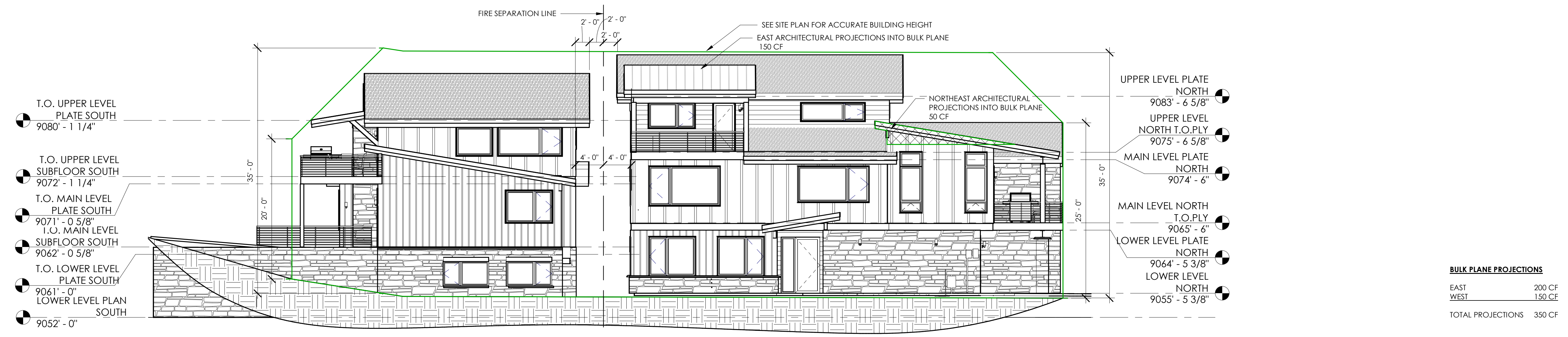
4 WEST ELEVATION- BULK PLANE  
SCALE: 1/8" = 1'-0"



2 NORTH ELEVATION BULK PLANE  
SCALE: 1/8" = 1'-0"



3 SOUTH ELEVATION- BULK PLANE  
SCALE: 1/8" = 1'-0"



1 EAST ELEVATION- BULK PLANE  
SCALE: 1/8" = 1'-0"

**BULK PLANE PROJECTIONS**

EAST	200 CF
WEST	150 CF
TOTAL PROJECTIONS	350 CF

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BULK PLANE

A3.5

**FINAL DRAINAGE REPORT  
411 TELLER STEET  
FRISCO, COLORADO**

**Prepared For:**

Neu Designs  
400 North Park Ave Unit 12B  
Breckridge, CO 80424

**Prepared By:**

Hurst and Associates, Inc.  
1265 S. Public Rd. Suite B  
Lafayette, CO 80026

Job Number 2695-1  
April 22, 2024



## ENGINEER'S CERTIFICATION

I hereby certify that this report for the final drainage of 411 Teller Street was prepared by me (or under my direct supervision) in accordance with the provisions of the Mile High Flood District Storm Drainage Criteria and Town of Frisco requirements for the Owners thereof.

---

Ryan J. Hurst, P.E.  
Colorado License #0054248



## Table Contents

I. GENERAL LOCATION AND DESCRIPTION .....	4
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## I. GENERAL LOCATION AND DESCRIPTION

411 Teller Street is 0.241-acre single family site located in Lots 17, 18 and 19, Block 19, Frisco Town Subdivision, Town of Frisco, County of Summit, State of Colorado. The site is bounded by alley on the north, Teller Street on the south, existing townhomes on the West and East. The site currently has a single-story home, weeds, trees, and other landscaping. The NRCS hydrological soil group for the site is group B soil. See the soil map in **Appendix C**. The site drains from the southwest to the northeast, there is a hill on the south side of the lot that slopes at 25% then continues on at 1.0%. The total area of the site that will be disturbed is 12,8240 square feet. The land use of the site is staying the same with the existing lot being broken up into a new townhome and new single-family house.

The intent of this final drainage report is to present an overview of the existing drainage patterns of the site and propose drainage patterns for the new layout. This report analyzes the impact of storm events only and is not intended to analyze the effects of future irrigation, final lot grading or ground water conditions.

## II. DRAINAGE BASINS

The existing runoff from the site sheet flows roughly to the northeast into the existing crossspan in the alley then to the existing crossspan in 5<sup>th</sup> Avenue. The new proposed townhome and single-family home will have a similar drainage pattern by sheet flows from south to north across the lot into two drywells. The site is made up of 7 roof basins and two ground basins. Basins R2, R4, R5, and G2 flow into the drywell on the northwest of the lot. R1, R3, R6, R7, and G1 flow into the drywell on the northeast side of the lot. Once the flows enter the drywells it will infiltrate back into the soil. See the next section for details.

The site does not lie within the 100-year floodplain according to Federal Emergency Management Agency's Flood Insurance Rate Map for Summit County number 08117C0353F, dated November 16th, 2018.

### III. DRAINAGE DESIGN CRITERIA

The Rational Method was used to determine the storm runoff from the drainage basin. **See Appendix A.** The Rational Method is presented in *Mile High Flood District Criteria Manual*. The onsite runoff and dry wells will be designed considering a 25-year 24-hour storm event in accordance with Town of Frisco design recommendation and the Mile High Flood District’s Urban Storm Drainage Criteria Manuals.

The lot imperviousness will increase from 35% to 49.5% because the new building footprints will increase from the existing. The *Mile High Flood District Criteria Manual* was used to calculate runoff coefficients. The minor storm C<sub>2</sub> has increased from 0.25 to 0.37 while the major storm C<sub>25</sub> increases from 0.47 to 0.56. This will cause the Q<sub>2</sub> to increase from 0.24 cfs to 0.46 cfs while Q<sub>25</sub> will go from 0.83 cfs to 1.26 cfs.

#### Basin Runoff

Basin	Area (acres)	C <sub>2</sub>	C <sub>5</sub>	C <sub>25</sub>	T <sub>c</sub> (mins)	I <sub>2</sub> (in/hr)	I <sub>5</sub> (in/hr)	I <sub>25</sub> (in/hr)	Q <sub>2</sub> (cfs)	Q <sub>5</sub> (cfs)	Q <sub>25</sub> (cfs)
R1	0.02	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.07	0.09	0.14
R2	0.03	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.11	0.14	0.21
R3	0.02	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.07	0.09	0.14
R4	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.04	0.05	0.07
R5	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.04	0.05	0.08
R6	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.04	0.04	0.07
R7	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.05	0.06	0.09
G1	0.13	0.14	0.16	0.38	6.8	3.84	4.77	6.88	0.07	0.10	0.35
G2	0.07	0.13	0.15	0.38	5.0	4.21	5.22	7.53	0.04	0.05	0.19
WEST	0.12	0.41	0.44	0.59	5.0	4.21	5.22	7.53	0.21	0.28	0.54
EAST	0.20	0.34	0.38	0.54	6.8	3.84	4.77	6.88	0.27	0.37	0.76
TOTAL	0.33	0.37	0.40	0.56	6.8	3.84	4.77	6.88	0.46	0.62	1.26
<b>Undeveloped</b>											
A1	0.24	0.25	0.27	0.47	5.5	4.10	5.09	7.34	0.24	0.34	0.83
OS1	0.06	0.03	0.03	0.28	5.0	4.21	5.22	7.53	0.01	0.01	0.12

### IV. DRAINAGE FACILITY DESIGN

The dry wells are sized using full spectrum detention design as described in the *Urban Storm Drainage Criteria Manual, Volume 2* will be used. The 25-year volume was



determined by using Urban Drainage detention workbook. See **Appendix B**. The dry wells have a grated opening should the wells fill beyond the 25-year volume.

