Drainage Report
Residences at Morning Vista
Portion of Section 24, T11S, R13E
Pima County Tax Code 219-20-001C
Oro Valley, Pima County, Arizona
TOV Application 2102029

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June 2023
3rd Submittal

ARROYO ENGINEERING, LLC
Water Resources & Civil Engineering Consultants

PLANS REVIEWED AND ACCEPTED FOR CODE COMPLIANCE
Stormwater: droberts 07/18/2023
The issuance of a permit shall not be construed to be a permit or approval of any violation of the codes or ordinances of the Town of Oro Valley

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I. INTRODUCTION

This Drainage Report has been prepared for Grenier Engineering, Inc., in conjunction with Improvement Plans for the proposed subdivision named "Residences at Morning Vista," located within the Town of Oro Valley, Pima County, Arizona. The project is located within a portion of Section 24, Township 11 South, Range 13 East. The proposed project is located on parcel 219-20-001C. A Location Map and an aerial photograph are provided in Appendix A:

Legal Description
CNTRL PTN E2 SW4 EXC RD 3.51 AC
SEC 24-11-13

More specially, the property situates on the east corner of the intersection of Rancho Vistoso Blvd. and Morning Vista Drive. The project is bounded on the northeast and southeast by the Monterey Homes at Rancho Vista (Rancho Vistoso Neighborhood 5). The proposed project is a development of 18 single-family residential homes on 3.51 acres. The site is currently undeveloped, and is zoned Rancho Vistoso PD (High Density Residential).

This drainage analysis was prepared in accordance with the Oro Valley Drainage Criteria Manual (DCM) (**Draft 2020 Edition**), using additional technical criteria and computational procedures from the City of Tucson Drainage Standards Manual (DSM) (1989, 1998), the Pima County Design Standards for Stormwater Detention and Retention (November, 2015), and PC-Hydro 7.2 (Pima County Regional Flood Control District, 2019).

The purpose of the engineering analysis consists of (1) a hydrologic analysis to determine 100-year discharges; (2) detention basin routing for 2-year, 10-year, and 100-year discharges; and (3) a hydraulic analysis for the proposed onsite stormwater conveyance measures.

II. EXISTING CONDITIONS

A. Offsite Watersheds

The project site is located on a topographic high point at the east corner of the intersection of Rancho Vistoso Boulevard and Morning Vista Drive. No regulatory watercourses and corresponding floodplains are located on, or adjacent to, the project site. The property is located in Zone X as shown on FEMA Flood Insurance Rate Map (FIRM) Panel 04019C1080L (June 16, 2011),

Since the proposed project is located on a topographic high point, the project site does not receive any offsite flows, with the exception of nuisance runoff from a strip of land located between Rancho Vistoso Boulevard and the northwest property line (CP-OS1). Offsite stormwater runoff along the southwest property line drains southerly towards Morning Vista Drive. Offsite runoff along the southeast property line drains northeasterly along an existing block wall. Offsite runoff along the northeast property is either contained by an existing block wall or drains southeasterly to an existing flow path. Flow arrows are shown on the attached Existing Conditions Drainage Map (Appendix A).

B. Onsite Drainage

The project site is located on a topographic high point. Onsite runoff generally flows easterly to outfall to an existing flow path at the eastern corner of the property. Concentration points, 100-year discharges, and flow arrows are shown on the Existing Conditions Drainage Map (Appendix A).

III. PROPOSED CONDITIONS

The site layout will impact hydrologic characteristics such as impervious cover and onsite flow paths. As a result of the increased impervious cover, a detention basin will be constructed to detain the increased onsite flows, with basin outflows less than existing conditions.

Adjoining properties will not be protected from erosion due to potential lateral channel migration because they are outside of the project 100-year floodplains and erosion hazard setbacks.

Maintenance of all drainage improvements proposed as part of this development will be the responsibility of the HOA.

A Concept Drainage Plan map is included in Appendix A. The map shows the developed hydrology, proposed hydraulic structures, and detention basin.

IV. SPECIAL CONDITIONS

A. Planned Area Development (PAD) Requirements

The project site is located within the boundaries of the Rancho Vistoso Planned Area Development (PAD) District 5 (American Continental Corporation et al., June 1987). Drainage and flood control requirements are excerpted below. None of these requirements are applicable to the project site.

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5. DEVELOPMENT REQUIREMENTS:

a. Hydrologic Constraints:

1) In general, washes shall be left in their natural state. Limited encroachment and minor channel improvements may be approved in the subdivision platting process.

2) Washes with discharge greater than 500 cubic feet per second (CFS) shall be evaluated in the subdivision platting process for maintenance of natural conditions and preservation of riparian habitat.

3) No development shall occur within the regulatory floodway.

4) Prior to platting, an encroachment study for Big Wash shall be completed. The study shall address groundwater recharge, flood storage reduction, geomorphic channel changes, and natural changes due to encroachment.

5) All washes with a 100-year peak discharge which equals or exceeds 3,000 cubic feet per second must be dedicated to Pima County in fee simple. (Ord. 89-22)

c. Washes:

1) Washes greater than 1000 CFS shall be preserved as open space, except where encroachment or channelization has been approved in the subdivision platting process.

2) Drainage easements and dedicated rights-of-way shall be established in conjunction with washes preserved as open space.

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NEIGHBORHOOD #5

1. This plan shall adhere to all Rancho Vistoso PAD General Policies.

2. The dwelling unit cap for Neighborhood #5 is 3,555.

3. The number of dwelling units permitted within a planning unit is calculated as RAC (residences per acre) multiplied by the developable acreage of the planning unit.

4. Floodplain Encroachment:
   a. Proposed maximum floodplain encroachment is subject to review and approval in the subdivision platting process.

   b. The permitted number of dwelling units of a planning unit shall be reduced or transferred in accordance with Policy #3, if developable acreage is reduced by the deletion of floodplain encroachment.

   c. Encroachment along Big Wash shall not increase the flow velocity so as to adversely affect downstream property, as determined in the subdivision platting process.

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11. Flood Control: All washes with a 100-year peak discharge which equals or exceeds 2,000 CFS must be dedicated to Pima County in fee simple. Other washes shall be evaluated in the subdivision platting process for dedication to Pima County.

V. HYDROLOGIC AND HYDRAULIC ANALYSIS

A. Hydrology

Hydrologic calculations were performed using the web-based PC-Hydro 7.2, in accordance with guidelines from the PC-Hydro User Guide (Pima County Regional Flood Control District, 2019; Arroyo Engineering, 2007). Hydrologic data sheets are included in Appendix B, which provide all of the input variables. Watersheds and concentration points are shown on the project maps in Appendix A.

Existing and developed onsite 2-year, 10-year, and 100-year discharges were calculated for use in performing the detention basin analysis. The developed 100-year discharges were calculated for use in determining concept designs for the scuppers and onsite channels.

1. Existing Conditions

The project site is located on a topographic high point. Onsite runoff generally flows easterly to outfall to an existing flow path at the eastern corner of the property. Concentration points, 100-year discharges, and flow arrows are shown on the Existing Conditions Drainage Map (Appendix A).

Existing Conditions Hydrology		
Concentration Point	Area (ac)	Q_{100} (cfs)
CP-E1	1.81	10.1
CP-E2	0.67	3.7
CP-E3	0.36	2.0
CP-E4	0.66	3.6
CP-OS1 (offsite)	0.22	1.2

2. Developed Conditions

A. Onsite Hydrology

Developed onsite 2-year, 10-year, and 100-year discharges were calculated for use in performing the detention basin analysis. The 100-year discharges were calculated for use in determining concept designs for the scuppers and local channels.

A Concept Drainage Plan map is included in Appendix A. The map shows the developed watersheds, 100-year discharges, proposed hydraulic structures, and detention basin.

Developed Conditions Hydrology		
Concentration Point	Area (ac)	Q_{100} (cfs)
S1	2.66	23
S2	0.08	0.7
S3	0.08	0.7
S4	0.11	0.6
S5	0.09	0.5
B1	0.07	0.4
B2	0.5	2.8
B3	0.08	0.4

B. Hydraulics

Project topographic mapping was provided by Grenier Engineering. From their survey base file:

BASIS OF ELEVATION:2950.40' NAVD88
Pima County OPUS Control Point R21
1/2" Rebar North Edge of Concrete Walk North Side of Vistoso Highlands Drive

1. Proposed Drainage Structures

All calculations, with referenced equations, are included in Appendix C as concept designs. Grenier's engineering designs have been shown on Improvement Plans (see Appendix H).

A. Streets

A 24-ft-wide access lane will convey onsite runoff from the west to the east. Hydraulic calculations were performed to establish the flow depth for the maximum downstream discharge and a design slope of 3%. The access lane cross section is based on 24 feet of pavement, a 2% cross slope, and 6-inch curbs. Manning's roughness coefficients were varied across the section, with a value of 0.013 used for concrete portions and a value of 0.016 used for asphalt portions.

Onsite Hydraulic Structures – Access Lane			
Conc. Pt.	Q_{100} (cfs)	Flow Depth (ft)	Street Slope (%)
S1	23	0.41	3

B. Scuppers

Hydraulic calculations were performed to determine the scupper sizes needed to convey the street runoff. The scupper widths were determined as a concept design minimum width at each location. All calculations, with referenced equations, are included in Appendix C as a concept design. Grenier's engineering design has been shown on the Improvement Plans (see Appendix H).

Onsite Hydraulic Structures – Scuppers			
Scupper Conc. Pt.	Q_{100} (cfs)	Depth (Yi) (ft)	Minimum width (L) (ft)
S1	23	0.5	22
S2	0.7	0.5	0.7
S3	0.7	0.5	0.7
S3.1	0.7	0.5	0.7
S3.2	0.8	0.5	0.8
S3.3	0.8	0.5	0.8
S4	0.6	0.5	0.6
S5	0.5	0.5	0.5

C. Channels

Local channels will be used around the edges of the lots to convey runoff. The concept designs for the channels, as shown in the following table, are based on normal depth for the design slope shown on the Grenier Grading Plan. The design depth includes freeboard or uses collector channel standards (Simons, Li and Associates, 1998). All calculations are included in Appendix C as a concept design. Grenier's engineering design has been shown on their Improvement Plans (see Appendix H).

Onsite Hydraulic Structures – Channels										
Grenier Location	Conc. Point	Q_{100} (cfs)	Flow Depth (ft)	Design Depth[a] (ft)	Velocity (ft/s)	Bottom width (ft)	Minimum		Maximum side slope	Lining
							Topwidth (ft)	Slope (%)		
8/C7.0	B1	0.4	0.38	0.45[a]	1.0	0	2.2	0.6	Left 1:1 Right 4:1	grouted riprap
17/C7.2	B1	0.4	0.34	0.4[a]	1.0	0	3.1	0.6	Left 2:1 Right 5.9:1	riprap
16/C7.1	B1	0.4	0.10	0.19[b]	1.8	2	2.8	12	2H:1V	riprap
Note 10/C4.0	S4	0.6	0.37	0.44[a]	1.4	0	2.6	0.8	3H:1V	earthen
Note 10/C4.0	B3	0.4	0.3	0.36[a]	1.5	0	2.1	1.2	3H:1V	earthen
9/C7.0	S5	0.5	0.18	0.22[a]	1.6	0	4.2	2.6	Left 12.5:1 Right 7:1	earthen
[a] = freeboard included, [b] = collector channel, double flow depth for design depth										

C. Stormwater Detention

A stormwater detention basin is proposed in accordance with DCM DRAFT 2020 subsection 2.9 as follows:

a) Routing calculations were performed with PC-Route (Pima County Regional Flood Control District, 2017).
b) Hydrologic data sheets for the basin inflows are included in Appendix E. Inflow hydrographs are shown on the PC-Route summary sheets in Appendix E.
c) Hydraulic calculations for the outlet structures are shown on the PC-Route summary sheets in Appendix E.
d) Routing calculations are shown on the PC-Route summary sheets in Appendix E. Summary tables are provided below.
e) The 100-year storage volume for the underground tanks has been increased by 50% to account for piggy-back storms.
f) The proposed basin will receive runoff from the proposed lots and access lane. No measurable sediment inflow is expected. Consequently, a sediment measurement device is not warranted.
g) The proposed basin will receive runoff from the proposed lots and access lane. No measurable sediment inflow is expected.
h) Basin safety and access features have been addressed by Grenier Engineering on the Improvement Plans.
i) The basin will drain in less than 48 hours (see Section V.C.5).

Compliance with additional items listed in DCM DRAFT 2020 subsection 12.7 is addressed as part of the Grenier Improvement Plans.

1. Proposed Outflows

Preliminary detention routing calculations were initially completed to match or reduce outflows in comparison to the existing conditions flows for the 100-year, 10-year, and 2-year flow events. Since the proposed detention basin includes an underground storage tank, the preliminary volume for the tank was increased by 50% in accordance with DCM DRAFT 2020 subsection 12.7.4.h.

Using the additional volume for the underground tank, detention routing calculations were completed for the proposed detention basin. Results are summarized in the following table, with calculations in Appendix E.

Proposed Outflows from Detention Basin			
	Q_{100} (cfs)	Q_{10} (cfs)	Q_2 (cfs)
Preliminary Routing	13.9	5.8	1.1
Final Routing with 50% additional tank volume	12.3	4.2	0.6

The detention routing calculations were completed to match or reduce outflows in comparison to the existing conditions flows for the 100-year, 10-year, and 2-year flow events at the eastern corner of the property. For existing conditions, flows at CP-E1, E2, and E3 combine as the outflow from the property. For developed conditions, the detention basin outflows combine with flows from B2 and B3. For developed conditions, hydrograph summations were compiled to determine the peak discharge for the 100-year, 10-year, and 2-year flow events.

Proposed Outflows at East Property Corner			
	Q_{100} (cfs)	Q_{10} (cfs)	Q_2 (cfs)
Existing Conditions (CP-E1+E2+E3)	15.8	7.5	2.5
Preliminary Routing plus B2+B3	15.8	6.5	1.3
Final Routing (with 50% additional tank volume) plus B2+B3	14.0	4.7	0.9

2. Basin Concept Design

An underground storage tank will be used to reduce the storage requirements for the proposed surface detention basin. For the preliminary design, the underground tank will collect the first 4162 cf of runoff via 3 circular grate inlets located in the bottom of the surface detention basin. A 3.5 inch orifice will drain the underground tank.

In accordance with DCM DRAFT 2020 subsection 12.7.4.h, an additional 50% was added to the 100-year volume of the underground storage tank.

Concept Design for Underground Storage Tanks	
Preliminary storage volume (cf)	4162
Volume with 50% additional (cf)	6243
Max 100-yr inflow (cfs)	21
Inflow structure (calculations in Appendix E)	3 30”-diameter circular grates
Outflow structure	3.5-in orifice

The proposed concept design for the detention basin is described by the following table.

Concept Design for Detention Basin	
Underground tank volume (cf) (100-yr plus 50%)	6243
100-yr inflow (cfs)	23.0
100-yr outflow (cfs)	12.3
100-yr surface ponding depth (ft)	2.8
Basin depth (ft)	3.0 plus (varies)
Freeboard (ft)	varies (see Grenier plans)
Sediment volume (cf)	not applicable
Sediment depth (ft)	not applicable
100-year required volume (cf) at d = 2.8 ft	12480
Total storage volume (cf) provided at depth = 3.0 ft (tank plus surface basin)	13034
Outflow structure (weir)	width = 1.3’ invert = 0.75’
Outflow structure (tank)	3.5-in orifice

3. Basin Sedimentation

The proposed basin will receive runoff from the proposed lots and access lane. No measurable sediment inflow is expected. Consequently, a sediment measurement device is not warranted.

4. Stormwater Harvesting

Stormwater harvesting will be provided by Grenier Engineering to the maximum extent practicable.

5. Basin Drain Times

The underground storage tanks will drain in 4.3 hours. Calculations are included in Appendix E.

6. Basin Maintenance Requirements

The detention basin will be maintained in accordance with subsection 12.9 of the DCM DRAFT 2020 and Section VI of this report.

12.9 Access and Maintenance

Routine maintenance is required to ensure adequate performance for the life of proposed treatment systems. The drainage report shall address the following:

1. Physical and legal access shall be provided to all stormwater detention basins and appurtenant structures. This shall include permanent ramps for vehicular access into all basins, the width of which is to be determined by the types of vehicles specified in the maintenance plan, otherwise they shall be at least14 feet wide. When needed, locking gates are to be provided on pedestrian barricades
2. Access is to be clearly identified on the grading and paving plans, final plats, and development plans.
3. A maintenance plan is required. Refer to DCM Chapter 15?.

D. Erosion Control

1. Riprap Aprons

Riprap aprons are proposed as erosion mitigation at the inlet and the outlets of the proposed detention basin. The concept designs for the aprons are based on Pima County geometric parameters (*Drainage and Channel Design Standards for Local Drainage*, June, 1984). Concept design parameters are provided in the following table. **Final designs by Grenier may vary depending on site grading constraints.**

Concept Design[1] for Erosion Control Aprons				
Location	Structure size	Apron upstream width[B] (ft)	Length of Apron[A] (L_{SB}) (ft)	Riprap (d_{50})
Basin inlet	22' (minimum) scupper	23	4	Grouted 6 inch
Basin outlets	1 18-inch CMP with a 3.5" orifice	4.5	8*0.253 (flow depth) = 2	Hand-placed or Grouted 6 inch
	1.3-ft-wide weir d= 2.05'	1.3'+(2*2.05') = 5.4'	use 5	Hand-placed or Grouted 6 inch

[1] **Concept design may vary on Grenier Improvement Plans depending on site grading constraints**
[A] L_{SB} = (8 * pipe diameter (Dc) or flow depth (D),
[B] apron upstream width = structure spread + 1D or 1Dc on each side
For hand-placed riprap. apron thickness = 2 * d_{50}

E. Stormwater Pollution Plan Requirements

Stormwater Pollution Plan requirements will be addressed by Grenier Engineering in conjunction with the preparation of Improvement Plans for this project.