**West Drywell Pond Characteristics**

**WQCV Vol. 25-Yr Vol.**

0.002 ac-ft      0.012 ac-ft

The 25-year Volume will be captured and released over approximately 42.8 hours.

**East Drywell Pond Characteristics**

**WQCV Vol. 25-Yr Vol.**

0.003 ac-ft      0.017 ac-ft

The 25-year Volume will be captured and released over approximately 42.3 hours.

**V. SUMMARY**

The drainage facilities are designed to capture developed runoff and mimic the historical rates for minor and major storm events. All facilities will be designed using Urban Drainage and Town of Frisco Criteria.

This report presents drainage facilities designed for storm events only. The facilities are not designed for any excess irrigation water or subsurface drainage.

## VI. REFERENCES

1. Mile High Flood District. June 2001, Revised April 2008. *Urban Storm Drainage Criteria Manual Volumes 1 and 2.*
2. Mile High Flood District. November 2010. *Urban Storm Drainage Criteria Manual Volume 3, Best Management Practices.*

## VII. APPENDICES

Rational Method Runoff Analysis.....	<b>Appendix A</b>
Dry Wells Design.....	<b>Appendix B</b>
Maps.....	<b>Appendix C</b>
1.    FIRM Map	
2.    USDA Soil Survey Map	
3.    Drainage Plan	



**APPENDIX A**  
**RATIONAL METHOD**  
**RUNOFF CALCULATIONS**

Runoff Coefficients

Basin	Area (ac.)	% Imperviousness Calculations					NRCS Soil Groups			2-Year			5-Year			25-Year			Runoff Coefficients			
		SFR (45%) (acres)	Lawns (5%) (acres)	Roof (95%) (acres)	Paved (95%) (acres)	Gravel (80%) (acres)	% Imp.	% A	% B	% C/D	C <sub>A</sub>	C <sub>B</sub>	C <sub>C/D</sub>	C <sub>A</sub>	C <sub>B</sub>	C <sub>C/D</sub>	C <sub>A</sub>	C <sub>B</sub>	C <sub>C/D</sub>	C <sub>2</sub>	C <sub>5</sub>	C <sub>25</sub>
R1	0.022	0.00	0.00	0.02	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
R2	0.032	0.00	0.00	0.03	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
R3	0.022	0.00	0.00	0.02	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
R4	0.011	0.00	0.00	0.01	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
R5	0.012	0.00	0.00	0.01	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
R6	0.011	0.00	0.00	0.01	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
R7	0.015	0.00	0.00	0.01	0.00	0.00	95.0	0	100	0	0.79	0.79	0.79	0.81	0.81	0.81	0.83	0.85	0.85	0.79	0.81	0.85
G1	0.134	0.00	0.11	0.00	0.02	0.00	21.5	0	100	0	0.11	0.14	0.15	0.12	0.16	0.21	0.16	0.38	0.44	0.14	0.16	0.38
G2	0.067	0.00	0.06	0.00	0.01	0.00	20.2	0	100	0	0.10	0.13	0.14	0.11	0.15	0.20	0.15	0.38	0.43	0.13	0.15	0.38
WEST	0.122	0.00	0.06	0.06	0.01	0.00	54.1	0	100	0	0.38	0.41	0.42	0.39	0.44	0.48	0.44	0.59	0.62	0.41	0.44	0.59
EAST	0.204	0.00	0.11	0.07	0.02	0.00	46.8	0	100	0	0.31	0.34	0.36	0.33	0.38	0.42	0.38	0.54	0.58	0.34	0.38	0.54
TOTAL	0.326	0.00	0.16	0.13	0.04	0.00	49.5	0	100	0	0.34	0.37	0.38	0.35	0.40	0.44	0.40	0.56	0.60	0.37	0.40	0.56

Undeveloped

A1	0.24	0.00	0.16	0.05	0.01	0.02	35.1	0	100	0	0.21	0.25	0.26	0.23	0.27	0.32	0.27	0.47	0.52	0.25	0.27	0.47
OS1	0.06	0.00	0.06	0.00	0.00	0.00	5.0	0	100	0	0.02	0.03	0.03	0.02	0.03	0.08	0.03	0.28	0.35	0.03	0.03	0.28

Times of Concentration

Basin	% Imperviousness	C <sub>5</sub>	Overland Flow			Channelized Flow					T <sub>c</sub> Eqn. 6-2 (min.)	Length (ft)	Slope (ft)	T <sub>c</sub> Eqn. 6-5 (min.)	Design T <sub>c</sub> (min.)
			Length (ft)	Slope (ft/ft)	T <sub>i</sub> Eqn. 6-3 (mins)	Length (ft)	Slope (ft/ft)	K	Note	T <sub>t</sub> Eqn. 6-4 (mins)					
R1	0.95	0.81	23	0.167	1.0	22	0.010	20	Roof Gutter	0.2	5.0	22	0.010	10.0	5.0
R2	0.95	0.81	26	0.167	1.1	62	0.010	20	Roof Gutter	0.5	5.0	62	0.010	10.3	5.0
R3	0.95	0.81	26	0.167	1.1	38	0.010	20	Roof Gutter	0.3	5.0	38	0.010	10.1	5.0
R4	0.95	0.81	18	0.167	0.9	37	0.010	20	Roof Gutter	0.3	5.0	37	0.010	10.1	5.0
R5	0.95	0.81	20	0.167	0.9	6	0.010	20	Roof Gutter	0.1	5.0	6	0.010	9.9	5.0
R6	0.95	0.81	15	0.500	0.6	27	0.010	20	Roof Gutter	0.2	5.0	27	0.010	10.1	5.0
R7	0.95	0.81	18	0.167	0.9	39	0.010	20	Roof Gutter	0.3	5.0	39	0.010	10.1	5.0
G1	0.22	0.16	92	0.164	6.5	91	0.077	15	Grass Swale	0.4	6.8	91	0.077	22.8	6.8
G2	0.20	0.15	36	0.281	3.4	100	0.030	15	Grass Swale	0.6	5.0	100	0.030	23.4	5.0

Undeveloped

A1	0.35	0.27	69	0.146	5.1	38	0.026	10	Bare Ground	0.4	5.5	38	0.026	20.3	5.5
OS1	0.05	0.03	18	0.497	2.3	54	0.055	10	Bare Ground	0.4	5.0	54	0.055	25.5	5.0

Intensity = 28.5 \* P<sub>1</sub> / ((10 + T<sub>c</sub>)<sup>0.786</sup>)

Town of Frisco 24-Hour Rainfall Depths

2-Year = 1.24

5-Year = 1.54

25-Year = 2.22

P<sub>1</sub> = 24-hour point rainfall depth

T<sub>c</sub> = Time of Concentration

Basin	Area (acres)	C <sub>2</sub>	C <sub>5</sub>	C <sub>25</sub>	T <sub>c</sub> (mins)	I <sub>2</sub> (in/hr)	I <sub>5</sub> (in/hr)	I <sub>25</sub> (in/hr)	Q <sub>2</sub> (cfs)	Q <sub>5</sub> (cfs)	Q <sub>25</sub> (cfs)
R1	0.02	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.07	0.09	0.14
R2	0.03	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.11	0.14	0.21
R3	0.02	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.07	0.09	0.14
R4	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.04	0.05	0.07
R5	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.04	0.05	0.08
R6	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.04	0.04	0.07
R7	0.01	0.79	0.81	0.85	5.0	4.21	5.22	7.53	0.05	0.06	0.09
G1	0.13	0.14	0.16	0.38	6.8	3.84	4.77	6.88	0.07	0.10	0.35
G2	0.07	0.13	0.15	0.38	5.0	4.21	5.22	7.53	0.04	0.05	0.19
WEST	0.12	0.41	0.44	0.59	5.0	4.21	5.22	7.53	0.21	0.28	0.54
EAST	0.20	0.34	0.38	0.54	6.8	3.84	4.77	6.88	0.27	0.37	0.76
TOTAL	0.33	0.37	0.40	0.56	6.8	3.84	4.77	6.88	0.46	0.62	1.26

Undeveloped

A1	0.24	0.25	0.27	0.47	5.5	4.10	5.09	7.34	0.24	0.34	0.83
OS1	0.06	0.03	0.03	0.28	5.0	4.21	5.22	7.53	0.01	0.01	0.12





**NOAA Atlas 14, Volume 8, Version 2**  
**Location name: Frisco, Colorado, USA\***  
**Latitude: 39.5742°, Longitude: -106.0967°**  
**Elevation: 9061 ft\*\***



\* source: ESRI Maps  
 \*\* source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

**PF tabular**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
<b>5-min</b>	<b>0.134</b> (0.105-0.174)	<b>0.175</b> (0.137-0.228)	<b>0.246</b> (0.191-0.321)	<b>0.308</b> (0.238-0.404)	<b>0.398</b> (0.299-0.551)	<b>0.471</b> (0.345-0.662)	<b>0.548</b> (0.388-0.793)	<b>0.630</b> (0.427-0.941)	<b>0.743</b> (0.484-1.15)	<b>0.832</b> (0.527-1.30)
<b>10-min</b>	<b>0.196</b> (0.153-0.255)	<b>0.256</b> (0.200-0.333)	<b>0.360</b> (0.280-0.470)	<b>0.450</b> (0.349-0.592)	<b>0.583</b> (0.438-0.807)	<b>0.690</b> (0.506-0.969)	<b>0.803</b> (0.568-1.16)	<b>0.922</b> (0.625-1.38)	<b>1.09</b> (0.708-1.68)	<b>1.22</b> (0.771-1.91)
<b>15-min</b>	<b>0.239</b> (0.187-0.311)	<b>0.312</b> (0.244-0.407)	<b>0.439</b> (0.342-0.573)	<b>0.549</b> (0.426-0.722)	<b>0.710</b> (0.535-0.984)	<b>0.842</b> (0.617-1.18)	<b>0.979</b> (0.693-1.42)	<b>1.12</b> (0.762-1.68)	<b>1.33</b> (0.864-2.05)	<b>1.49</b> (0.941-2.32)
<b>30-min</b>	<b>0.328</b> (0.257-0.427)	<b>0.412</b> (0.323-0.537)	<b>0.562</b> (0.438-0.734)	<b>0.698</b> (0.541-0.917)	<b>0.903</b> (0.683-1.26)	<b>1.08</b> (0.791-1.52)	<b>1.26</b> (0.894-1.83)	<b>1.46</b> (0.992-2.19)	<b>1.74</b> (1.14-2.70)	<b>1.97</b> (1.25-3.08)
<b>60-min</b>	<b>0.422</b> (0.331-0.549)	<b>0.505</b> (0.395-0.658)	<b>0.658</b> (0.513-0.860)	<b>0.802</b> (0.622-1.05)	<b>1.02</b> (0.778-1.43)	<b>1.22</b> (0.897-1.72)	<b>1.42</b> (1.01-2.08)	<b>1.65</b> (1.12-2.48)	<b>1.98</b> (1.30-3.07)	<b>2.25</b> (1.42-3.52)
<b>2-hr</b>	<b>0.516</b> (0.409-0.664)	<b>0.598</b> (0.473-0.770)	<b>0.755</b> (0.595-0.975)	<b>0.906</b> (0.710-1.18)	<b>1.15</b> (0.882-1.59)	<b>1.36</b> (1.01-1.90)	<b>1.59</b> (1.14-2.29)	<b>1.84</b> (1.27-2.75)	<b>2.22</b> (1.47-3.42)	<b>2.53</b> (1.62-3.92)
<b>3-hr</b>	<b>0.584</b> (0.465-0.746)	<b>0.659</b> (0.524-0.843)	<b>0.806</b> (0.639-1.04)	<b>0.952</b> (0.751-1.23)	<b>1.19</b> (0.921-1.64)	<b>1.40</b> (1.05-1.95)	<b>1.63</b> (1.18-2.34)	<b>1.89</b> (1.31-2.80)	<b>2.27</b> (1.51-3.46)	<b>2.58</b> (1.66-3.97)
<b>6-hr</b>	<b>0.709</b> (0.571-0.896)	<b>0.799</b> (0.643-1.01)	<b>0.968</b> (0.776-1.23)	<b>1.13</b> (0.901-1.44)	<b>1.39</b> (1.08-1.88)	<b>1.61</b> (1.22-2.21)	<b>1.85</b> (1.36-2.62)	<b>2.12</b> (1.49-3.11)	<b>2.52</b> (1.69-3.80)	<b>2.84</b> (1.85-4.33)
<b>12-hr</b>	<b>0.870</b> (0.708-1.09)	<b>0.999</b> (0.813-1.25)	<b>1.23</b> (1.00-1.55)	<b>1.45</b> (1.17-1.83)	<b>1.78</b> (1.40-2.38)	<b>2.06</b> (1.58-2.79)	<b>2.36</b> (1.74-3.30)	<b>2.70</b> (1.90-3.89)	<b>3.17</b> (2.15-4.72)	<b>3.55</b> (2.33-5.35)
<b>24-hr</b>	<b>1.08</b> (0.888-1.33)	<b>1.24</b> (1.02-1.54)	<b>1.54</b> (1.26-1.91)	<b>1.81</b> (1.48-2.26)	<b>2.22</b> (1.77-2.93)	<b>2.57</b> (1.99-3.44)	<b>2.94</b> (2.20-4.06)	<b>3.35</b> (2.39-4.77)	<b>3.93</b> (2.69-5.78)	<b>4.40</b> (2.92-6.55)
<b>2-day</b>	<b>1.34</b> (1.11-1.63)	<b>1.52</b> (1.26-1.86)	<b>1.85</b> (1.54-2.27)	<b>2.16</b> (1.78-2.66)	<b>2.63</b> (2.11-3.42)	<b>3.02</b> (2.37-4.00)	<b>3.45</b> (2.60-4.71)	<b>3.92</b> (2.83-5.53)	<b>4.59</b> (3.18-6.69)	<b>5.14</b> (3.44-7.56)
<b>3-day</b>	<b>1.50</b> (1.26-1.82)	<b>1.72</b> (1.44-2.08)	<b>2.09</b> (1.75-2.55)	<b>2.44</b> (2.02-2.98)	<b>2.96</b> (2.39-3.82)	<b>3.39</b> (2.67-4.45)	<b>3.86</b> (2.93-5.21)	<b>4.36</b> (3.17-6.10)	<b>5.08</b> (3.54-7.34)	<b>5.66</b> (3.82-8.28)
<b>4-day</b>	<b>1.64</b> (1.38-1.98)	<b>1.88</b> (1.58-2.26)	<b>2.29</b> (1.92-2.77)	<b>2.66</b> (2.22-3.24)	<b>3.21</b> (2.60-4.12)	<b>3.67</b> (2.90-4.78)	<b>4.16</b> (3.17-5.59)	<b>4.69</b> (3.42-6.51)	<b>5.43</b> (3.80-7.80)	<b>6.02</b> (4.09-8.78)
<b>7-day</b>	<b>2.02</b> (1.72-2.41)	<b>2.27</b> (1.93-2.72)	<b>2.72</b> (2.30-3.26)	<b>3.12</b> (2.62-3.76)	<b>3.71</b> (3.03-4.70)	<b>4.20</b> (3.34-5.40)	<b>4.71</b> (3.62-6.26)	<b>5.26</b> (3.87-7.23)	<b>6.04</b> (4.26-8.58)	<b>6.65</b> (4.55-9.61)
<b>10-day</b>	<b>2.34</b> (2.00-2.77)	<b>2.61</b> (2.23-3.10)	<b>3.09</b> (2.63-3.68)	<b>3.51</b> (2.97-4.20)	<b>4.13</b> (3.39-5.18)	<b>4.64</b> (3.72-5.93)	<b>5.18</b> (4.00-6.83)	<b>5.75</b> (4.25-7.85)	<b>6.55</b> (4.65-9.26)	<b>7.20</b> (4.95-10.3)
<b>20-day</b>	<b>3.21</b> (2.78-3.76)	<b>3.56</b> (3.08-4.18)	<b>4.17</b> (3.59-4.90)	<b>4.69</b> (4.02-5.55)	<b>5.45</b> (4.52-6.74)	<b>6.06</b> (4.91-7.63)	<b>6.70</b> (5.23-8.71)	<b>7.37</b> (5.51-9.92)	<b>8.30</b> (5.95-11.6)	<b>9.04</b> (6.29-12.8)
<b>30-day</b>	<b>3.94</b> (3.44-4.58)	<b>4.38</b> (3.81-5.10)	<b>5.12</b> (4.44-5.98)	<b>5.75</b> (4.95-6.75)	<b>6.63</b> (5.53-8.12)	<b>7.34</b> (5.97-9.15)	<b>8.06</b> (6.32-10.4)	<b>8.81</b> (6.61-11.7)	<b>9.83</b> (7.08-13.6)	<b>10.6</b> (7.44-15.0)
<b>45-day</b>	<b>4.89</b> (4.29-5.64)	<b>5.45</b> (4.78-6.30)	<b>6.38</b> (5.57-7.39)	<b>7.14</b> (6.20-8.33)	<b>8.19</b> (6.86-9.92)	<b>9.01</b> (7.36-11.1)	<b>9.82</b> (7.74-12.5)	<b>10.6</b> (8.03-14.1)	<b>11.7</b> (8.50-16.1)	<b>12.6</b> (8.86-17.6)
<b>60-day</b>	<b>5.72</b> (5.04-6.56)	<b>6.39</b> (5.63-7.35)	<b>7.48</b> (6.57-8.63)	<b>8.37</b> (7.30-9.71)	<b>9.56</b> (8.03-11.5)	<b>10.5</b> (8.58-12.8)	<b>11.3</b> (8.97-14.3)	<b>12.2</b> (9.24-16.0)	<b>13.3</b> (9.69-18.1)	<b>14.2</b> (10.0-19.7)