F. First Flush

First-flush requirements are not required per DCN 11.7.2.

VI. LONG-TERM MAINTENANCE PLAN

Section VI of this report serves as the Long-Term Maintenance Plan for the proposed development Residences at Morning Vista. The maintenance of drainage facilities will be conducted in accordance with Chapter 14 of the DCM DRAFT 2020, provided in Appendix F. The site-specific "Maintenance Plan and Drainage System Checklist," for use by the Homeowner's Association, is also provided in Appendix F.

A. Requirements

In accordance with DCM DRAFT 2020 subsection 2.6.11, a Long-Term Maintenance Plan is required per the following TOV statement:

> Maintenance is required in order for drainage facilities to function as originally designed and constructed to ensure the service life of the facility is maximized. Common maintenance issues associated with drainage facilities include growth of undesirable vegetation, debris accumulation, sedimentation, erosion, scour, soil piping, soil settlement and structural damage. This section of the Drainage Report shall provide guidance to the designer regarding development of maintenance elements that will assure structural stability, operability, and aesthetics.

TOV Maintenance Elements "a" through "f"

a. There are no regulatory watercourses for inspection and maintenance.
b. Constructed drainage structures, including channels, scuppers, and the detention facilities, shall be inspected and maintained. Remediation, if necessary, shall consist of restoring the function of the drainage infrastructure.
c. Vegetative growth and sediment accumulation shall be removed from the detention basin as necessary to restore the design storage volume to the basin.
d. Onsite drainage facilities are to be maintained by the Homeowner's Association.
   i. Drainage easements are shown on the Grenier Improvement Plans.
   ii. Physical and legal access for maintenance is provided on the Grenier plans.
   iii. The purpose of all drainage easements is for operation and maintenance of the stormwater facility. Maintenance requirements for landscaping are provided separately by others.
e. The following two notes are provided as required.

> *All drainage structures shall be inspected and a summary report prepared a minimum of once each year in accordance with the procedures in the approved Drainage Report. Copies of the annual inspection reports shall be made available to the Town upon request.*
>
> *All drainage structures shall be inspected and a summary report prepared by an Arizona Registered Professional Civil Engineer a minimum of once every five years in accordance with the procedures presented in the approved Drainage Report. Copies of the 5-year-interval inspection reports shall be made available to the Town upon request. The report shall identify the maintenance needs for the next 5-year period, including the anticipated annual cost of maintenance and repair.*

f. There are no cross-drainage culverts to be maintained.

VII. CONCLUSION

This Drainage Report was prepared in accordance with the Town of Oro Valley Drainage Criteria Manual (Draft, 2020). Existing and developed onsite 2-year, 10-year, and 100-year discharges were calculated for use in performing detention basin routing. The developed 100-year discharges were calculated for use in determining concept designs for the scuppers and local channels.

A Concept Drainage Plan map is included in Appendix A. The map shows the developed watersheds, 100-year discharges, proposed hydraulic structures, and detention basin.

Section VI of this report serves as the Long-Term Maintenance Plan for the proposed development. The maintenance of drainage facilities will be conducted in accordance with Chapter 14 of the DCM DRAFT 2020, provided as Appendix F. The site-specific "Maintenance Plan and Drainage System Checklist," for use by the Homeowner's Association, is also provided in Appendix F.

VIII. REFERENCES

American Continental Corporation et al., *Rancho Vistoso Planned Area Development District 5*, June 1987.

Federal Emergency Management Agency, *Flood Insurance Study for Pima County and Incorporated Areas, Arizona,* June 16, 2011.

Town of Oro Valley, *Drainage Criteria Manual,* Draft, 2020.

Pima County Regional Flood Control District, *Design Standards for Stormwater Detention and Retention*, November, 2015.

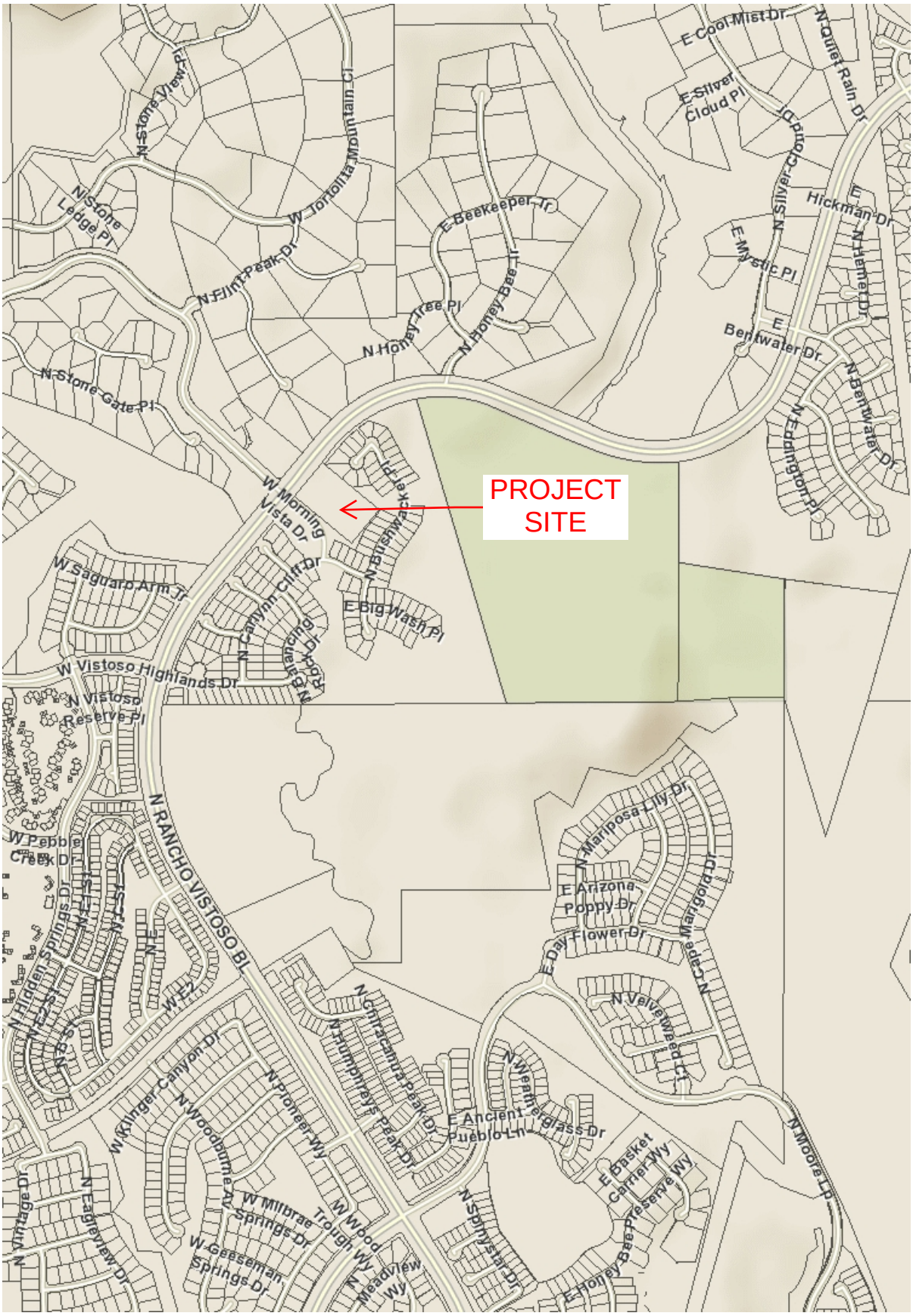
Pima County Regional Flood Control District, *PC-Hydro User Guide,* 2019; (Pima County Regional Flood Control District, 2019; Arroyo Engineering, 2007).

Pima County Department of Transportation and Flood Control District, *Drainage and Channel Design Standards for Local Drainage*, June, 1984.

Simons, Li & Associates, Inc., *Standards Manual for Drainage Design and Floodplain Management in Tucson, Arizona*, 1989, updated 1998.

Appendix A. Exhibits

Location Map



Legend

- Parcels

Notes:

8/10/2022

2,000.0 0 1,000.00

Feet

Pima County GIS

This map is static output from an internet mapping site and no warranty is expressed or implied as to the accuracy, reliability, currency or completeness of the data, and is for reference only

Aerial Photo

Legend

Parcels

Notes:

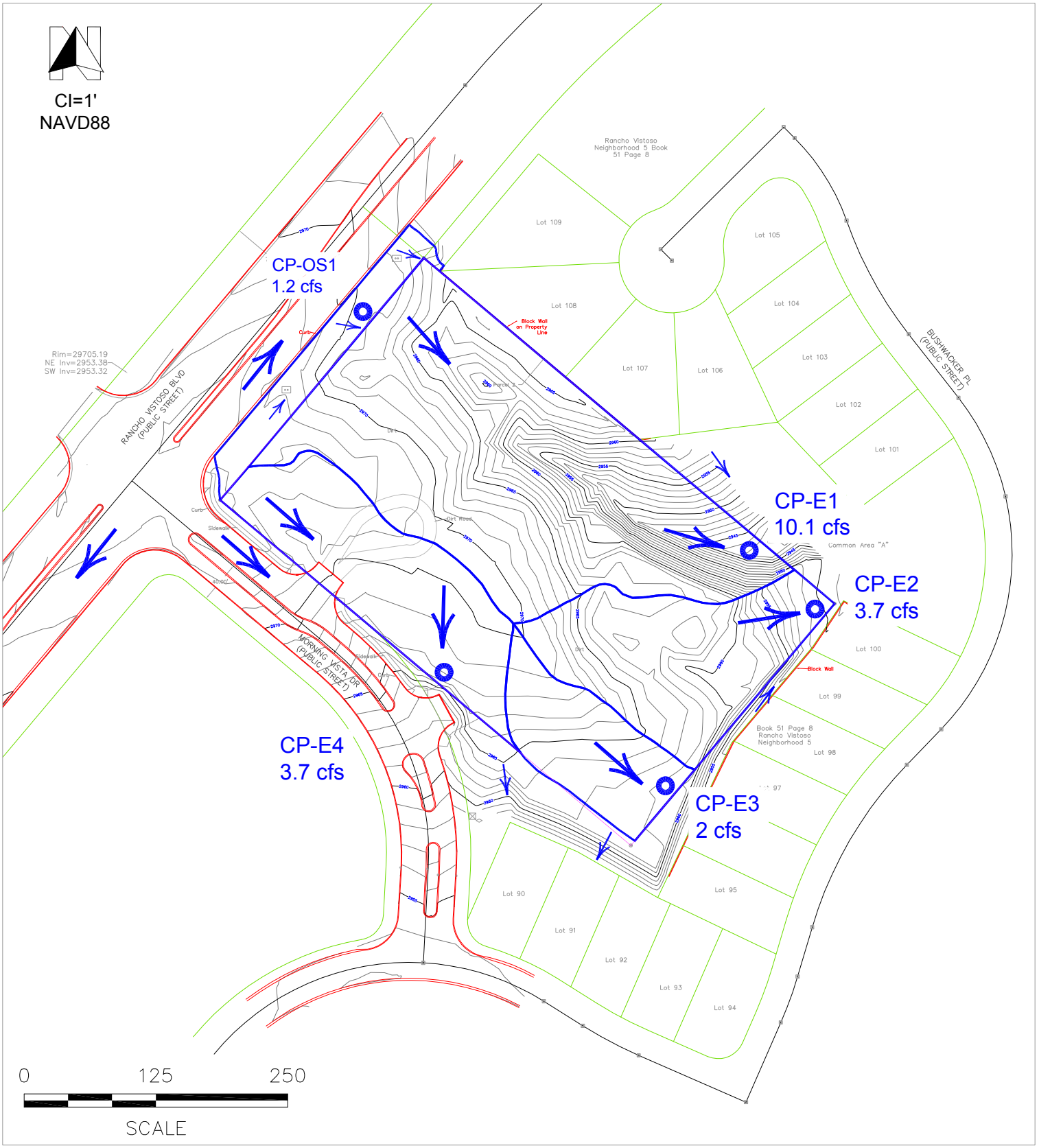
8/10/2022

200.0 0 100.00

Feet

Pima County GIS

This map is static output from an internet mapping site and no warranty is expressed or implied as to the accuracy, reliability, currency or completeness of the data, and is for reference only

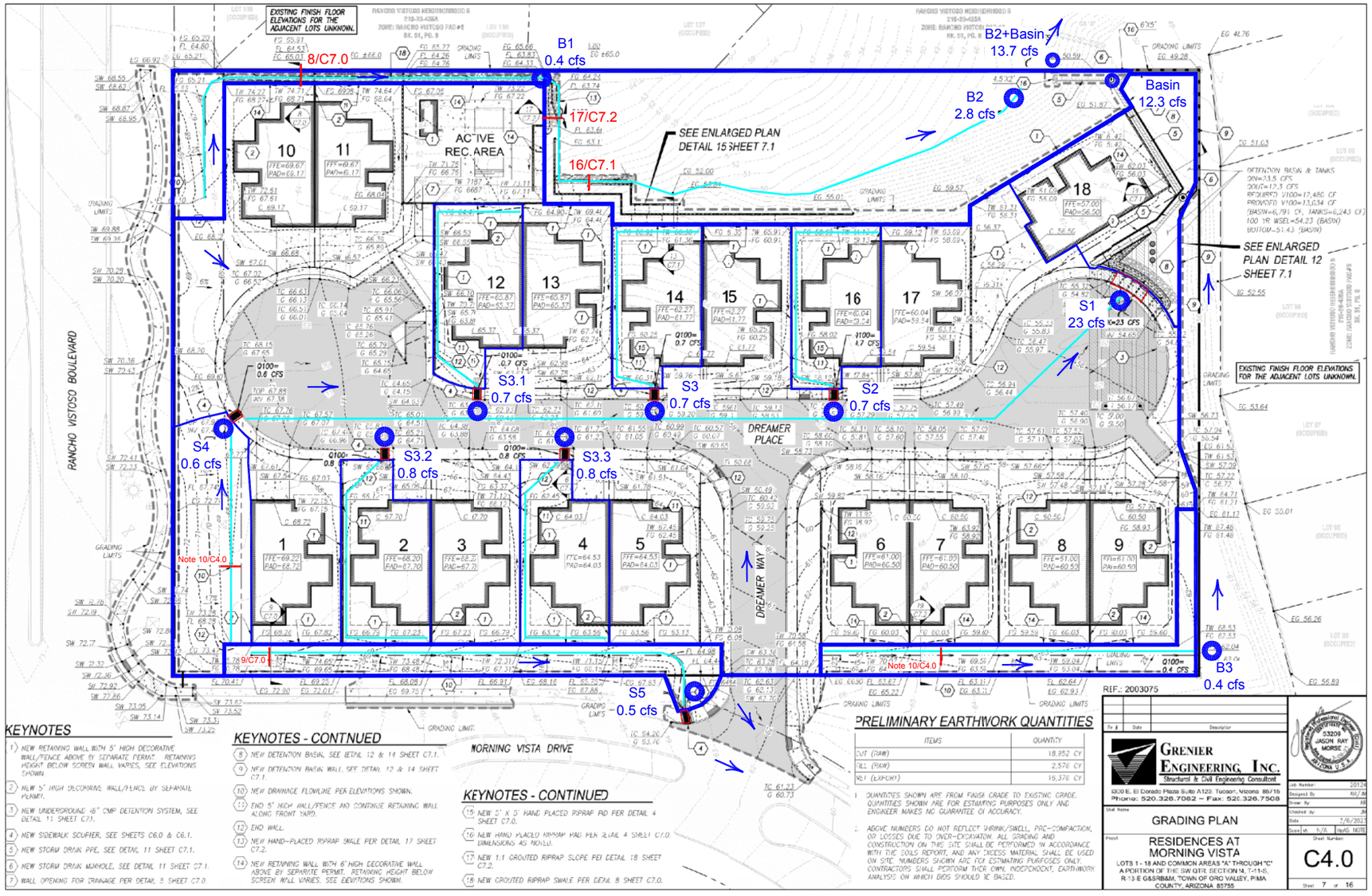


LEGEND

- Project site
- Watershed boundaries
- CP-E1 10.1 cfs — Conc. pt. and Q100
- Flow arrow

ARROYO ENGINEERING, LLC
Water Resources & Civil Engineering Consultants

Existing Conditions Drainage Map



C.I. = 1'
DATUM = NAVD88

0 60 120
FEET

LEGEND

- Flow arrows
- Watershed
- PC-Hydro Lc
- S2 / 0.7 cfs — Developed 100-yr discharge (cfs)
- 16/C7.1 — Hydraulic cross section, with Grenier ID
- Proposed scupper

KEYNOTES

1. NEW RETAINING WALL WITH 5' HIGH DECORATIVE WALL/FENCE ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE ELEVATIONS SHOWN.
2. NEW 5' HIGH DECORATIVE WALL/FENCE BY SEPARATE PERMIT.
3. NEW UNDERGROUND 48" CMP DETENTION SYSTEM, SEE DETAIL 11 SHEET C7.1.
4. NEW SIDEWALK SCUFFER, SEE SHEETS C6.0 & C6.1.
5. NEW STORM DRAIN PIPE, SEE DETAIL 11 SHEET C7.1.
6. NEW STORM DRAIN MANHOLE, SEE DETAIL 11 SHEET C7.1.
7. WALL OPENING FOR DRAINAGE PER DETAIL 5 SHEET C7.0.

KEYNOTES - CONTNUED

8. NEW DETENTION BASIN, SEE DETAIL 12 & 14 SHEET C7.1.
9. NEW DETENTION BASIN WALL, SEE DETAIL 12 & 14 SHEET C7.1.
10. NEW DRAINAGE FLOWLINE PER ELEVATIONS SHOWN.
11. END 5' HIGH WALL/FENCE AND CONTINUE RETAINING WALL ALONG FRONT YARD.
12. END WALL.
13. NEW HAND-PLACED RIPRAP SWALE PER DETAIL 17 SHEET C7.2.
14. NEW RETAINING WALL WITH 6' HIGH DECORATIVE WALL ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES. SEE ELEVATIONS SHOWN.

KEYNOTES - CONTINUED

15. NEW 3' X 5' HAND PLACED RIPRAP PAD PER DETAIL 4 SHEET C7.0.
16. NEW HAND PLACED RIPRAP PAD PER DETAIL 4 SHEET C7.0. DIMENSIONS AS NOTED.
17. NEW 1:1 GROUTED RIPRAP SLOPE PER DETAIL 18 SHEET C7.2.
18. NEW GROUTED RIPRAP SWALE PER DETAIL 8 SHEET C7.0.

PRELIMINARY EARTHWORK QUANTITIES

ITEMS	QUANTITY
CUT (RAW)	18,952 CY
FILL (RAW)	2,576 CY
NET (EXPORT)	16,376 CY

1. QUANTITIES SHOWN ARE FROM FINISH GRADE TO EXISTING GRADE. QUANTITIES SHOWN ARE FOR ESTIMATING PURPOSES ONLY AND ENGINEER MAKES NO GUARANTEE OF ACCURACY.
2. ABOVE NUMBERS DO NOT REFLECT SHRINK/SWELL, PRE-COMPACTION, OR LOSSES DUE TO OVER-EXCAVATION. ALL GRADING AND CONSTRUCTION ON THIS SITE SHALL BE PERFORMED IN ACCORDANCE WITH THE SOILS REPORT, AND ANY EXCESS MATERIAL SHALL BE USED ON SITE. NUMBERS SHOWN ARE FOR ESTIMATING PURPOSES ONLY. CONTRACTORS SHALL PERFORM THEIR OWN, INDEPENDENT, EARTHWORK ANALYSIS ON WHICH BIDS SHOULD BE BASED.

REF.: 2003075

GRENIER ENGINEERING, INC.
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Phone: 520.326.7082 ~ Fax: 520.326.7508

GRADING PLAN

RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 14, T-11-S, R-13 E G&SRB&M, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Job Number: 2012
Designed By: RE/
Drawn By: SH
Checked By: JM
Date: 7/6/201
Scale: VE: N/A HAS NOTE
Sheet Number: C4.0
Sheet 7 of 16

ARROYO ENGINEERING, LLC
Water Resources & Civil Engineering Consultants

Concept Drainage Plan (annotated Grading Plan)

Streets

- Streets - All
- Streets - Unknown
- Streets - Major - With Names

Topography - PAG Orthophotos

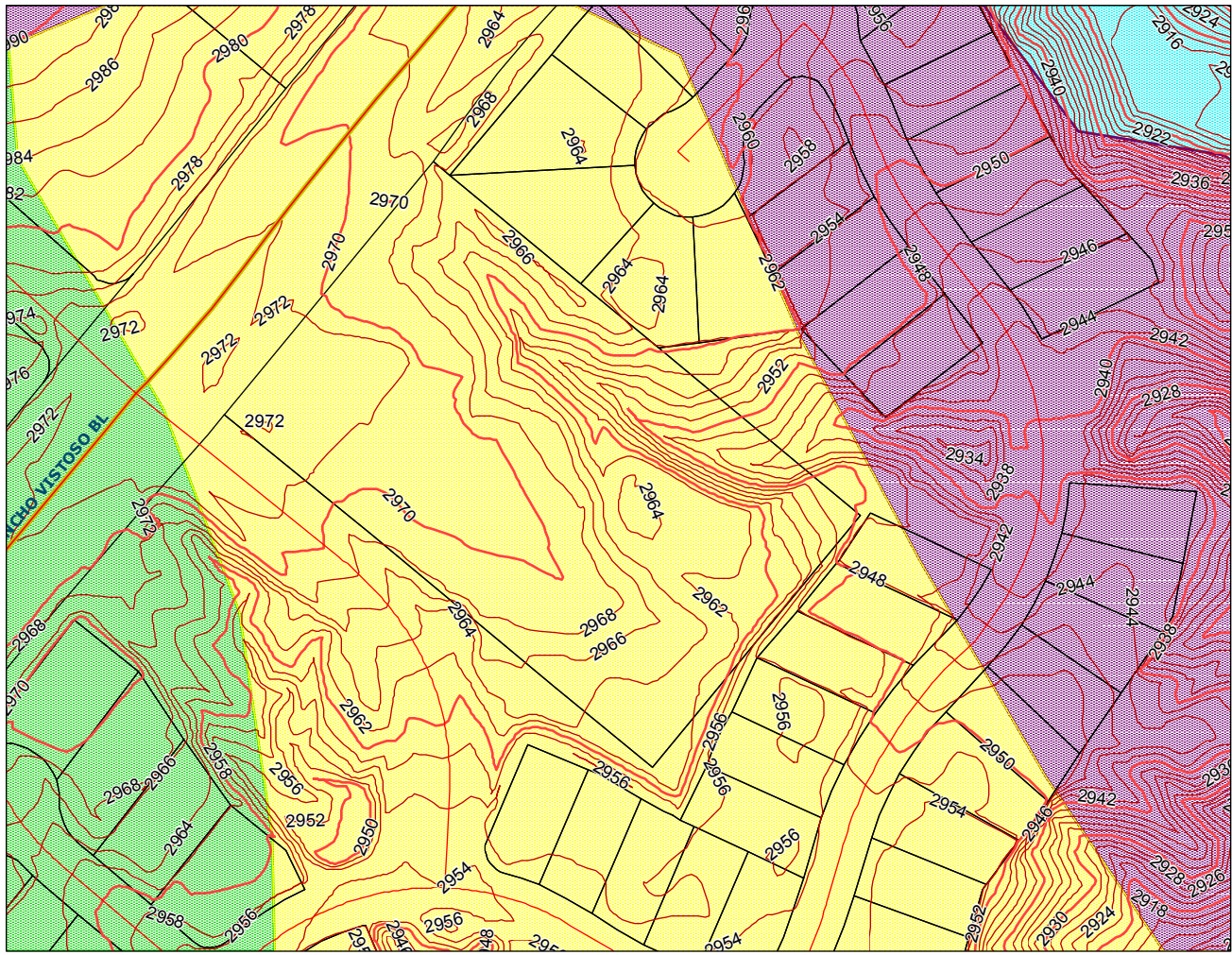
- All 2-foot Topography - NAVD88 with labels
  - 2 Foot Contours
  - 10 Foot Contours

Parcels

- Parcels - Pima

Hydrologic Soils Groups - NRCS

- Soil Group: A (100%)
- Soil Group: B (100%)
- Soil Group: C (100%)
- Soil Group: D (100%)
- Soil Group: Mixed 41A 41C 18D



SCALE 1 : 2,000

200 0 200 400 600

FEET

N

Appendix B. Hydrology

PIMA COUNTY
FLOOD CONTROL

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E1	Job #	
Watershed Area:	1.81 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	25	482	0.0519	0.06

Length of Watercourse (Lc):	482	feet	Mean Slope:	0.0519	
Length to Cen. of Gravity (Lca):	241	feet	Weighted Basin Fac:	0.06	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 2-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.37	0.56	0.69	0.93	1.15	1.3	1.37	1.57	1.78	2.08

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.149
C	41	87.3	0.277
D	18	90.3	0.378
Imp.	0	99	0.902

Weighted Runoff Coef. (Cw):	0.24	
Time of Concentration:	8.2	min
Rainfall Intensity (i) @ Tc:	3.59	in/hr
Runoff Supply Rate (q) @ Tc:	0.87	in/hr
PEAK DISCHARGE:	1.6	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E1	Job #	
Watershed Area:	1.81 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	25	482	0.0519	0.06

Length of Watercourse (Lc):	482	feet	Mean Slope:	0.0519	
Length to Cen. of Gravity (Lca):	241	feet	Weighted Basin Fac:	0.06	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 10-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.57	0.87	1.08	1.45	1.79	2	2.08	2.32	2.59	3.04

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.285
C	41	87.3	0.425
D	18	90.3	0.523
Imp.	0	99	0.935

Weighted Runoff Coef. (Cw):	0.39	
Time of Concentration:	5.3	min
Rainfall Intensity (i) @ Tc:	6.63	in/hr
Runoff Supply Rate (q) @ Tc:	2.55	in/hr
PEAK DISCHARGE:	4.7	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E1	Job #	
Watershed Area:	1.81 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	25	482	0.0519	0.06

Length of Watercourse (Lc):	482	feet	Mean Slope:	0.0519	
Length to Cen. of Gravity (Lca):	241	feet	Weighted Basin Fac:	0.06	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	10.1	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E2	Job #	
Watershed Area:	0.67 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	20	326	0.0613	0.065

Length of Watercourse (Lc):	326	feet	Mean Slope:	0.0613	
Length to Cen. of Gravity (Lca):	163	feet	Weighted Basin Fac:	0.065	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 2-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.37	0.56	0.69	0.93	1.15	1.3	1.37	1.57	1.78	2.08

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.149
C	41	87.3	0.277
D	18	90.3	0.378
Imp.	0	99	0.902

Weighted Runoff Coef. (Cw):	0.24	
Time of Concentration:	6.3	min
Rainfall Intensity (i) @ Tc:	3.99	in/hr
Runoff Supply Rate (q) @ Tc:	0.97	in/hr
PEAK DISCHARGE:	0.7	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E2	Job #	
Watershed Area:	0.67 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	20	326	0.0613	0.065

Length of Watercourse (Lc):	326	feet	Mean Slope:	0.0613	
Length to Cen. of Gravity (Lca):	163	feet	Weighted Basin Fac:	0.065	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 10-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.57	0.87	1.08	1.45	1.79	2	2.08	2.32	2.59	3.04

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.285
C	41	87.3	0.425
D	18	90.3	0.523
Imp.	0	99	0.935

Weighted Runoff Coef. (Cw):	0.39	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	6.84	in/hr
Runoff Supply Rate (q) @ Tc:	2.64	in/hr
PEAK DISCHARGE:	1.8	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E2	Job #	
Watershed Area:	0.67 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	20	326	0.0613	0.065

Length of Watercourse (Lc):	326	feet	Mean Slope:	0.0613	
Length to Cen. of Gravity (Lca):	163	feet	Weighted Basin Fac:	0.065	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	3.7	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista.	Date:	01/09/2023
Concentration Point:	CP-E3	Job #	
Watershed Area:	0.36 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9	246	0.0366	0.04

Length of Watercourse (Lc):	246	feet	Mean Slope:	0.0366	
Length to Cen. of Gravity (Lca):	123	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 2-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.37	0.56	0.69	0.93	1.15	1.3	1.37	1.57	1.78	2.08

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.149
C	41	87.3	0.277
D	18	90.3	0.378
Imp.	0	99	0.902

Weighted Runoff Coef. (Cw):	0.24	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	4.44	in/hr
Runoff Supply Rate (q) @ Tc:	1.08	in/hr
PEAK DISCHARGE:	0.4	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista.	Date:	01/09/2023
Concentration Point:	CP-E3	Job #	
Watershed Area:	0.36 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9	246	0.0366	0.04

Length of Watercourse (Lc):	246	feet	Mean Slope:	0.0366	
Length to Cen. of Gravity (Lca):	123	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 10-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.57	0.87	1.08	1.45	1.79	2	2.08	2.32	2.59	3.04

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.285
C	41	87.3	0.425
D	18	90.3	0.523
Imp.	0	99	0.935

Weighted Runoff Coef. (Cw):	0.39	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	6.84	in/hr
Runoff Supply Rate (q) @ Tc:	2.64	in/hr
PEAK DISCHARGE:	1	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista.	Date:	01/09/2023
Concentration Point:	CP-E3	Job #	
Watershed Area:	0.36 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9	246	0.0366	0.04

Length of Watercourse (Lc):	246	feet	Mean Slope:	0.0366	
Length to Cen. of Gravity (Lca):	123	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	2	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	CP-E4	Job #	
Watershed Area:	0.66 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	7	278	0.0252	0.04

Length of Watercourse (Lc):	278	feet	Mean Slope:	0.0252	
Length to Cen. of Gravity (Lca):	139	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	3.7	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	1/9/2023
Concentration Point:	OS-1	Job #	
Watershed Area:	0.22 Acres	Watershed Type	Undeveloped-Foothills

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	7	296	0.0236	0.04

Length of Watercourse (Lc):	296	feet	Mean Slope:	0.0236	
Length to Cen. of Gravity (Lca):	148	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	1.2	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	S1	Job #	
Watershed Area:	2.66 Acres	Watershed Type	High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.9	108	0.0083	0.045
2	12.4	462	0.0268	0.04

Length of Watercourse (Lc):	570	feet	Mean Slope:	0.0203	
Length to Cen. of Gravity (Lca):	285	feet	Weighted Basin Fac:	0.041	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	65	99	0.958

Weighted Runoff Coef. (Cw):	0.81	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	8.51	in/hr
PEAK DISCHARGE:	22.8	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	S2, S3, S3.1	Job #	
Watershed Area:	0.08 Acres	Watershed Type	High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.7	132	0.0049	0.04

Length of Watercourse (Lc):	132	feet	Mean Slope:	0.0049	
Length to Cen. of Gravity (Lca):	66	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	80	99	0.958

Weighted Runoff Coef. (Cw):	0.87	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	9.19	in/hr
PEAK DISCHARGE:	0.7	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	S3.2, S3.3	Job #	
Watershed Area:	.09 Acres	Watershed Type	High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.7	136	0.0048	0.04

Length of Watercourse (Lc):	136	feet	Mean Slope:	0.0048	
Length to Cen. of Gravity (Lca):	68	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	80	99	0.958

Weighted Runoff Coef. (Cw):	0.87	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	9.19	in/hr
PEAK DISCHARGE:	0.8	cfs

PIMA COUNTY
FLOOD CONTROL

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	S4	Job #	
Watershed Area:	0.11 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.7	108	0.006	0.04

Length of Watercourse (Lc):	108 feet	Mean Slope:	0.006
Length to Cen. of Gravity (Lca):	54 feet	Weighted Basin Fac:	0.04
Veg. Cover Type(s):	Desert Brush	Veg. Cover Density:	30

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	0.6	cfs

PIMA COUNTY
FLOOD CONTROL

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	S5	Job #	
Watershed Area:	0.09 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	6.4	238	0.0269	0.04

Length of Watercourse (Lc):	238	feet	Mean Slope:	0.0269	
Length to Cen. of Gravity (Lca):	119	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	0.5	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B1	Job #	
Watershed Area:	0.07 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	3	224	0.0134	0.04

Length of Watercourse (Lc):	224	feet	Mean Slope:	0.0134	
Length to Cen. of Gravity (Lca):	112	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	0.4	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B2	Job #	
Watershed Area:	0.5 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	3	224	0.0134	0.04
2	22	273	0.0806	0.074

Length of Watercourse (Lc):	497	feet	Mean Slope:	0.0294	
Length to Cen. of Gravity (Lca):	248	feet	Weighted Basin Fac:	0.059	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 2-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.37	0.56	0.69	0.93	1.15	1.3	1.37	1.57	1.78	2.08

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.149
C	41	87.3	0.277
D	18	90.3	0.378
Imp.	0	99	0.902

Weighted Runoff Coef. (Cw):	0.24	
Time of Concentration:	10.7	min
Rainfall Intensity (i) @ Tc:	3.24	in/hr
Runoff Supply Rate (q) @ Tc:	0.79	in/hr
PEAK DISCHARGE:	0.4	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B2	Job #	
Watershed Area:	0.5 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	3	224	0.0134	0.04
2	22	273	0.0806	0.074

Length of Watercourse (Lc):	497	feet	Mean Slope:	0.0294	
Length to Cen. of Gravity (Lca):	248	feet	Weighted Basin Fac:	0.059	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 10-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.57	0.87	1.08	1.45	1.79	2	2.08	2.32	2.59	3.04

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.285
C	41	87.3	0.425
D	18	90.3	0.523
Imp.	0	99	0.935

Weighted Runoff Coef. (Cw):	0.39	
Time of Concentration:	7	min
Rainfall Intensity (i) @ Tc:	5.92	in/hr
Runoff Supply Rate (q) @ Tc:	2.28	in/hr
PEAK DISCHARGE:	1.1	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B2	Job #	
Watershed Area:	0.5 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	3	224	0.0134	0.04
2	22	273	0.0806	0.074

Length of Watercourse (Lc):	497	feet	Mean Slope:	0.0294	
Length to Cen. of Gravity (Lca):	248	feet	Weighted Basin Fac:	0.059	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	2.8	cfs

PIMA COUNTY
FLOOD CONTROL

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B3	Job #	
Watershed Area:	0.08 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	1.9	184	0.0103	0.04

Length of Watercourse (Lc):	184	feet	Mean Slope:	0.0103	
Length to Cen. of Gravity (Lca):	92	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 2-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.37	0.56	0.69	0.93	1.15	1.3	1.37	1.57	1.78	2.08

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.149
C	41	87.3	0.277
D	18	90.3	0.378
Imp.	0	99	0.902

Weighted Runoff Coef. (Cw):	0.24	
Time of Concentration:	5.5	min
Rainfall Intensity (i) @ Tc:	4.25	in/hr
Runoff Supply Rate (q) @ Tc:	1.03	in/hr
PEAK DISCHARGE:	0.1	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B3	Job #	
Watershed Area:	0.08 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	1.9	184	0.0103	0.04

Length of Watercourse (Lc):	184	feet	Mean Slope:	0.0103	
Length to Cen. of Gravity (Lca):	92	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 10-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.57	0.87	1.08	1.45	1.79	2	2.08	2.32	2.59	3.04

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.285
C	41	87.3	0.425
D	18	90.3	0.523
Imp.	0	99	0.935

Weighted Runoff Coef. (Cw):	0.39	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	6.84	in/hr
Runoff Supply Rate (q) @ Tc:	2.64	in/hr
PEAK DISCHARGE:	0.2	cfs

PIMA COUNTY
FLOOD CONTROL

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	B3	Job #	
Watershed Area:	0.08 Acres	Watershed Type	Mixed

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	1.9	184	0.0103	0.04

Length of Watercourse (Lc):	184	feet	Mean Slope:	0.0103	
Length to Cen. of Gravity (Lca):	92	feet	Weighted Basin Fac:	0.04	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	0	99	0.958

Weighted Runoff Coef. (Cw):	0.52	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	5.54	in/hr
PEAK DISCHARGE:	0.4	cfs

Appendix C. Hydraulics

Calculations for Scuppers

Project: Residences at Morning Vista

10.6.2 Capacity of a Curb Inlet in a Sag

A curb inlet in a sag operates as a weir to depths up to the height of the curb inlet, and as an orifice at depths greater than 1.4 times the opening height. Between those depths, flow is in a transition stage.