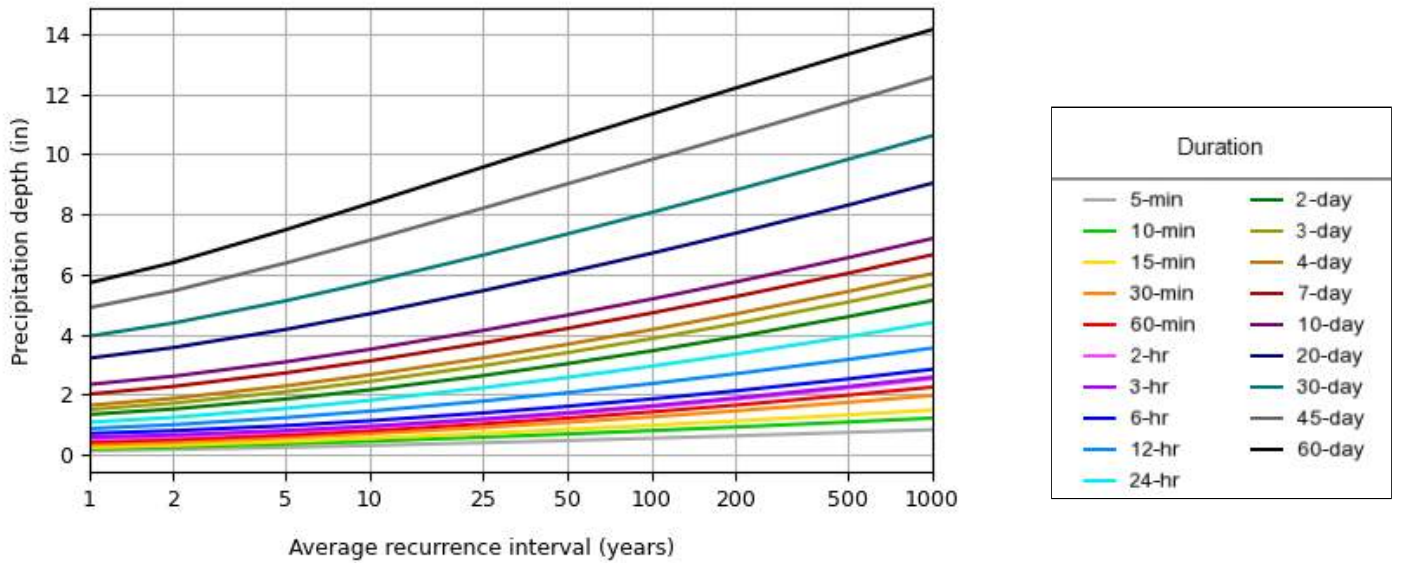
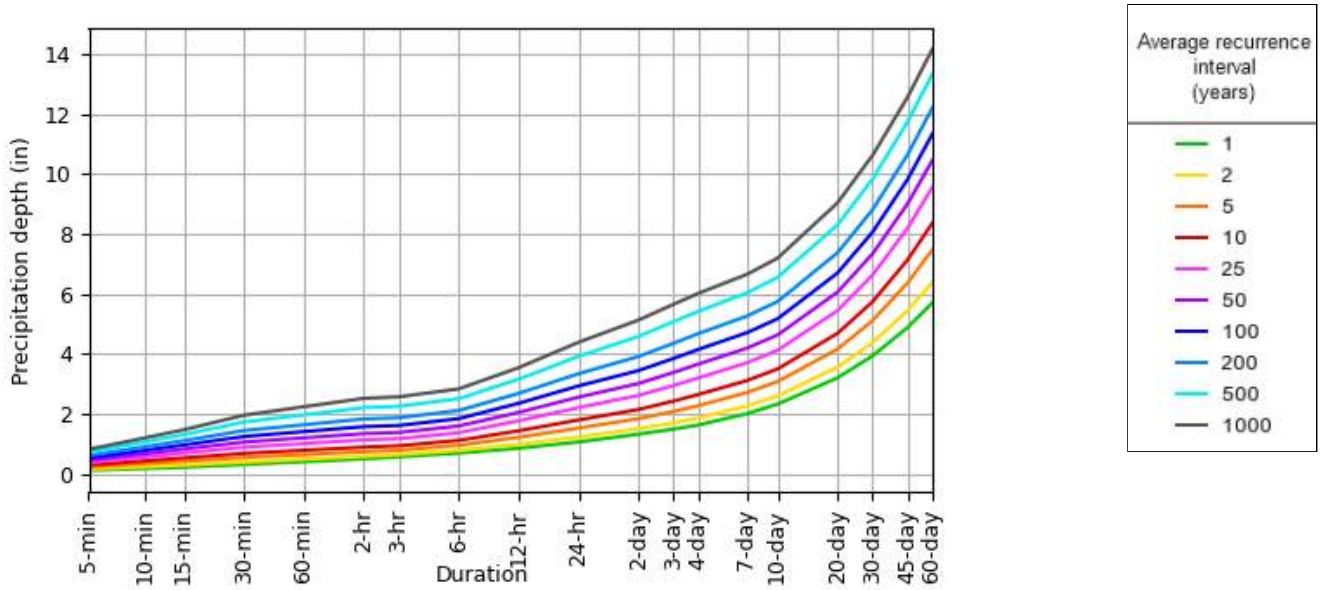
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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**PF graphical**