The equation for computing the interception capacity of a curb inlet *without a depression* which operates as a weir is:

$$Q_i = 3\,LY_i^{3/2} \qquad (10.14)$$

Equation can be used for scuppers if thickness of scupper is negligible (otherwise use HDS#5, Eqn. 28)

Required capacity is 10-year flow plus 50% clogging

Design flow = 100-yr
No clogging factor

Concentration Point	Q_{100} (cfs)	Design Depth (Yi, in feet)	Scupper Opening (L, in feet) (minimum)
S1	23	0.5	22
S2	0.7	0.5	0.7
S3	0.7	0.5	0.7
S3.1	0.7	0.5	0.7
S3.2	0.8	0.5	0.8
S3.3	0.8	0.5	0.8
S4	0.6	0.5	0.6
S5	0.5	0.5	0.5

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: PAAL - 24 ft

Concentration point: S!
Q100: 23
Minimum slope = 3.0%

MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTION

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

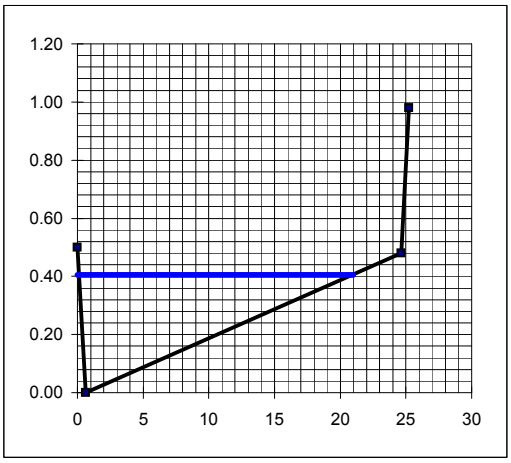
Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient

SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.



NUMBER OF POINTS IN SECTION = 4
ASSUMED WSEL= 0.41
BED OR ENERGY SLOPE (FT/FT) = 0.030 design

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0	0.50	0.0
2	0.625	0.00	0.4
3	24.625	0.48	0.0
4	25	0.98	0.0

SEGMENT DATA

Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.0130	0.51	0.10	0.65	0.16	5.79	0.6
0.0160	20.25	4.10	20.25	0.20	5.55	22.7
0.0160	0.00	0.00	0.00	0.00	0.00	0.0
VALUES FOR TOTAL SECTION =	21	4	21	0.2	5.6	23

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: Grenier 8/C7.0

Conc point: B1
Q100: 0.4
Minimum slope = 0.6%

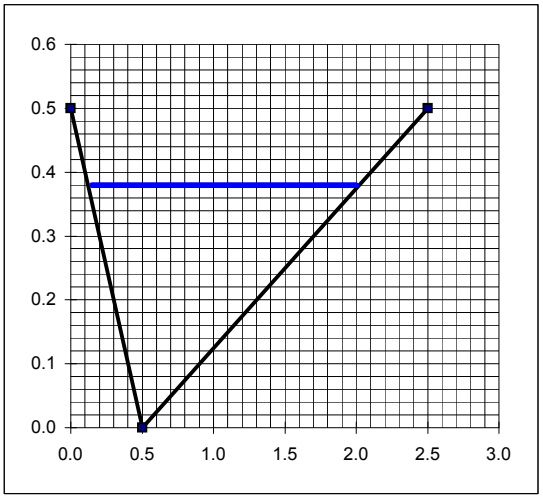
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION =	3.00		
ASSUMED WSEL=	0.38		
BED OR ENERGY SLOPE (FT/FT) =	0.006	design	
Freeboard	0.07	(ft)	
Design Flow Depth	0.45	(ft)	
Left Side slope (H:V)	1.0	(ft)	grouted riprap
Right Side slope (H:V)	4.0	(ft)	grouted riprap
Design Channel bottom width	0.0	(ft)	
Design Channel Topwidth	2.2	(ft)	

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0.0	0.5	0.0
2	0.5	0.0	0.4
3	2.5	0.5	0.0

SEGMENT DATA

Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.0360	0.38	0.07	0.54	0.13	0.84	0.1
0.0360	1.52	0.29	1.57	0.18	1.04	0.3
VALUES FOR TOTAL SECTION =	2	0	2	0.2	1.0	0.4

F = 0.4

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: Grenier 17/C7.2

Conc point: B1
Q100: 0.4
Minimum slope = 0.6%

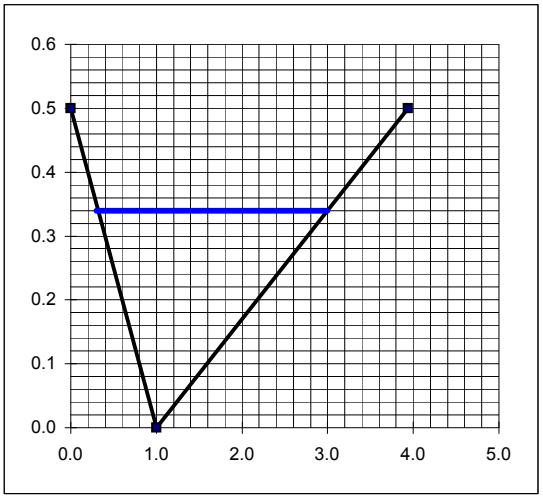
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION =	3.00		
ASSUMED WSEL=	0.34		
BED OR ENERGY SLOPE (FT/FT) =	0.006	design	
Freeboard	0.06	(ft)	
Design Flow Depth	0.40	(ft)	
Left Side slope (H:V)	2.0	(ft)	riprap
Right Side slope (H:V)	5.9	(ft)	riprap
Design Channel bottom width	0.0	(ft)	
Design Channel Topwidth	3.1	(ft)	

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0.0	0.5	0.0
2	1.0	0.0	0.3
3	3.9	0.5	0.0

SEGMENT DATA

Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.0360	0.68	0.12	0.76	0.15	0.91	0.1
0.0360	2.00	0.34	2.03	0.17	0.97	0.3
VALUES FOR TOTAL SECTION =	3	0	3	0.2	1.0	0.4

F = 0.4

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: Grenier 16/C7.1
Collector channel
Conc. Pt.: B1
Q100: 0.4
Minimum slope = 12.0%

MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTION

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

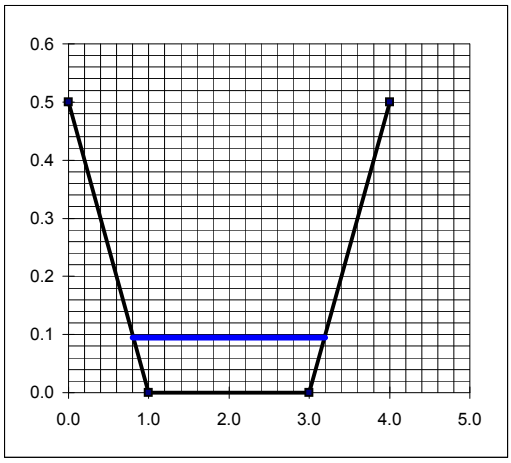
Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient

SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.



NUMBER OF POINTS IN SECTION =	4.00		
ASSUMED WSEL=	0.10		
BED OR ENERGY SLOPE (FT/FT) =	0.120	design	
Design Flow Depth	0.19	(ft)	double flow depth
Left Side slope (H:V)	2.0	(ft)	riprap
Right Side slope (H:V)	2.0	(ft)	riprap
Design Channel bottom width	2.0	(ft)	riprap
Design Channel Topwidth	2.8	(ft)	

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0.0	0.5	0.0
2	1.0	0.0	0.1
3	3.0	0.0	0.1
4	4.0	0.5	0.0

SEGMENT DATA

	Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
	N/A	N/A	N/A	N/A	N/A	N/A	N/A
increase	0.0360	0.19	0.01	0.21	0.04	1.74	0.0
to get	0.0610	2.00	0.19	2.00	0.10	1.76	0.3
crit. depth	0.0360	0.19	0.01	0.21	0.04	1.74	0.0
VALUES FOR TOTAL SECTION =		2	0	2	0.1	1.8	0.4

F = 1.0

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: Note 10/C4.0
Conc. Point: B3
Q100: 0.4
Minimum slope = 1.2%

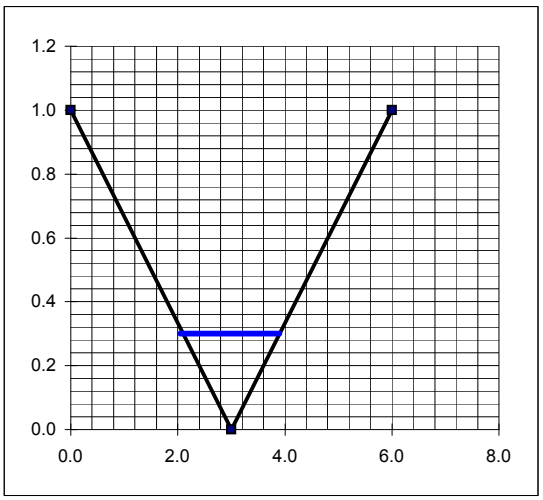
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION =	3.00	
ASSUMED WSEL=	0.30	
BED OR ENERGY SLOPE (FT/FT) =	0.012	design
Freeboard	0.06	(ft)
Design Flow Depth	0.36	(ft)
Left Side slope (H:V)	3.0	(ft)
Right Side slope (H:V)	3.0	(ft)
Design Channel bottom width	0.0	(ft)
Design Channel Topwidth	2.1	(ft)

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0.0	1.0	0.0
2	3.0	0.0	0.3
3	6.0	1.0	0.0

SEGMENT DATA

Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.0300	0.90	0.14	0.95	0.14	1.48	0.2
0.0300	0.90	0.14	0.95	0.14	1.48	0.2
VALUES FOR TOTAL SECTION =	2	0	2	0.1	1.5	0.4

F = 0.7

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: Note 10/C4.0
Conc. Point: S4
Q100: 0.6
Minimum slope = 0.8%

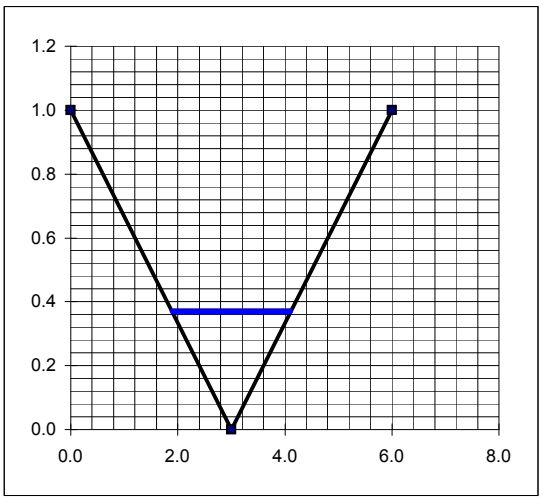
MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient



SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.

NUMBER OF POINTS IN SECTION =	3.00	
ASSUMED WSEL=	0.37	
BED OR ENERGY SLOPE (FT/FT) =	0.008	design
Freeboard	0.07	(ft)
Design Flow Depth	0.44	(ft)
Left Side slope (H:V)	3.0	(ft)
Right Side slope (H:V)	3.0	(ft)
Design Channel bottom width	0.0	(ft)
Design Channel Topwidth	2.6	(ft)

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0.0	1.0	0.0
2	3.0	0.0	0.4
3	6.0	1.0	0.0

SEGMENT DATA

Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.0300	1.11	0.21	1.17	0.18	1.39	0.3
0.0300	1.11	0.21	1.17	0.18	1.39	0.3
VALUES FOR TOTAL SECTION =	2	0	2	0.2	1.4	0.6

F = 0.6

PROJECT NAME: Residences at Morning Vista
PROJECT DETAIL: Grenier 9/C7.0
Conc. Point: S5 v-ditch
Q100: 0.5
Minimum slope = 2.6%

MANNING'S NORMAL DEPTH FLOW CALCULATION FOR IRREGULAR SECTIONS

THE FOLLOWING CALCULATIONS DETERMINE FLOW IN IRREGULAR SECTIONS BASED ON MANNING'S EQUATION FOR NORMAL DEPTH IN UNIFORM FLOW AS SHOWN BELOW:

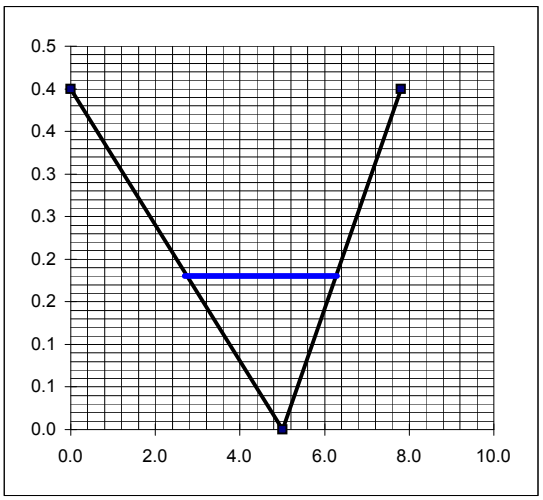
Q = V * A = (1.486 * Rh ^ (2/3) * SQRT(S) / n) * A

Where:

Q = Discharge (cfs)
V = Flow Velocity (fps)
A = Cross-Sectional Flow Area (sq ft)
R = Hydraulic Radius (ft) = A / WP
WP = Wetted Perimeter (ft)
S = Bed or Energy Slope (ft/ft)
n = Manning's Roughness Coefficient

SPREADSHEET DETERMINES DISCHARGE FOR A GIVEN WATER SURFACE ELEVATION (WSEL).

ENTER REQUESTED DATA; AND THEN ENTER STATION, ELEVATION, AND MANNING "n" VALUES IN TABLE BELOW.



NUMBER OF POINTS IN SECTION =	3.00	
ASSUMED WSEL=	0.18	
BED OR ENERGY SLOPE (FT/FT) =	0.026	design
Freeboard	0.04	(ft)
Design Flow Depth	0.22	(ft)
Left Side slope (H:V)	12.5	(ft)
Right Side slope (H:V)	7.0	(ft)
Design Channel bottom width	0.0	(ft)
Design Channel Topwidth	4.2	(ft)

POINT DATA

POINT Number	STATION (ft.)	ELEV (ft.)	h (ft.)
1	0.0	0.4	0.0
2	5.0	0.0	0.2
3	7.8	0.4	0.0

SEGMENT DATA

Manning n-value	TW (ft.)	A (sq. ft.)	WP (ft.)	Rh (ft.)	V (ft./sec.)	Q (cfs)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
0.0300	2.25	0.20	2.26	0.09	1.60	0.3
0.0300	1.26	0.11	1.27	0.09	1.59	0.2
VALUES FOR TOTAL SECTION =	4	0	4	0.1	1.6	0.5

F = 0.9

Appendix D. Scour and Erosion
(not used)

Appendix E. Detention Routing

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	Basin inflow	Job #	
Watershed Area:	2.8 Acres	Watershed Type	High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.9	108	0.0083	0.045
2	12.4	462	0.0268	0.04

Length of Watercourse (Lc):	570	feet	Mean Slope:	0.0203	
Length to Cen. of Gravity (Lca):	285	feet	Weighted Basin Fac:	0.041	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 2-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.37	0.56	0.69	0.93	1.15	1.3	1.37	1.57	1.78	2.08

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.149
C	41	87.3	0.277
D	18	90.3	0.378
Imp.	61	99	0.902

Weighted Runoff Coef. (Cw):	0.64	
Time of Concentration:	5.8	min
Rainfall Intensity (i) @ Tc:	4.15	in/hr
Runoff Supply Rate (q) @ Tc:	2.68	in/hr
PEAK DISCHARGE:	7.6	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	Basin inflow	Job #	
Watershed Area:	2.8 Acres	Watershed Type	High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.9	108	0.0083	0.045
2	12.4	462	0.0268	0.04

Length of Watercourse (Lc):	570	feet	Mean Slope:	0.0203	
Length to Cen. of Gravity (Lca):	285	feet	Weighted Basin Fac:	0.041	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 10-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.57	0.87	1.08	1.45	1.79	2	2.08	2.32	2.59	3.04

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.285
C	41	87.3	0.425
D	18	90.3	0.523
Imp.	61	99	0.935

Weighted Runoff Coef. (Cw):	0.72	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	6.84	in/hr
Runoff Supply Rate (q) @ Tc:	4.93	in/hr
PEAK DISCHARGE:	13.9	cfs

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Generated using methonds provided by Pima County Regional Flood Control District

Client:	Grenier Engineering	Prepared by:	lkr
Project Name:	Residences at Morning Vista	Date:	01/09/2023
Concentration Point:	Basin inflow	Job #	
Watershed Area:	2.8 Acres	Watershed Type	High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	0.9	108	0.0083	0.045
2	12.4	462	0.0268	0.04

Length of Watercourse (Lc):	570	feet	Mean Slope:	0.0203	
Length to Cen. of Gravity (Lca):	285	feet	Weighted Basin Fac:	0.041	
Veg. Cover Type(s):	Desert Brush		Veg. Cover Density:	30	

RETURN PERIOD: 100-years NOAA Data Obtained: 2021-06-20 01:40:01 PM

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 32.4567 Longitude: -110.9716

Duration:	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in):	0.88	1.34	1.66	2.24	2.77	3.09	3.25	3.58	3.91	4.65

Soil Type	Percent	Curve # (CN)	Runoff Coef. (C)
B	41	81.9	0.431
C	41	87.3	0.564
D	18	90.3	0.649
Imp.	61	99	0.958

Weighted Runoff Coef. (Cw):	0.79	
Time of Concentration:	5	min
Rainfall Intensity (i) @ Tc:	10.56	in/hr
Runoff Supply Rate (q) @ Tc:	8.33	in/hr
PEAK DISCHARGE:	23.5	cfs

Calculations for Grate Inlets in a sump acting as a weir

Project : **Residences at Morning Glory**
Determine grate inlet size for maximum inflow of 21 cfs before underground tank is filled

Equation 10.10 (City of Tucson Drainage Standards Manual)
*Qi = 3 * P *Yi^1.5* , where P= perimeter

Double perimeter for clogging factor to account for debris (page 10.24)

Depth =	0.71	feet

Watershed Location	100-year Discharge (cfs)	100-year Perimeter (feet)
Basin floor	21	23.6

Proposed Circular Grate Inlets

Diameter (ft)	2.5
Perimeter (ft)	7.9
Perimeter for 3 grates	23.6

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

Worksheet to Input the Inflow Hydrograph, & Automatically Perform the Routing Calculations using the Stage-Volume data, Volume-Outflow data, & SO Working Curve

PIMA COUNTY FLOOD CONTROL

Rev. 4/17

Corner basin with vertical walls and underground tanl	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
preliminary basin 2nd sub.xls	**Program File Name**

GOVERNING EQUATION: *Ref: Applied Hydrology (Ven Te Chow, Editor 1964)*

Mass Conservation: $0.5 * (I_1 + I_2) * \Delta t - 0.5 * (O_1 + O_2) * \Delta t = S_2 - S_1$

Isolate, divide by Δt: $0.5 * (I_1 + I_2) + S_1 / \Delta t - 0.5 * O_1 = S_2 / \Delta t + 0.5 * O_2$

VARIABLES:

Δt	time interval between hydrograph discharges.
I_1, I_2	inflow rate into facility at start and end of time interval from inflow hydrograph
O_1, O_2	facility outflow rate at start & end of time interval
S_1, S_2	stormwater in storage in the facility at start and end of time interval

Note: Input Δt, target discharges & inflow hydrographs for 3 storm frequencies into blue cells. Outflow hydrographs (yellow) are calculated from specified outlet configuration (**vol-outflow** tab) and facility geometry (**Stage-Vol** tab). To add rows to this worksheet, add them in roughly the center of the range, then unhide all columns and copy hidden equations into the new rows. Zero discharge within and beyond the end of the hydrograph will not affect the routing. **All blue cells in this spreadsheet must either be blank (highlight, right-click, Clear Contents) or must contain a number. In addition, the Stage - Volume data must be entered in numerically ascending order. This spreadsheet does not have a "clear" button to clear all input data in one action; to accomplish this, restart Excel using a blank copy of the spreadsheet.**

RESULTS:

	max inflow	max outflow	total inflow volume	max stage (H) *	Target +B2+B3
100-Year	23.0 cfs	13.9 cfs	24370 ft^3 0.559 af	4.91 ft 21 min	14.0 cfs
10-Year	13.6 cfs	5.8 cfs	14415 ft^3 0.331 af	3.88 ft 25 min	6.7 csf
2-Year	7.6 cfs	1.1 cfs	8150 ft^3 0.187 af	2.96 ft 36 min	2.1 cfs

* Max Design Stage = 4.9 ft Surface basin design stage

NOTE: IF H > MAX DESIGN STAGE, EXTEND STAGE-VOL DATA TO A HIGHER STAGE

** target discharges not used in calculations; for informational use only

Δt = 1.00 min 0.0167 hr inflow hydrograph time interval

index count	100-Year Inflow I, cfs	100-Year time t, hr	100-Year S/Δt+O/2 cfs	10-Year Inflow I, cfs	10-Year S/Δt+O/2 cfs	2-Year Inflow I, cfs	2-Year S/Δt+O/2 cfs	100-Year outflow O, cfs	100-Year Stage H, ft	10-Year outflow O, cfs	10-Year Stage H, ft	2-Year outflow O, cfs	2-Year Stage H, ft
0	0	0.0000	0.00	0	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0	0.0167	0.22	0	0.13	0.1	0.07	0.00	0.01	0.00	0.00	0.00	0.00
2	1	0.0333	1.07	1	0.63	0.4	0.33	0.00	0.03	0.00	0.02	0.00	0.01
3	2	0.0500	2.90	1	1.72	0.7	0.89	0.01	0.08	0.00	0.05	0.00	0.02
4	4	0.0667	5.92	2	3.50	1.1	1.82	0.04	0.16	0.02	0.10	0.00	0.05
5	5	0.0833	10.24	3	6.07	1.6	3.17	0.10	0.28	0.04	0.17	0.01	0.09
6	7	0.1000	16.04	4	9.51	2.1	4.96	0.18	0.44	0.09	0.26	0.03	0.14
7	8	0.1167	23.46	5	13.92	2.6	7.27	0.23	0.65	0.15	0.38	0.06	0.20
8	10	0.1333	32.63	6	19.32	3.2	10.11	0.28	0.90	0.20	0.53	0.10	0.28
9	12	0.1500	43.71	7	25.84	3.8	13.50	0.33	1.21	0.24	0.71	0.15	0.37
10	15	0.1667	57.03	9	33.67	4.5	17.52	0.39	1.58	0.29	0.93	0.19	0.48
11	18	0.1833	72.91	10	43.01	5.4	22.29	0.44	2.02	0.33	1.19	0.22	0.62
12	20	0.2000	91.41	12	53.88	6.2	27.88	0.50	2.53	0.37	1.49	0.25	0.77
13	22	0.2167	112.19	13	66.09	7.0	34.21	1.53	3.07	0.42	1.83	0.29	0.95
14	23	0.2333	133.31	14	79.08	7.6	41.18	4.09	3.60	0.46	2.19	0.32	1.14
15	22	0.2500	151.53	13	91.81	7.2	48.25	6.92	4.04	0.50	2.54	0.35	1.34
16	20	0.2667	165.53	12	103.69	6.8	54.89	9.38	4.37	0.82	2.85	0.38	1.52
17	19	0.2833	175.62	11	114.38	6.3	61.06	11.27	4.61	1.75	3.13	0.40	1.69
18	17	0.3000	182.39	10	123.31	5.9	66.75	12.59	4.76	2.77	3.35	0.42	1.85
19	16	0.3167	186.46	9	130.40	5.4	71.99	13.41	4.86	3.69	3.53	0.44	1.99
20	15	0.3333	188.40	9	135.78	5.0	76.78	13.80	4.90	4.45	3.66	0.45	2.13
21	14	0.3500	188.74	8	139.70	4.6	81.15	13.87	4.91	5.03	3.76	0.47	2.25
22	13	0.3667	187.93	7	142.39	4.3	85.15	13.71	4.89	5.45	3.82	0.48	2.36
23	11	0.3833	186.22	7	144.05	4.0	88.80	13.36	4.85	5.71	3.86	0.49	2.46
24	10	0.4000	183.81	6	144.82	3.6	92.11	12.88	4.80	5.83	3.88	0.50	2.55
25	9	0.4167	180.91	6	144.89	3.3	95.09	12.30	4.73	5.84	3.88	0.51	2.63
26	9	0.4333	177.66	5	144.40	3.0	97.75	11.66	4.65	5.76	3.87	0.53	2.70
27	8	0.4500	174.18	5	143.48	2.7	100.11	10.99	4.57	5.62	3.85	0.61	2.76
28	7	0.4667	170.58	4	142.24	2.5	102.12	10.31	4.49	5.42	3.82	0.72	2.81
29	6	0.4833	166.94	4	140.76	2.3	103.77	9.64	4.40	5.19	3.78	0.82	2.86
30	6	0.5000	163.27	3	139.10	2.0	105.09	8.96	4.32	4.94	3.74	0.92	2.89
31	5	0.5167	159.66	3	137.32	1.8	106.10	8.32	4.23	4.67	3.70	1.00	2.92
32	5	0.5333	156.16	3	135.50	1.7	106.84	7.71	4.15	4.41	3.65	1.05	2.94
33	4	0.5500	152.77	2	133.64	1.5	107.35	7.13	4.07	4.14	3.61	1.09	2.95
34	4	0.5667	149.53	2	131.80	1.3	107.66	6.59	3.99	3.88	3.56	1.12	2.96
35	3	0.5833	146.45	2	129.99	1.2	107.81	6.09	3.92	3.64	3.52	1.13	2.96
36	3	0.6000	143.53	2	128.23	1.1	107.84	5.62	3.85	3.40	3.48	1.13	2.96
37	3	0.6167	140.77	2	126.52	1.0	107.75	5.19	3.78	3.18	3.43	1.13	2.96
38	2	0.6333	138.14	1	124.87	0.9	107.57	4.80	3.72	2.96	3.39	1.11	2.96
39	2	0.6500	135.66	1	123.27	0.8	107.31	4.43	3.66	2.76	3.35	1.09	2.95
40	2	0.6667	133.33	1	121.76	0.7	106.99	4.10	3.60	2.58	3.31	1.07	2.94
41	2	0.6833	131.14	1	120.31	0.7	106.62	3.79	3.55	2.40	3.28	1.04	2.93
42	2	0.7000	129.09	1	118.93	0.6	106.22	3.51	3.50	2.24	3.24	1.01	2.92
43	2	0.7167	127.20	1	117.65	0.6	105.80	3.26	3.45	2.10	3.21	0.97	2.91
44	1	0.7333	125.43	1	116.44	0.5	105.37	3.03	3.41	1.97	3.18	0.94	2.90
45	1	0.7500	123.76	1	115.28	0.5	104.93	2.82	3.37	1.84	3.15	0.91	2.89
46	1	0.7667	122.19	1	114.18	0.4	104.48	2.63	3.33	1.73	3.12	0.88	2.88
47	1	0.7833	120.69	1	113.12	0.4	104.03	2.45	3.29	1.62	3.10	0.84	2.86
48	1	0.8000	119.29	1	112.12	0.4	103.57	2.28	3.25	1.52	3.07	0.81	2.85
49	1	0.8167	117.97	1	111.17	0.3	103.12	2.13	3.22	1.43	3.05	0.78	2.84
50	1	0.8333	116.72	0	110.26	0.3	102.66	2.00	3.19	1.35	3.02	0.75	2.83
51	1	0.8500	115.53	0	109.39	0.3	102.21	1.87	3.16	1.27	3.00	0.73	2.82
52	1	0.8667	114.39	0	108.55	0.3	101.76	1.75	3.13	1.20	2.98	0.70	2.80
53	1	0.8833	113.31	0	107.75	0.2	101.31	1.64	3.10	1.13	2.96	0.67	2.79
54	1	0.9000	112.30	0	106.99	0.2	100.87	1.54	3.08	1.07	2.94	0.65	2.78
55	1	0.9167	111.34	0	106.27	0.2	100.43	1.45	3.05	1.01	2.92	0.63	2.77
56	1	0.9333	110.43	0	105.58	0.2	100.00	1.36	3.03	0.96	2.90	0.61	2.76
57	0	0.9500	109.57	0	104.92	0.2	99.58	1.28	3.01	0.91	2.89	0.59	2.75
58	0	0.9667	108.74	0	104.29	0.2	99.17	1.21	2.99	0.86	2.87	0.57	2.74
59	0	0.9833	107.95	0	103.67	0.2	98.75	1.14	2.97	0.82	2.85	0.56	2.72
60	0	1.0000	107.20	0	103.08	0.1	98.34	1.08	2.95	0.78	2.84	0.54	2.71

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

Worksheet to Input the Stage - Volume Relationship for the Facility

PIMA COUNTY FLOOD CONTROL

Rev.4/17

Corner basin with vertical walls and underground tank	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
preliminary basin 2nd sub.xls	**Program File Name**

GOVERNING EQUATIONS: ***Ref: HEC-1 Flood Hydrograph Package User's Manual (USACOE September 1990)***

Conic method for reservoir volume: $\Delta V_{1\text{-}2} = 0.33 * h * (A_1 + A_2 + (A_1 * A_2)^{0.5})$ (see "**Conic Proj**" tab)

VARIABLES:

$\Delta V_{1\text{-}2}$	incremental facility storage volume between stages H_1 and H_2
h	elevation difference between A_1 and A_2
A1, A2	facility surface area at stages H_1 and H_2

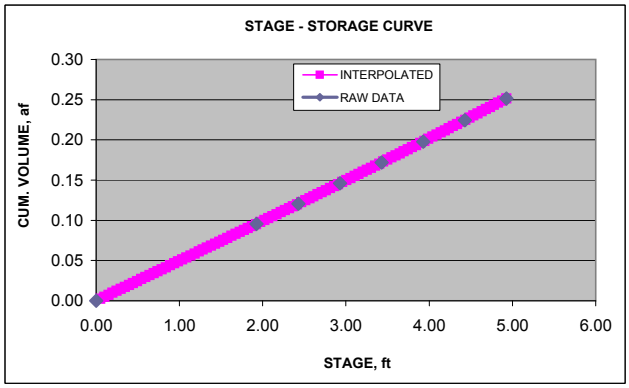
4.93 = max design stage (ft)

3.00 = max surface stage (ft)

underground tank volume

Elev	stage H, ft	area A, ac	volume ΔV, af	for information only: area A, ft²	volume ΔV, ft³	Σ ΔV S, ft³	Σ ΔV S, af	index for interpolation
2160	0.0	0.0496	0	2160	0	0	0	1
2160 51.43	1.93	0.0496	0.096	2160	4162	4162	0.096	2
2196 53.36	2.43	0.0504	0.025	2196	1089	5251	0.121	3
2231 53.86	2.93	0.0512	0.025	2231	1107	6357	0.146	4
2265 54.36	3.43	0.0520	0.026	2265	1124	7481	0.172	5
2299 54.86	3.93	0.0528	0.026	2299	1141	8622	0.198	6
2331 55.36	4.43	0.0535	0.027	2331	1157	9779	0.224	7
2364 55.86	4.93	0.0543	0.027	2364	1173	10953	0.251	8
								9
								10
								11
								12
								13
								14
								15
								16
								17
								18
								19
								20
								21
								22
								23
								24
								25
								26

Note: Develop stage-storage curve on this worksheet by either entering in the blue shaded column the planimetered basin areas (in acres) at various stages or by entering facility stages and corresponding incremental volumes (acre-feet, purple shaded column). Graph of the stage-storage curve shown to verify proper interpolation (purple points) of facility volume by **Vol Outflow** tab. **You may insert rows into the middle of this table** to accomodate the size of your data set; empty rows below the extent of your data will not cause a problem. **Stage - Volume data must begin at stage = 0 ft with a volume of 0 af. Stage - Volume data must be entered in ascending order. Blue cells below the entered data must remain empty (highlight, right-click, clear contents). All blue cells must eigther be blank or must contain a number.**



PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

PIMA COUNTY FLOOD CONTROL

Rev. 4/17

Worksheet to Develop the Stage - Discharge Characteristics of the Outlet Works for the Facility

Corner basin with vertical walls and underground tanl	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
preliminary basin 2nd sub.xls	**Program File Name**

Note: Populate characteristics of selected outflow elements corresponding to facility outlet configuration (blue cells), or overwrite purple cells with outflows calculated outside this worksheet, as a function of the given facility stages. Storage (last column) at each stage is interpolated from stage-volume relationship (see **Stage Vol**" tab). **Do not add rows** to this worksheet; it automatically divides maximum facility design stage into 100 increments to develop the volume-outflow curve.