PDS-based depth-duration-frequency (DDF) curves

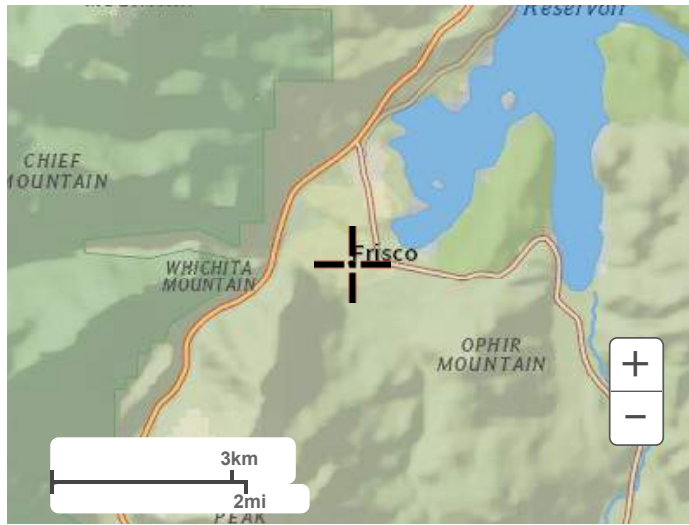
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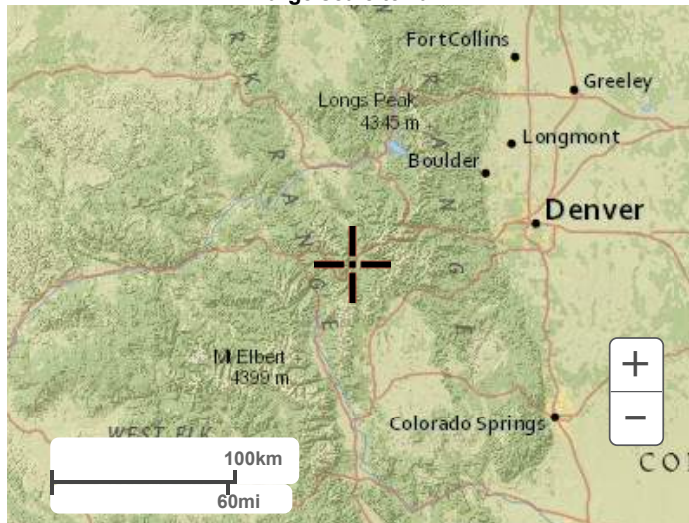
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**Maps & aerials**

**Small scale terrain**



Large scale terrain

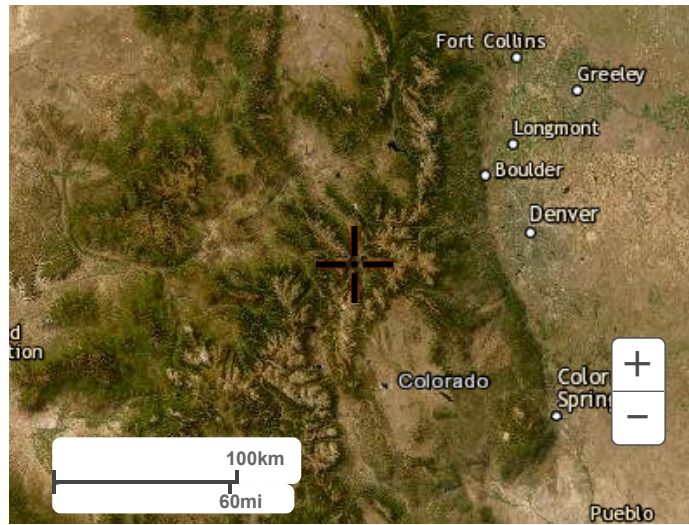


Large scale map



Large scale aerial





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[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

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**APPENDIX B**  
**DRY WELL DESIGN**

**West Side Runoff Volume Calculations**

Contributing Basins :	R2,R4,R5,G2
Area =	0.122 acres
% Imperviousness =	54.1 %
% Type A Hydrologic Soils =	0.0 %
% Type B Hydrologic Soils =	100.0 %
% Type C/D Hydrologic Soils =	0.0 %

**Water Quality Capture Volume**

<b>Required WQVC Detention Volume <math>V_2</math> =</b>	<b>0.002 ac-ft</b>
<i>*Weighted Soil Average</i>	

*\*From MHFD Detention Worksheet*

**25-Year Volume**

<b>Required 25-Year Detention Volume <math>V_{100}</math> =</b>	<b>0.012 ac-ft</b>
<i>*Weighted Soil Average</i>	

*\*From MHFD Detention Worksheet*

**Drywell Stage- Storage Relationship**

W.S.E.	Depth (ft)	W.S.E. Area (s.f.)	Incremental Volume (c.f.)	Volume (c.f.)	Volume (ac-ft)	Note
9046.00	0	100	0	0	0	Bottom
<b>9046.78</b>	<b>0.78</b>	<b>100</b>	<b>78</b>	<b>78</b>	<b>0.002</b>	<b>WQCV W.S.E.</b>
9047.00	1.00	100	100	100	0.002	
9048.00	2.00	100	100	200	0.005	
9049.00	3.00	100	100	300	0.007	
9050.00	4.00	100	100	400	0.009	
9051.00	5.00	100	100	300	0.007	
9052.00	6.00	100	100	400	0.009	
9053.00	7.00	100	100	500	0.011	
<b>9053.05</b>	<b>7.05</b>	<b>100</b>	<b>5</b>	<b>505</b>	<b>0.012</b>	<b>25-Yr W.S.E.</b>
9054.00	8.00	100	100	600	0.014	

**Infiltration Release**

\*per Geotechnical Engineering Study by Kumar & Associates dated 11/30/23

Soil Type = (GW-GM) Well graded silty gravel

Permeability = 0.00328 - 0.0000328 ft/s

Drain Time = 42.79 (hrs)