GOVERNING EQUATIONS:

Orifice equation: $Q_o = C * A * (2 * g * H)^{0.5}$ and see weir flow equation on "**Orifice**" tab

Rectangular Weir Equation: $Q_w = C * L * H^{1.5}$

Triangular Weir Equation $Q_w = C_t * Tan(\Theta/2) * H^{2.5}$

Box Culvert Equation See Box Culvert equations for Inlet Control on **"RCBC"** tab

0.75 stage at crest for surface basin

ORIFICE PLATE OUTFLOW ELEMENT				
d_o (in) =	3.50	diameter	area (ft²) =	0.067
C =	0.60	disch coefficient		
E_o (ft) =	0.15	stage @ orifice center	inv (in) =	0.00
N =	1	nbr identical openings	inv (ft) =	0.000

TRIANGULAR WEIR OUTFLOW ELEMENT		
Z =		side slope
E_w (ft) =		stage at crest
C_t =		disch coefficient
Θ (deg) =		notch angle

RECTANGULAR WEIR OUTFLOW ELEMENT(S)	rect 1	rect 2	rect 3	
L (ft) =	1.32			crest length
C =	3.00			disch coefficient
E_w (ft) =	2.68			routing stage

BOX, ROUND CULVERT OUTFLOW ELEMENT	RCP	RCBC	
D (ft) =			barrel rise, dia
B (ft) =			barrel span
E_b (ft) =			barrel invert
# PIPES =			

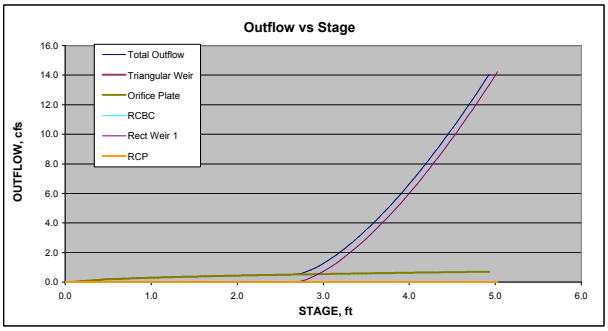
Stage	Orifice Plate	Weir Element(s) Triang 1	Rect 1	Rect 2	Rect 3	RCP	RCBC	Outflow	Σ vol
H, ft	Q, cfs	Q, cfs	Q, cfs	Q, cfs	Q, cfs	Q, cfs	Q, cfs	O, cfs	S, af
0.00								0.0	0.0000
0.05	0.0							0.0	0.0024
0.10	0.0							0.0	0.0049
0.15	0.0							0.0	0.0073
0.20	0.1							0.1	0.0098
0.25	0.1							0.1	0.0122
0.30	0.1							0.1	0.0147
0.35	0.1							0.1	0.0171
0.39	0.2							0.2	0.0195
0.44	0.2							0.2	0.0220
0.49	0.2							0.2	0.0244
0.54	0.2							0.2	0.0269
0.59	0.2							0.2	0.0293
0.64	0.2							0.2	0.0318
0.69	0.2							0.2	0.0342
0.74	0.2							0.2	0.0366
0.79	0.3							0.3	0.0391
0.84	0.3							0.3	0.0415
0.89	0.3							0.3	0.0440
0.94	0.3							0.3	0.0464
0.99	0.3							0.3	0.0488
1.04	0.3							0.3	0.0513
1.08	0.3							0.3	0.0537
1.13	0.3							0.3	0.0562
1.18	0.3							0.3	0.0586
1.23	0.3							0.3	0.0611
1.28	0.3							0.3	0.0635
1.33	0.4							0.4	0.0659
1.38	0.4							0.4	0.0684
1.43	0.4							0.4	0.0708
1.48	0.4							0.4	0.0733
1.53	0.4							0.4	0.0757
1.58	0.4							0.4	0.0782
1.63	0.4							0.4	0.0806
1.68	0.4							0.4	0.0830
1.73	0.4							0.4	0.0855
1.77	0.4							0.4	0.0879
1.82	0.4							0.4	0.0904
1.87	0.4							0.4	0.0928
1.92	0.4							0.4	0.0953
1.97	0.4							0.4	0.0977
2.02	0.4							0.4	0.1002
2.07	0.4							0.4	0.1026
2.12	0.5							0.5	0.1051
2.17	0.5							0.5	0.1076
2.22	0.5							0.5	0.1100
2.27	0.5							0.5	0.1125
2.32	0.5							0.5	0.1150
2.37	0.5							0.5	0.1174
2.41	0.5							0.5	0.1199
2.46	0.5							0.5	0.1224
2.51	0.5							0.5	0.1249
2.56	0.5							0.5	0.1274
2.61	0.5							0.5	0.1299
2.66	0.5							0.5	0.1324
2.71	0.5		0.0					0.5	0.1349
2.76	0.5		0.1					0.6	0.1374
2.81	0.5		0.2					0.7	0.1399
2.86	0.5		0.3					0.8	0.1424
2.91	0.5		0.4					1.0	0.1449
2.96	0.5		0.6					1.1	0.1474
3.01	0.5		0.7					1.3	0.1500
3.06	0.5		0.9					1.5	0.1525
3.10	0.6		1.1					1.6	0.1551
3.15	0.6		1.3					1.8	0.1576
3.20	0.6		1.5					2.1	0.1602
3.25	0.6		1.7					2.3	0.1627
3.30	0.6		1.9					2.5	0.1652
3.35	0.6		2.2					2.8	0.1678
3.40	0.6		2.4					3.0	0.1703
3.45	0.6		2.7					3.3	0.1729
3.50	0.6		2.9					3.5	0.1754
3.55	0.6		3.2					3.8	0.1781
3.60	0.6		3.5					4.1	0.1806
3.65	0.6		3.8					4.4	0.1832
3.70	0.6		4.0					4.7	0.1858
3.75	0.6		4.4					5.0	0.1884
3.79	0.6		4.7					5.3	0.1909
3.84	0.6		5.0					5.6	0.1935
3.89	0.6		5.3					5.9	0.1961
3.94	0.6		5.6					6.2	0.1987
3.99	0.6		5.9					6.6	0.2013
4.04	0.6		6.3					6.9	0.2039
4.09	0.6		6.6					7.3	0.2066
4.14	0.6		7.0					7.6	0.2092
4.19	0.6		7.3					8.0	0.2118
4.24	0.7		7.7					8.3	0.2144
4.29	0.7		8.1					8.7	0.2170
4.34	0.7		8.4					9.1	0.2196
4.39	0.7		8.8					9.5	0.2223
4.44	0.7		9.2					9.9	0.2249
4.48	0.7		9.6					10.3	0.2276
4.53	0.7		10.0					10.7	0.2302
4.58	0.7		10.4					11.1	0.2328
4.63	0.7		10.8					11.5	0.2355
4.68	0.7		11.2					11.9	0.2382
4.73	0.7		11.6					12.3	0.2408
4.78	0.7		12.0					12.7	0.2434
4.83	0.7		12.5					13.2	0.2461
4.88	0.7		12.9					13.6	0.2488
4.93	0.7		13.3					14.0	0.2514
5.03	0.7		14.2					14.9	0.2567

last two cells in cum.vol column contain non-standard equations

ROUTING RESULTS FOR DESIGN OF OUTLET WORKS

Subtract 1.93 from results for surface basin | Max Design Stage = 4.93 ft

	Max Inflow		Max Outflow		Max Stage				target discharges	
100-Yr	23.0	cfs	13.9	cfs	4.91	ft @	21	min	14.0	cfs
10-Yr	13.6	cfs	5.8	cfs	3.88	ft @	25	min	6.7	cfs
2 -yr	7.6	cfs	1.1	cfs	2.96	ft @	36	min	2.1	cfs



PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

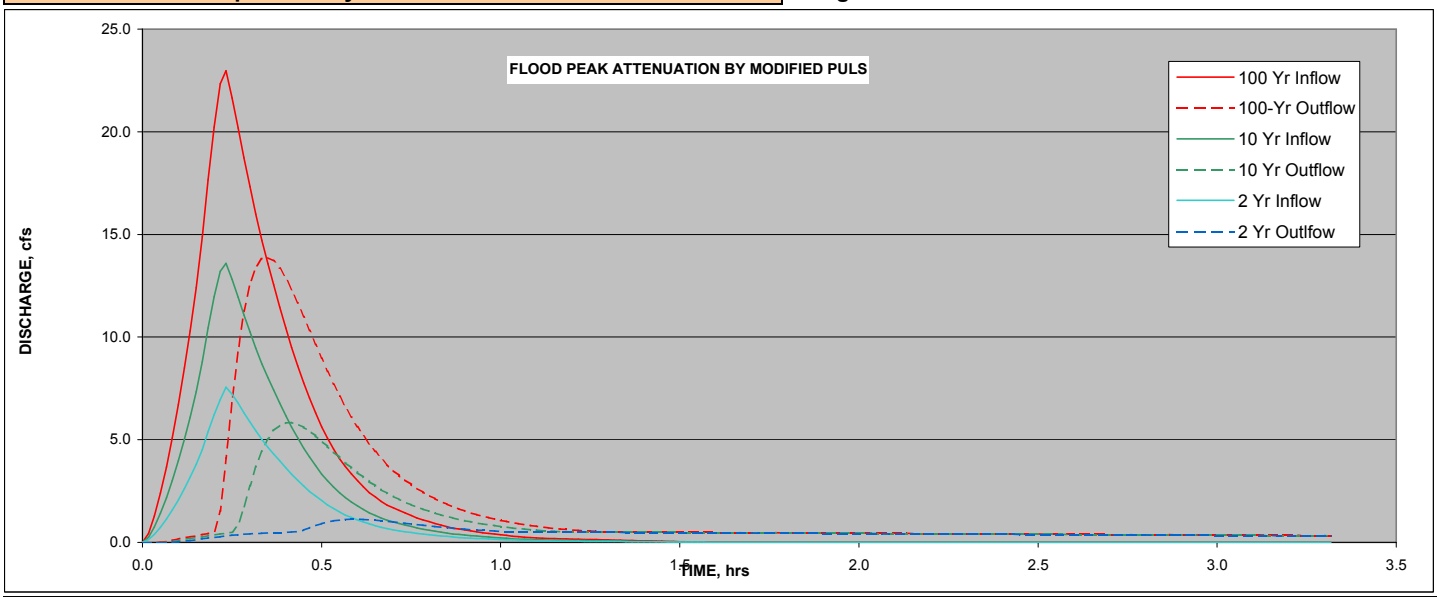
THIS TAB CONTAINS NO INPUT DATA

Summary of Reservoir Routing of the Inflow Hydrograph using the Specified Detention Facility and Outlet Works

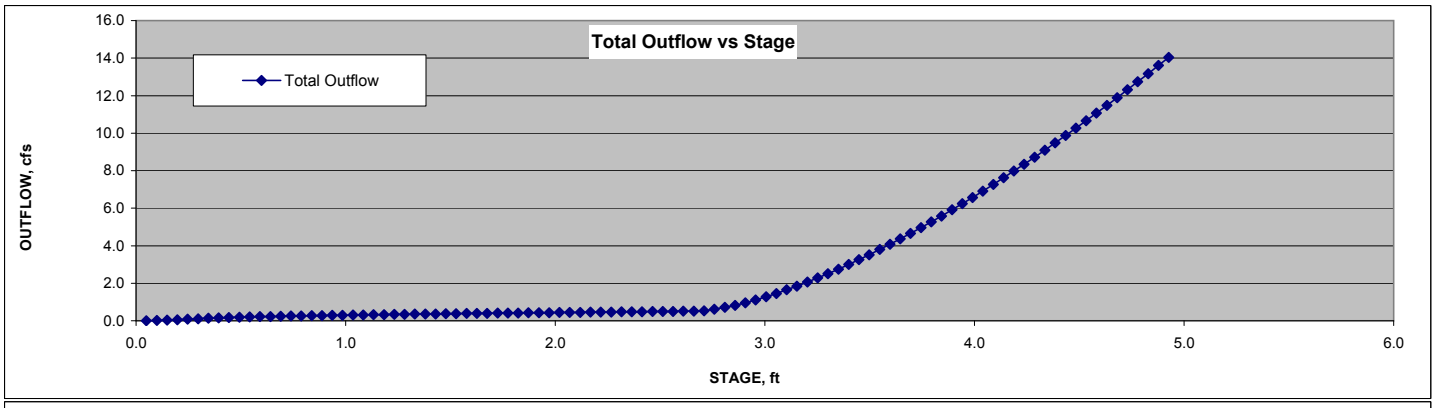
PIMA COUNTY FLOOD CONTROL

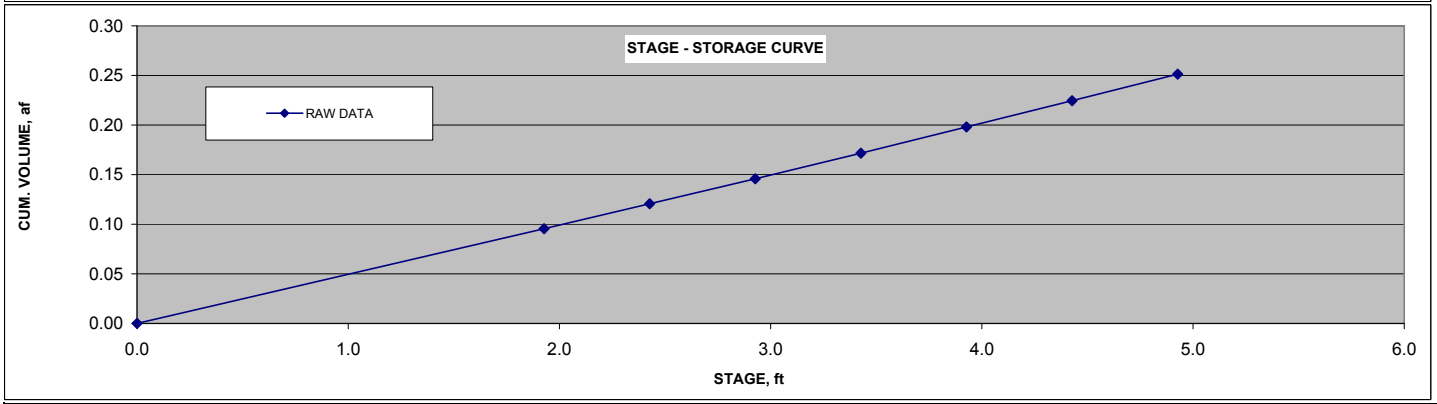
Rev.04/17

Corner basin with vertical walls and underground tank	Project Address
Larry K. Roberts, P.E.	Designer
Friday, January 13, 2023	Run Date
preliminary basin 2nd sub.xls	Program File Name



ORIFICE PLATE			TRIANGULAR WEIR			RECTANGULAR WEIR(S)					RCP / RCBC		
							rect 1	rect 2	rect 3		RCP	RCBC	
d_o (in) =	3.5	diameter	Z =	0.0	side slope								
C (dim) =	0.60	discharge coefficient	E_w (ft) =	0.00	stage at weir crest	L (ft) =	1.3	0.0	0.0	crest length	0.0	0.0	D (ft) rise / diameter
N =	1	nbr identical openings	Θ =		° notch angle	C =	3.00	0.00	0.00	discharge coef		0.0	B (ft) span
inv (ft) =	0.00	stage at invert	C_1 =	0	discharge coefficient	E_w (ft) =	2.68	0.00	0.00	stage at crest	0.00	0.00	E_b (ft) stage at invert





RESULTS:

	max inflow	max outflow	target discharge	total inflow volume	max stage (H) *
100-Year	23.0 cfs	13.9 cfs	14.0 cfs	24370 ft^3 0.559 af	4.91 ft at 21 min
10-Year	13.6 cfs	5.8 cfs	6.7 cfs	14415 ft^3 0.331 af	3.88 ft at 25 min
2-Year	7.6 cfs	1.1 cfs	2.1 cfs	8150 ft^3 0.187 af	2.96 ft at 36 min

* Max Design Stage (ft) = 4.93

NOTE: IF H > MAX DESIGN STAGE, EXTEND STAGE-VOL DATA TO A HIGHER STAGE

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

Worksheet to Input the Inflow Hydrograph, & Automatically Perform the Routing Calculations using the Stage-Volume data, Volume-Outflow data, & SO Working Curve

PIMA COUNTY FLOOD CONTROL

Rev. 4/17

Corner basin with vertical walls and 1.5 * tank volume	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
final basin with 1.5 tank vol 2nd sub.xls	**Program File Name**

GOVERNING EQUATION: *Ref: Applied Hydrology (Ven Te Chow, Editor 1964)*

Mass Conservation: $0.5 * (I_1 + I_2) * \Delta t - 0.5 * (O_1 + O_2) * \Delta t = S_2 - S_1$

Isolate, divide by Δt: $0.5 * (I_1 + I_2) + S_1 / \Delta t - 0.5 * O_1 = S_2 / \Delta t + 0.5 * O_2$

VARIABLES:

Δt	time interval between hydrograph discharges.
I_1, I_2	inflow rate into facility at start and end of time interval from inflow hydrograph
O_1, O_2	facility outflow rate at start & end of time interval
S_1, S_2	stormwater in storage in the facility at start and end of time interval

Note: Input Δt, target discharges & inflow hydrographs for 3 storm frequencies into blue cells. Outflow hydrographs (yellow) are calculated from specified outlet configuration (**vol-outflow** tab) and facility geometry (**Stage-Vol** tab). To add rows to this worksheet, add them in roughly the center of the range, then unhide all columns and copy hidden equations into the new rows. Zero discharge within and beyond the end of the hydrograph will not affect the routing. **All blue cells in this spreadsheet must either be blank (highlight, right-click, Clear Contents) or must contain a number. In addition, the Stage - Volume data must be entered in numerically ascending order. This spreadsheet does not have a "clear" button to clear all input data in one action; to accomplish this, restart Excel using a blank copy of the spreadsheet.**

RESULTS:

	max inflow	max outflow	total inflow volume		max stage (H) *	Target +B2+B3
100-Year	23.0 cfs	12.3 cfs	24370 ft^3	0.559 af	5.67 ft 22 min	14.0 cfs
10-Year	13.6 cfs	4.2 cfs	14415 ft^3	0.331 af	4.57 ft 28 min	6.7 csf
2-Year	7.6 cfs	0.6 cfs	8150 ft^3	0.187 af	3.13 ft 43 min	2.1 cfs

* Max Design Stage = 5.9 ft Surface basin design stage

NOTE: IF H > MAX DESIGN STAGE, EXTEND STAGE-VOL DATA TO A HIGHER STAGE

** target discharges not used in calculations; for informational use only

Δt = 1.00 min 0.0167 hr inflow hydrograph time interval

index count	100-Year Inflow I, cfs	100-Year time t, hr	100-Year S/Δt+O/2 cfs	10-Year Inflow I, cfs	10-Year S/Δt+O/2 cfs	2-Year Inflow I, cfs	2-Year S/Δt+O/2 cfs	100-Year outflow O, cfs	100-Year Stage H, ft	10-Year outflow O, cfs	10-Year Stage H, ft	2-Year outflow O, cfs	2-Year Stage H, ft
0	0	0.0000	0.00	0	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0	0.0167	0.22	0	0.13	0.1	0.07	0.00	0.01	0.00	0.00	0.00	0.00
2	1	0.0333	1.07	1	0.63	0.4	0.33	0.00	0.03	0.00	0.02	0.00	0.01
3	2	0.0500	2.90	1	1.72	0.7	0.89	0.01	0.08	0.01	0.05	0.00	0.02
4	4	0.0667	5.92	2	3.50	1.1	1.82	0.04	0.16	0.02	0.10	0.01	0.05
5	5	0.0833	10.24	3	6.07	1.6	3.17	0.10	0.28	0.04	0.17	0.01	0.09
6	7	0.1000	16.03	4	9.51	2.1	4.96	0.17	0.44	0.09	0.26	0.03	0.14
7	8	0.1167	23.46	5	13.91	2.6	7.27	0.23	0.65	0.15	0.38	0.06	0.20
8	10	0.1333	32.63	6	19.32	3.2	10.10	0.28	0.90	0.20	0.53	0.10	0.28
9	12	0.1500	43.71	7	25.84	3.8	13.50	0.33	1.21	0.24	0.71	0.15	0.37
10	15	0.1667	57.03	9	33.67	4.5	17.52	0.39	1.58	0.29	0.93	0.19	0.48
11	18	0.1833	72.91	10	43.01	5.4	22.29	0.44	2.02	0.33	1.19	0.22	0.62
12	20	0.2000	91.41	12	53.88	6.2	27.87	0.50	2.53	0.37	1.49	0.25	0.77
13	22	0.2167	112.19	13	66.09	7.0	34.21	0.55	3.11	0.42	1.83	0.29	0.95
14	23	0.2333	134.29	14	79.07	7.6	41.18	0.68	3.71	0.46	2.19	0.32	1.14
15	22	0.2500	155.92	13	91.81	7.2	48.25	2.61	4.26	0.50	2.54	0.35	1.34
16	20	0.2667	174.24	12	103.69	6.8	54.89	5.10	4.71	0.53	2.87	0.38	1.52
17	19	0.2833	188.60	11	114.67	6.3	61.06	7.41	5.06	0.56	3.18	0.40	1.69
18	17	0.3000	199.22	10	124.78	5.9	66.75	9.28	5.31	0.59	3.45	0.42	1.85
19	16	0.3167	206.60	9	134.05	5.4	71.98	10.65	5.48	0.67	3.70	0.44	1.99
20	15	0.3333	211.29	9	142.45	5.0	76.78	11.55	5.59	1.22	3.92	0.45	2.13
21	14	0.3500	213.89	8	149.60	4.6	81.15	12.05	5.65	1.90	4.10	0.47	2.25
22	13	0.3667	214.90	7	155.43	4.3	85.14	12.25	5.67	2.55	4.25	0.48	2.36
23	11	0.3833	214.65	7	159.98	4.0	88.80	12.20	5.67	3.11	4.37	0.49	2.46
24	10	0.4000	213.40	6	163.35	3.6	92.11	11.96	5.64	3.55	4.45	0.50	2.55
25	9	0.4167	211.41	6	165.70	3.3	95.08	11.57	5.59	3.87	4.51	0.51	2.63
26	9	0.4333	208.89	5	167.18	3.0	97.75	11.09	5.54	4.07	4.54	0.52	2.71
27	8	0.4500	205.99	5	167.95	2.7	100.12	10.54	5.47	4.18	4.56	0.52	2.77
28	7	0.4667	202.84	4	168.14	2.5	102.21	9.95	5.40	4.21	4.57	0.53	2.83
29	6	0.4833	199.56	4	167.88	2.3	104.06	9.35	5.32	4.17	4.56	0.53	2.88
30	6	0.5000	196.18	3	167.24	2.0	105.67	8.73	5.24	4.08	4.54	0.54	2.93
31	5	0.5167	192.80	3	166.32	1.8	107.06	8.14	5.16	3.95	4.52	0.54	2.97
32	5	0.5333	189.48	3	165.22	1.7	108.26	7.56	5.08	3.80	4.49	0.54	3.00
33	4	0.5500	186.23	2	163.97	1.5	109.28	7.01	5.00	3.63	4.46	0.55	3.03
34	4	0.5667	183.10	2	162.63	1.3	110.14	6.50	4.93	3.45	4.43	0.55	3.05
35	3	0.5833	180.12	2	161.26	1.2	110.87	6.02	4.86	3.27	4.40	0.55	3.07
36	3	0.6000	177.27	2	159.86	1.1	111.47	5.57	4.79	3.09	4.36	0.55	3.09
37	3	0.6167	174.56	2	158.46	1.0	111.96	5.15	4.72	2.92	4.33	0.55	3.10
38	2	0.6333	171.98	1	157.06	0.9	112.36	4.76	4.66	2.74	4.29	0.55	3.11
39	2	0.6500	169.53	1	155.68	0.8	112.66	4.41	4.60	2.58	4.26	0.55	3.12
40	2	0.6667	167.23	1	154.35	0.7	112.87	4.08	4.54	2.42	4.22	0.56	3.13
41	2	0.6833	165.05	1	153.05	0.7	113.02	3.78	4.49	2.27	4.19	0.56	3.13
42	2	0.7000	163.02	1	151.81	0.6	113.10	3.51	4.44	2.13	4.16	0.56	3.13
43	2	0.7167	161.13	1	150.64	0.6	113.12	3.26	4.39	2.01	4.13	0.56	3.13
44	1	0.7333	159.37	1	149.52	0.5	113.11	3.03	4.35	1.89	4.10	0.56	3.13
45	1	0.7500	157.71	1	148.44	0.5	113.05	2.82	4.31	1.78	4.08	0.56	3.13
46	1	0.7667	156.13	1	147.40	0.4	112.96	2.63	4.27	1.67	4.05	0.56	3.13
47	1	0.7833	154.63	1	146.40	0.4	112.83	2.45	4.23	1.58	4.02	0.56	3.13
48	1	0.8000	153.23	1	145.44	0.4	112.66	2.29	4.20	1.49	4.00	0.55	3.12
49	1	0.8167	151.90	1	144.53	0.3	112.46	2.14	4.16	1.40	3.98	0.55	3.11
50	1	0.8333	150.64	0	143.65	0.3	112.23	2.01	4.13	1.32	3.95	0.55	3.11
51	1	0.8500	149.44	0	142.80	0.3	111.98	1.88	4.10	1.25	3.93	0.55	3.10
52	1	0.8667	148.28	0	141.97	0.3	111.70	1.76	4.07	1.18	3.91	0.55	3.09
53	1	0.8833	147.19	0	141.19	0.2	111.40	1.65	4.04	1.12	3.89	0.55	3.09
54	1	0.9000	146.16	0	140.44	0.2	111.08	1.55	4.02	1.06	3.87	0.55	3.08
55	1	0.9167	145.19	0	139.72	0.2	110.74	1.46	3.99	1.01	3.85	0.55	3.07
56	1	0.9333	144.27	0	139.03	0.2	110.39	1.38	3.97	0.96	3.83	0.55	3.06
57	0	0.9500	143.39	0	138.36	0.2	110.03	1.30	3.95	0.91	3.82	0.55	3.05
58	0	0.9667	142.54	0	137.72	0.2	109.66	1.23	3.93	0.87	3.80	0.55	3.04
59	0	0.9833	141.74	0	137.10	0.2	109.27	1.16	3.90	0.83	3.78	0.55	3.03
60	0	1.0000	140.96	0	136.50	0.1	108.87	1.10	3.88	0.79	3.77	0.55	3.02

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

Worksheet to Input the Stage - Volume Relationship for the Facility

PIMA COUNTY FLOOD CONTROL

Rev.4/17

Corner basin with vertical walls and 1.5 * tank volume	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
final basin with 1.5 tank vol 2nd sub.xls	**Program File Name**

GOVERNING EQUATIONS: ***Ref: HEC-1 Flood Hydrograph Package User's Manual (USACOE September 1990)***

Conic method for reservoir volume: $\Delta V_{1\text{-}2} = 0.33 * h * (A_1 + A_2 + (A_1 * A_2)^{0.5})$ (see "**Conic Proj**" tab)

VARIABLES:

$\Delta V_{1\text{-}2}$	incremental facility storage volume between stages H_1 and H_2
h	elevation difference between A_1 and A_2
A1, A2	facility surface area at stages H_1 and H_2

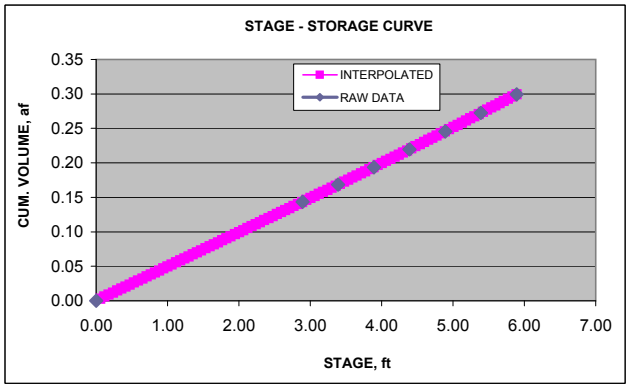
5.89 = max design stage (ft)

3.00 = max surface stage (ft)

underground tank volume with 50% added

Elev	stage H, ft	area A, ac	volume ΔV, af	for information only: area A, ft²	volume ΔV, ft³	Σ ΔV S, ft³	Σ ΔV S, af	index for interpolation
2160	0.0	0.0496	0	2160	0	0	0	1
2160 51.43	2.89	0.0496	0.143	2160	6243	6243	0.143	2
2196 54.32	3.39	0.0504	0.025	2196	1089	7332	0.168	3
2231 54.82	3.89	0.0512	0.025	2231	1107	8438	0.194	4
2265 55.32	4.39	0.0520	0.026	2265	1124	9562	0.220	5
2299 55.82	4.89	0.0528	0.026	2299	1141	10703	0.246	6
2331 56.32	5.39	0.0535	0.027	2331	1157	11860	0.272	7
2364 56.82	5.89	0.0543	0.027	2364	1173	13034	0.299	8
								9
								10
								11
								12
								13
								14
								15
								16
								17
								18
								19
								20
								21
								22
								23
								24
								25
								26

Note: Develop stage-storage curve on this worksheet by either entering in the blue shaded column the planimetered basin areas (in acres) at various stages or by entering facility stages and corresponding incremental volumes (acre-feet, purple shaded column). Graph of the stage-storage curve shown to verify proper interpolation (purple points) of facility volume by **Vol Outflow** tab. **You may insert rows into the middle of this table** to accomodate the size of your data set; empty rows below the extent of your data will not cause a problem. **Stage - Volume data must begin at stage = 0 ft with a volume of 0 af. Stage - Volume data must be entered in ascending order. Blue cells below the entered data must remain empty (highlight, right-click, clear contents). All blue cells must eigther be blank or must contain a number.**



PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT
ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

PIMA COUNTY FLOOD CONTROL

Rev. 4/17

Worksheet to Develop the Stage - Discharge Characteristics of the Outlet Works for the Facility

Corner basin with vertical walls and 1.5 * tank volume	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
final basin with 1.5 tank vol 2nd sub.xls	**Program File Name**

Note: Populate characteristics of selected outflow elements corresponding to facility outlet configuration (blue cells), or overwrite purple cells with outflows calculated outside this worksheet, as a function of the given facility stages. Storage (last column) at each stage is interpolated from stage-volume relationship (see **Stage Vol**" tab). **Do not add rows** to this worksheet; it automatically divides maximum facility design stage into 100 increments to develop the volume-outflow curve.

GOVERNING EQUATIONS:

Orifice equation: $Q_o = C * A * (2 * g * H)^{0.5}$ and see weir flow equation on "**Orifice**" tab
Rectangular Weir Equation: $Q_w = C * L * H^{1.5}$
Triangular Weir Equation $Q_w = C_1 * Tan(\Theta/2) * H^{2.5}$
Box Culvert Equation See Box Culvert equations for Inlet Control on "**RCBC**" tab

0.75 stage at crest for surface basin

ORIFICE PLATE OUTFLOW ELEMENT

d_o (in) =	3.50	diameter	area (ft²) =	0.067
C =	0.60	disch coefficient		
E_o (ft) =	0.15	stage @ orifice center	inv (in) =	0.00
N =	1	nbr identical openings	inv (ft) =	0.000

TRIANGULAR WEIR OUTFLOW ELEMENT

Z =		side slope
E_w (ft) =		stage at crest
C_1 =		disch coefficient
Θ (deg) =		notch angle

RECTANGULAR WEIR OUTFLOW ELEMENT(S)

	rect 1	rect 2	rect 3	
L (ft) =	1.32			crest length
C =	3.00			disch coefficient
E_w (ft) =	3.64			routing stage

BOX, ROUND CULVERT OUTFLOW ELEMENT

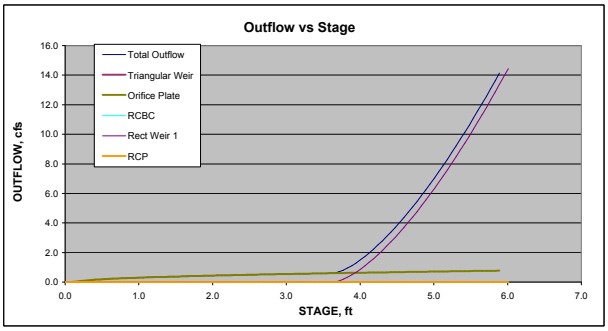
	RCP	RCBC	
D (ft) =			barrel rise, dia
B (ft) =			barrel span
E_b (ft) =			barrel invert
# PIPES =			

Stage	Orifice Plate	Weir Element(s) Triang 1	Rect 1	Rect 2	Rect 3	RCP	RCBC	Outflow	Σ vol
H, ft	Q, cfs	Q, cfs	Q, cfs	Q, cfs	Q, cfs	Q, cfs	Q, cfs	O, cfs	S, af
0.00								0.0	0.0000
0.06	0.0							0.0	0.0029
0.12	0.0							0.0	0.0059
0.18	0.0							0.0	0.0088
0.24	0.1							0.1	0.0117
0.30	0.1							0.1	0.0146
0.35	0.1							0.1	0.0175
0.41	0.2							0.2	0.0204
0.47	0.2							0.2	0.0234
0.53	0.2							0.2	0.0263
0.59	0.2							0.2	0.0292
0.65	0.2							0.2	0.0321
0.71	0.2							0.2	0.0351
0.77	0.3							0.3	0.0380
0.83	0.3							0.3	0.0409
0.88	0.3							0.3	0.0438
0.94	0.3							0.3	0.0468
1.00	0.3							0.3	0.0496
1.06	0.3							0.3	0.0526
1.12	0.3							0.3	0.0555
1.18	0.3							0.3	0.0584
1.24	0.3							0.3	0.0613
1.30	0.3							0.3	0.0643
1.36	0.4							0.4	0.0672
1.41	0.4							0.4	0.0701
1.47	0.4							0.4	0.0730
1.53	0.4							0.4	0.0760
1.59	0.4							0.4	0.0789
1.65	0.4							0.4	0.0818
1.71	0.4							0.4	0.0847
1.77	0.4							0.4	0.0876
1.83	0.4							0.4	0.0905
1.89	0.4							0.4	0.0935
1.94	0.4							0.4	0.0964
2.00	0.4							0.4	0.0993
2.06	0.4							0.4	0.1022
2.12	0.5							0.5	0.1052
2.18	0.5							0.5	0.1081
2.24	0.5							0.5	0.1110
2.30	0.5							0.5	0.1139
2.36	0.5							0.5	0.1168
2.42	0.5							0.5	0.1197
2.47	0.5							0.5	0.1227
2.53	0.5							0.5	0.1256
2.59	0.5							0.5	0.1285
2.65	0.5							0.5	0.1314
2.71	0.5							0.5	0.1344
2.77	0.5							0.5	0.1373
2.83	0.5							0.5	0.1402
2.89	0.5							0.5	0.1431
2.95	0.5							0.5	0.1460
3.00	0.5							0.5	0.1490
3.06	0.5							0.5	0.1519
3.12	0.6							0.6	0.1549
3.18	0.6							0.6	0.1578
3.24	0.6							0.6	0.1608
3.30	0.6							0.6	0.1637
3.36	0.6							0.6	0.1667
3.42	0.6							0.6	0.1696
3.48	0.6							0.6	0.1726
3.54	0.6							0.6	0.1756
3.59	0.6							0.6	0.1786
3.65	0.6		0.0					0.6	0.1816
3.71	0.6		0.1					0.7	0.1846
3.77	0.6		0.2					0.8	0.1876
3.83	0.6		0.3					0.9	0.1906
3.89	0.6		0.5					1.1	0.1936
3.95	0.6		0.7					1.3	0.1966
4.01	0.6		0.9					1.5	0.1997
4.07	0.6		1.1					1.7	0.2027
4.12	0.6		1.3					2.0	0.2057
4.18	0.6		1.6					2.2	0.2088
4.24	0.7		1.8					2.5	0.2118
4.30	0.7		2.1					2.8	0.2148
4.36	0.7		2.4					3.1	0.2179
4.42	0.7		2.7					3.4	0.2209
4.48	0.7		3.0					3.7	0.2240
4.54	0.7		3.4					4.0	0.2271
4.60	0.7		3.7					4.4	0.2302
4.65	0.7		4.0					4.7	0.2333
4.71	0.7		4.4					5.1	0.2364
4.77	0.7		4.8					5.5	0.2395
4.83	0.7		5.1					5.8	0.2426
4.89	0.7		5.5					6.2	0.2457
4.95	0.7		5.9					6.6	0.2487
5.01	0.7		6.3					7.0	0.2519
5.07	0.7		6.7					7.5	0.2550
5.13	0.7		7.2					7.9	0.2581
5.18	0.7		7.6					8.3	0.2613
5.24	0.7		8.0					8.8	0.2644
5.30	0.7		8.5					9.2	0.2675
5.36	0.7		8.9					9.7	0.2707
5.42	0.7		9.4					10.1	0.2738
5.48	0.7		9.9					10.6	0.2770
5.54	0.7		10.4					11.1	0.2802
5.60	0.8		10.8					11.6	0.2833
5.66	0.8		11.3					12.1	0.2865
5.71	0.8		11.8					12.6	0.2897
5.77	0.8		12.3					13.1	0.2929
5.83	0.8		12.9					13.6	0.2960
5.89	0.8		13.4					14.1	0.2992
6.01	0.8		14.4					15.2	0.3056