**East Side Runoff Volume Calculations**

Contributing Basins :	R1,R3,R6,R7,G1
Area =	0.204 acres
% Imperviousness =	46.8 %
% Type A Hydrologic Soils =	0.0 %
% Type B Hydrologic Soils =	100.0 %
% Type C/D Hydrologic Soils =	0.0 %

**Water Quality Capture Volume**

<b>Required WQVC Detention Volume <math>V_2</math> =</b>	<b>0.003 ac-ft</b>
<i>*Weighted Soil Average</i>	

*\*From MHFD Detention Worksheet*

WQVC Drain Time =	12 hours
WQCV Release Rate =	0.0027 cfs
WQCV Unit Release Rate =	0.013 cfs/acre

**25-Year Volume**

<b>Required 25-Year Detention Volume <math>V_{100}</math> =</b>	<b>0.017 ac-ft</b>
<i>*Weighted Soil Average</i>	

*\*From MHFD Detention Worksheet*

**Drywell Stage- Storage Relationship**

W.S.E.	Depth (ft)	W.S.E. Area (s.f.)	Incremental Volume (c.f.)	Volume (c.f.)	Volume (ac-ft)	Note
9046.00	0	150	0	0	0	Bottom
<b>9046.78</b>	<b>0.78</b>	<b>150</b>	<b>118</b>	<b>118</b>	<b>0.003</b>	<b>WQCV W.S.E.</b>
9047.00	1.00	150	150	150	0.003	
9048.00	2.00	150	150	300	0.007	
9049.00	3.00	150	150	450	0.010	
9050.00	4.00	150	150	600	0.014	
9051.00	5.00	150	150	450	0.010	
9052.00	6.00	150	150	600	0.014	
<b>9052.99</b>	<b>6.99</b>	<b>150</b>	<b>149</b>	<b>749</b>	<b>0.017</b>	<b>25-Yr W.S.E.</b>
9053.00	7.00	150	150	750	0.017	

**Infiltration Release**

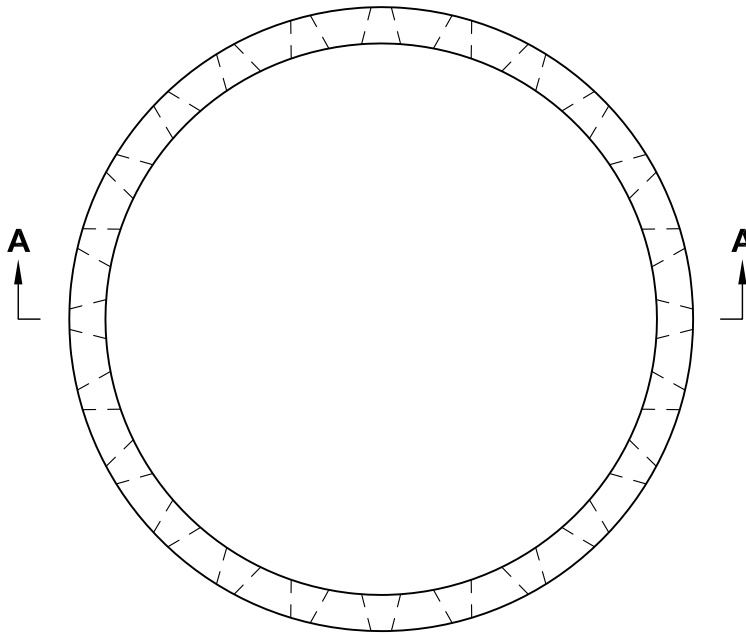
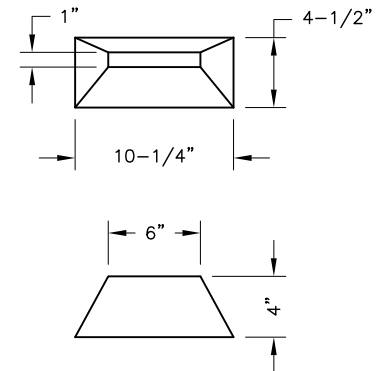
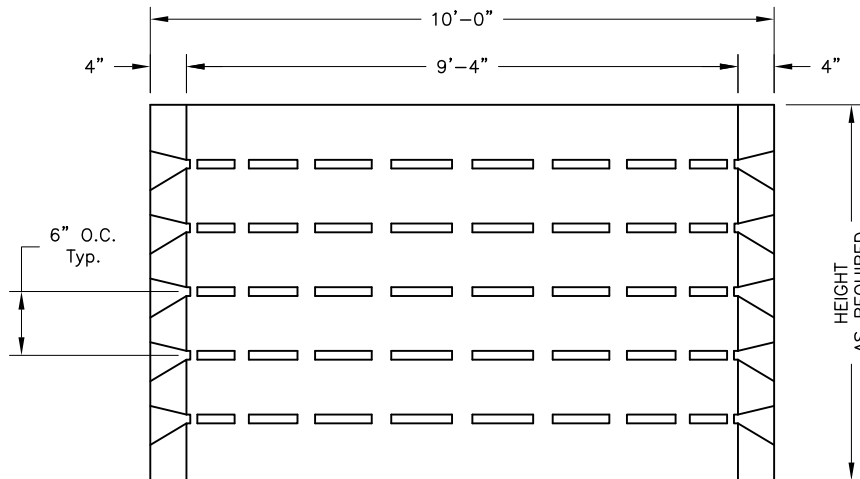
\*per Geotechnical Engineering Study by Kumar & Associates dated 11/30/23

Permeability = 0.00328 - 0.0000328 ft/s

Drain Time = 42.30 (hrs)



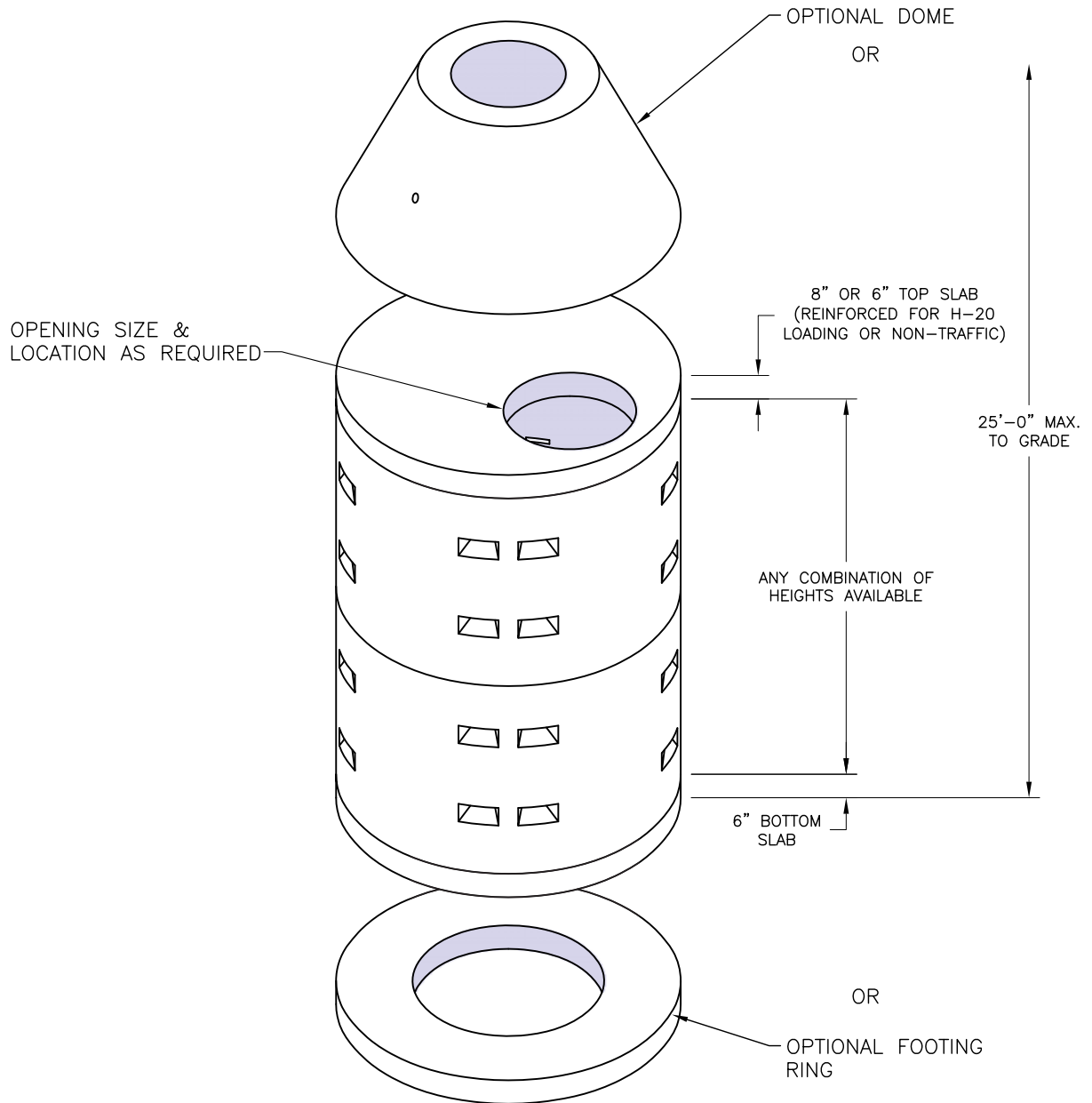



**PLAN**

**LEACHING BLOCK DETAIL**

**SECTION A-A**

SPECIFICATIONS				
RING HEIGHTS	LEACHING AREA	VOLUME C.F.	VOLUME GAL.	APPROX. WEIGHT/LBS.
3'-0"	94 S.F.	205	1536	3650
4'-0"	126 S.F.	273	2048	4800
5'-0"	157 S.F.	342	2559	5900

**GENERAL NOTES:**

1. Concrete: 28 Day Compressive Strength  $f'_c = 4,000\text{psi}$ .
2. Steel Reinforcement: ASTM A-615, Grade 60, ASTM A-185.



**APPENDIX C**  
**MAPS**



**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only landward of 0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, NNGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, Maryland 20910-3282  
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

**Base map** information shown on this FIRM was derived from NAIP Orthophotography produced with a one meter ground resolution from photography dated 2011.

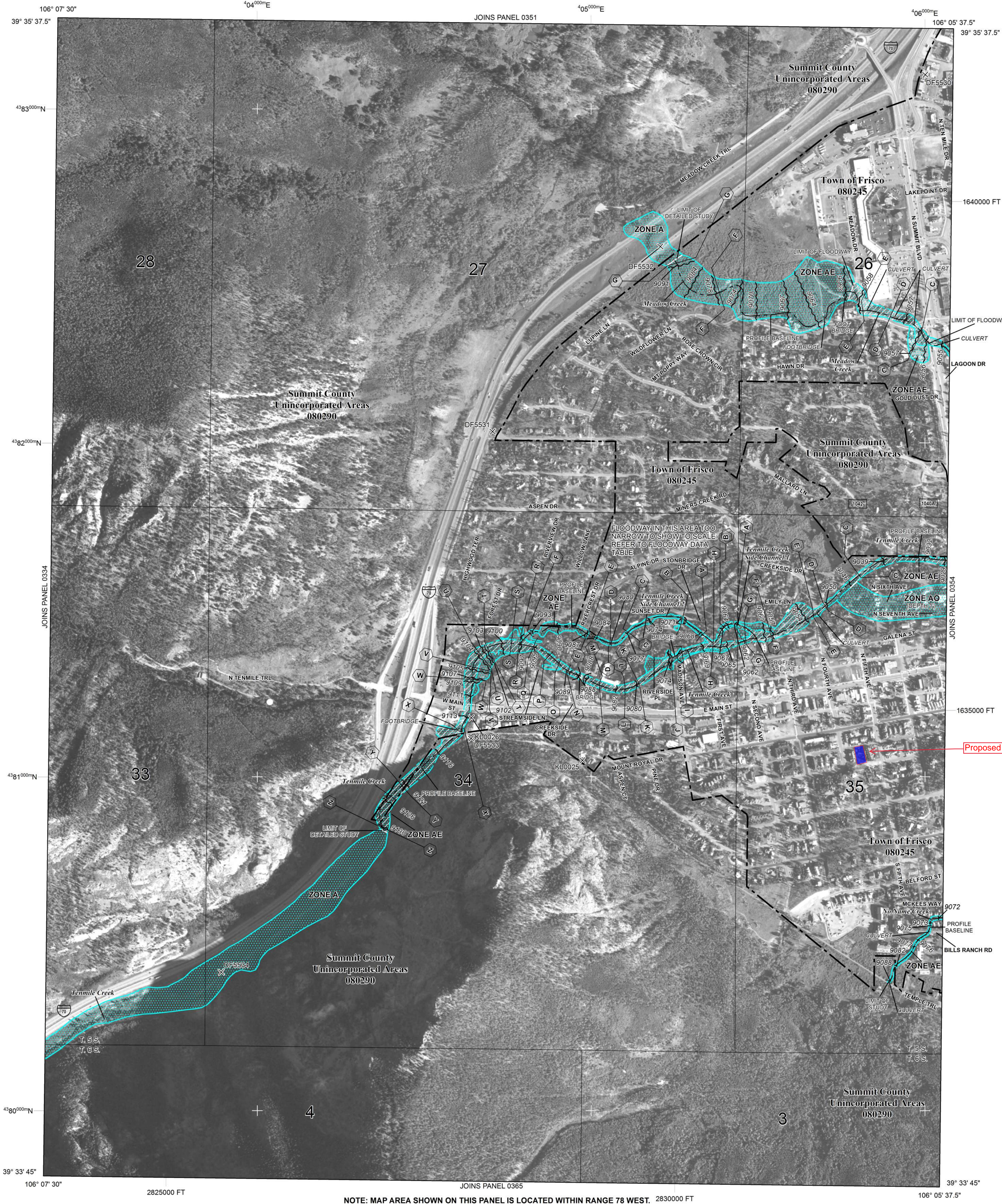
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information Exchange (FMIX)** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfp>.



**LEGEND**

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**  
The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
  - ZONE AE** Base Flood Elevations determined.
  - ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
  - ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
  - ZONE AR** Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently deteriorated. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
  - ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
  - ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
  - ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**  
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
  - OTHER AREAS**
  - ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
  - ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAs)**  
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 1% Annual Chance Floodplain Boundary
  - 0.2% Annual Chance Floodplain Boundary
  - Floodway boundary
  - Zone D boundary
  - CBRS and OPA boundary
  - Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
  - Base Flood Elevation line and value; elevation in feet\*
  - Base Flood Elevation value where uniform within zone; elevation in feet\*
- \*Referenced to the North American Vertical Datum of 1988
- ⊖ ⊕ Cross section line
  - ⊖ ⊕ Transverse line
  - 45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
  - 3100000 FT 5000-foot ticks: Colorado State Plane Central Zone (FIPS Zone 0502), Lambert Conformal Conic projection
  - 4899000 N 1000-meter Universal Transverse Mercator grid values, zone 13
  - DX5510 X Bench mark (see explanation in Notes to Users section of this FIRM panel)
  - M1.5 River Mile
- MAP REPOSITORIES**  
Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**  
November 16, 2011
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**  
November 16, 2018: to update Special Flood Hazard Areas
- For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.
- To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0353F**

**FIRM**  
**FLOOD INSURANCE RATE MAP**  
**SUMMIT COUNTY,**  
**COLORADO**  
**AND INCORPORATED AREAS**

**PANEL 353 OF 575**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
FRISCO, TOWN OF	080245	0353	F
SUMMIT COUNTY, UNINCORPORATED AREAS	080290	0353	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
**08117C0353F**  
**MAP REVISED**  
**NOVEMBER 16, 2018**

**Federal Emergency Management Agency**

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN RANGE 78 WEST. 2830000 FT





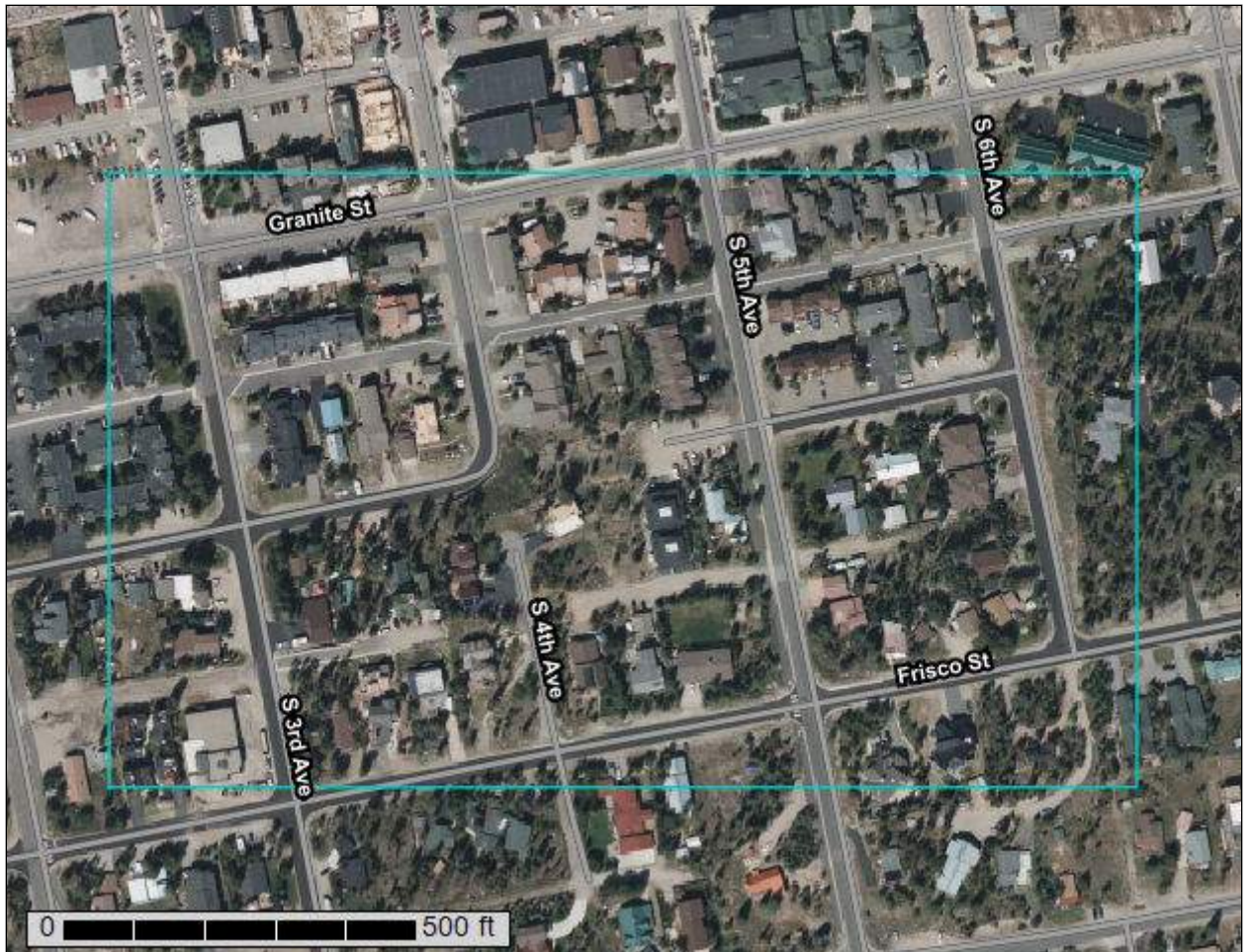
United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for Summit County Area, Colorado



# Preface

---

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

## Custom Soil Resource Report

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and



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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



# Custom Soil Resource Report Soil Map




Map Scale: 1:2,450 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84


### MAP LEGEND


**Area of Interest (AOI)**

 Area of Interest (AOI)




















**Soils**







 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

**Special Point Features**






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

**Water Features**

 Streams and Canals

**Transportation**

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

**Background**

 Aerial Photography

### MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Summit County Area, Colorado  
 Survey Area Data: Version 15, Aug 22, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 5, 2021—Sep 7, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7C	Grenadier gravelly loam, 0 to 6 percent slopes	29.3	100.0%
<b>Totals for Area of Interest</b>		<b>29.3</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

## Custom Soil Resource Report

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.



## Summit County Area, Colorado

### 7C—Grenadier gravelly loam, 0 to 6 percent slopes

#### Map Unit Setting

*National map unit symbol:* jphc  
*Elevation:* 9,000 to 13,000 feet  
*Mean annual precipitation:* 20 to 30 inches  
*Mean annual air temperature:* 30 to 34 degrees F  
*Frost-free period:* 30 to 50 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Grenadier and similar soils:* 80 percent  
*Minor components:* 10 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Grenadier

##### Typical profile

*H1 - 0 to 3 inches:* gravelly loam  
*H2 - 3 to 16 inches:* gravelly sandy clay loam  
*H3 - 16 to 60 inches:* very cobbly sandy loam

##### Properties and qualities

*Slope:* 2 to 6 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Well drained  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.20 to 2.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water supply, 0 to 60 inches:* Low (about 4.6 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* B  
*Ecological site:* F048AY918CO - Spruce-Fir Woodland  
*Hydric soil rating:* No

#### Minor Components

##### Cumulic cryaquolls

*Percent of map unit:* 5 percent  
*Landform:* Swales  
*Hydric soil rating:* Yes

##### Histic cryaquolls

*Percent of map unit:* 5 percent  
*Landform:* Swales  
*Hydric soil rating:* Yes

## Custom Soil Resource Report



# Soil Information for All Uses

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## Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

## Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

## Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or

## Custom Soil Resource Report

soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

*Surface runoff* refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

### Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

Hydrologic Soil Group and Surface Runoff—Summit County Area, Colorado			
Map symbol and soil name	Pct. of map unit	Surface Runoff	Hydrologic Soil Group
7C—Grenadier gravelly loam, 0 to 6 percent slopes			
Grenadier	80	—	B