ROUTING RESULTS FOR DESIGN OF OUTLET WORKS

Subtract 2.89 from results for surface basin. Max Design Stage = 5.89 ft

	Max Inflow	Max Outflow	Max Stage				target discharges	
100-Yr	23.0 cfs	12.3 cfs	5.67 ft	@	22 min		14.0	cfs
10-Yr	13.6 cfs	4.2 cfs	4.57 ft	@	28 min		6.7	cfs
2 -yr	7.6 cfs	0.6 cfs	3.13 ft	@	43 min		2.1	cfs



last two cells in cum.vol column contain non-standard equations

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT

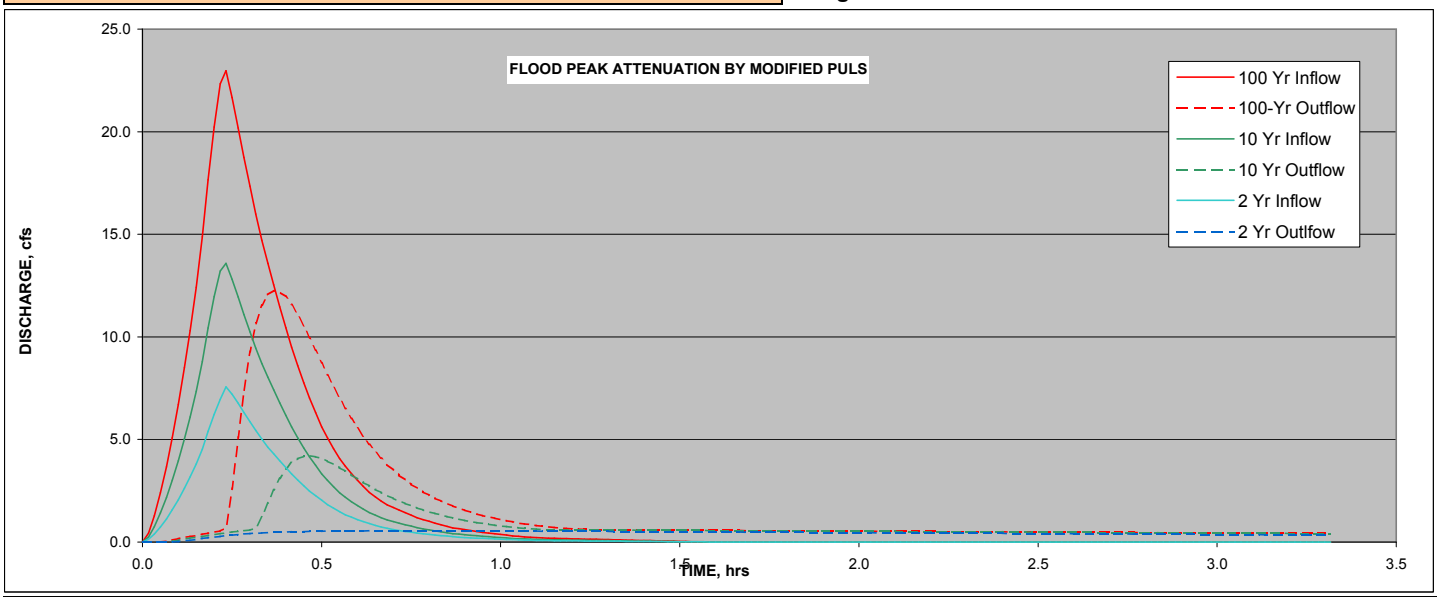
ROUTING OF A FLOOD HYDROGRAPH THROUGH A STORMWATER DETENTION / RETENTION FACILITY

THIS TAB CONTAINS NO INPUT DATA

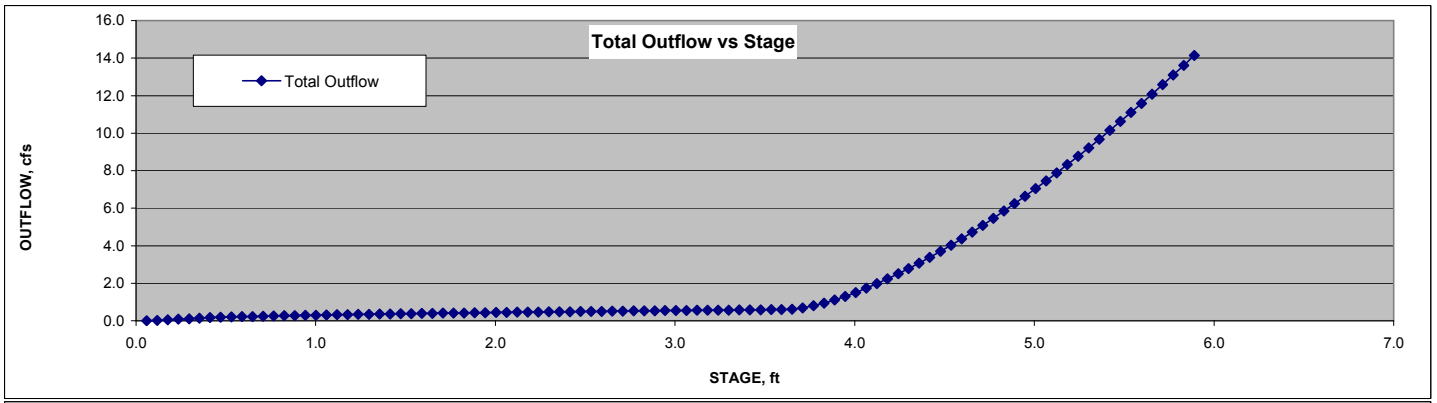
Summary of Reservoir Routing of the Inflow Hydrograph using the Specified Detention Facility and Outlet Works

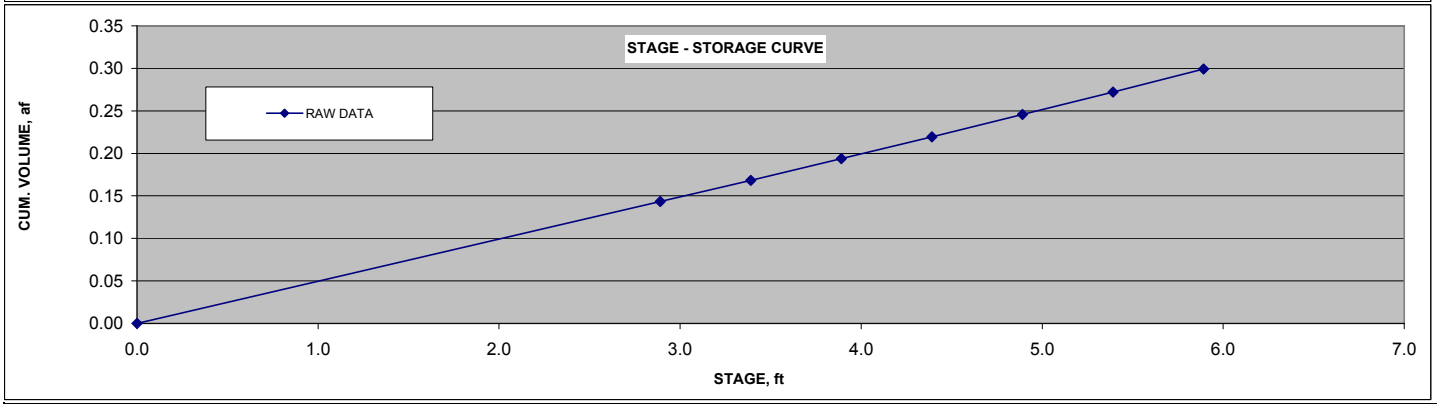
Corner basin with vertical walls and 1.5 * tank volume	**Project Address**
Larry K. Roberts, P.E.	**Designer**
Friday, January 13, 2023	**Run Date**
final basin with 1.5 tank vol 2nd sub.xls	**Program File Name**

Rev.04/17



ORIFICE PLATE			TRIANGULAR WEIR			RECTANGULAR WEIR(S)					RCP / RCBC		
							rect 1	rect 2	rect 3		RCP	RCBC	
d_o (in) =	3.5	diameter	Z =	0.0	side slope								
C (dim) =	0.60	discharge coefficient	E_w (ft) =	0.00	stage at weir crest	L (ft) =	1.3	0.0	0.0	crest length	0.0	0.0	D (ft) rise / diameter
N =	1	nbr identical openings	Θ =		° notch angle	C =	3.00	0.00	0.00	discharge coef		0.0	B (ft) span
inv (ft) =	0.00	stage at invert	C_1 =	0	discharge coefficient	E_w (ft) =	3.64	0.00	0.00	stage at crest	0.00	0.00	E_b (ft) stage at invert





RESULTS:

	max inflow	max outflow	target discharge	total inflow volume	max stage (H) *
100-Year	23.0 cfs	12.3 cfs	14.0 cfs	24370 ft^3 0.559 af	5.67 ft at 22 min
10-Year	13.6 cfs	4.2 cfs	6.7 cfs	14415 ft^3 0.331 af	4.57 ft at 28 min
2-Year	7.6 cfs	0.6 cfs	2.1 cfs	8150 ft^3 0.187 af	3.13 ft at 43 min

* Max Design Stage (ft) = 5.89

NOTE: IF H > MAX DESIGN STAGE, EXTEND STAGE-VOL DATA TO A HIGHER STAGE

Retention basin drain time

Retention volume	6243	cf	underground storage
Average outflow	0.4	cfs	orifice discharge for average tank depth (from PC-Route)
Drain time	4.3	hr	

Residences at Morning Vista

Hydrograph summation - B2+B3+basin outflow

Preliminary Design - 100-yr volume for underground tank

Concentration Point	B2	B3	Basin	Basin+B2	Basin+B2+B3	B2	B3	Basin	Basin+B2	Basin+B2+B3	B2	B3	Basin	Basin+B2	Basin+B2+B3
	Q100 (cfs)					Q10 (cfs)					Q2 (cfs)				
Q max (cfs)	2.7	0.4	13.9	15.6	**15.8**	1.1	0.2	5.8	6.4	**6.5**	0.4	0.1	1.1	1.3	**1.3**
Time (min)	Q100 hydrographs (cfs)					Q10 hydrographs (cfs)					Q2 hydrographs (cfs)				
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.2	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
3	0.3	0.0	0.0	0.3	0.3	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
4	0.4	0.1	0.0	0.5	0.5	0.1	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.1
5	0.6	0.1	0.1	0.7	0.8	0.2	0.0	0.0	0.3	0.3	0.1	0.0	0.0	0.1	0.1
6	0.8	0.1	0.2	1.0	1.1	0.3	0.1	0.1	0.4	0.4	0.1	0.0	0.0	0.1	0.1
7	1.0	0.1	0.2	1.2	1.4	0.3	0.1	0.2	0.5	0.6	0.1	0.0	0.1	0.2	0.2
8	1.2	0.2	0.3	1.5	1.7	0.4	0.1	0.2	0.6	0.7	0.1	0.0	0.1	0.2	0.3
9	1.5	0.2	0.3	1.8	2.0	0.5	0.1	0.2	0.7	0.8	0.1	0.1	0.1	0.3	0.3
10	1.8	0.3	0.4	2.2	2.4	0.6	0.1	0.3	0.9	1.0	0.2	0.1	0.2	0.4	0.4
11	2.1	0.3	0.4	2.5	2.8	0.7	0.2	0.3	1.0	1.2	0.2	0.1	0.2	0.4	0.5
12	2.4	0.3	0.5	2.9	3.3	0.8	0.2	0.4	1.2	1.4	0.2	0.1	0.3	0.5	0.6
13	2.7	0.4	1.5	4.2	4.6	0.9	0.2	0.4	1.3	1.5	0.2	0.1	0.3	0.5	0.6
14	2.7	0.4	4.1	6.8	7.2	1.0	0.2	0.5	1.5	1.7	0.3	0.1	0.3	0.6	0.7
15	2.6	0.4	6.9	9.5	9.9	1.1	0.2	0.5	1.6	1.8	0.3	0.1	0.4	0.7	0.8
16	2.4	0.3	9.4	11.8	12.1	1.0	0.2	0.8	1.9	2.0	0.4	0.1	0.4	0.7	0.8
17	2.2	0.3	11.3	13.5	13.8	1.0	0.2	1.7	2.7	2.9	0.4	0.1	0.4	0.8	0.9
18	2.1	0.3	12.6	14.7	15.0	0.9	0.1	2.8	3.7	3.8	0.4	0.1	0.4	0.8	0.9
19	1.9	0.3	13.4	15.3	15.6	0.9	0.1	3.7	4.6	4.7	0.4	0.1	0.4	0.8	0.9
20	1.8	0.3	13.8	15.6	15.8	0.8	0.1	4.4	5.3	5.4	0.4	0.1	0.5	0.8	0.9
21	1.6	0.2	13.9	15.5	15.7	0.7	0.1	5.0	5.8	5.9	0.3	0.1	0.5	0.8	0.9
22	1.5	0.2	13.7	15.2	15.4	0.7	0.1	5.4	6.1	6.2	0.3	0.1	0.5	0.8	0.9
23	1.4	0.2	13.4	14.7	14.9	0.6	0.1	5.7	6.3	6.4	0.3	0.1	0.5	0.8	0.8
24	1.2	0.2	12.9	14.1	14.3	0.6	0.1	5.8	6.4	6.5	0.3	0.0	0.5	0.8	0.8
25	1.1	0.2	12.3	13.4	13.6	0.6	0.1	5.8	6.4	6.5	0.3	0.0	0.5	0.8	0.8
26	1.0	0.1	11.7	12.7	12.8	0.5	0.1	5.8	6.3	6.3	0.3	0.0	0.5	0.8	0.8
27	0.9	0.1	11.0	11.9	12.0	0.5	0.1	5.6	6.1	6.1	0.2	0.0	0.6	0.9	0.9
28	0.8	0.1	10.3	11.1	11.3	0.4	0.1	5.4	5.8	5.9	0.2	0.0	0.7	0.9	1.0
29	0.8	0.1	9.6	10.4	10.5	0.4	0.1	5.2	5.6	5.6	0.2	0.0	0.8	1.0	1.1
30	0.7	0.1	9.0	9.6	9.7	0.4	0.0	4.9	5.3	5.3	0.2	0.0	0.9	1.1	1.1
31	0.6	0.1	8.3	8.9	9.0	0.3	0.0	4.7	5.0	5.0	0.2	0.0	1.0	1.2	1.2
32	0.5	0.1	7.7	8.2	8.3	0.3	0.0	4.4	4.7	4.7	0.2	0.0	1.1	1.2	1.2
33	0.5	0.1	7.1	7.6	7.7	0.3	0.0	4.1	4.4	4.4	0.2	0.0	1.1	1.3	1.3
34	0.4	0.1	6.6	7.0	7.1	0.2	0.0	3.9	4.1	4.2	0.1	0.0	1.1	1.3	1.3
35	0.4	0.1	6.1	6.5	6.5	0.2	0.0	3.6	3.9	3.9	0.1	0.0	1.1	1.3	1.3
36	0.4	0.1	5.6	6.0	6.0	0.2	0.0	3.4	3.6	3.6	0.1	0.0	1.1	1.3	1.3
37	0.3	0.0	5.2	5.5	5.6	0.2	0.0	3.2	3.4	3.4	0.1	0.0	1.1	1.2	1.3
38	0.3	0.0	4.8	5.1	5.1	0.2	0.0	3.0	3.1	3.1	0.1	0.0	1.1	1.2	1.2
39	0.3	0.0	4.4	4.7	4.7	0.1	0.0	2.8	2.9	2.9	0.1	0.0	1.1	1.2	1.2
40	0.2	0.0	4.1	4.3	4.4	0.1	0.0	2.6	2.7	2.7	0.1	0.0	1.1	1.2	1.2
41	0.2	0.0	3.8	4.0	4.0	0.1	0.0	2.4	2.5	2.5	0.1	0.0	1.0	1.1	1.1
42	0.2	0.0	3.5	3.7	3.7	0.1	0.0	2.2	2.4	2.4	0.1	0.0	1.0	1.1	1.1
43	0.2	0.0	3.3	3.4	3.5	0.1	0.0	2.1	2.2	2.2	0.1	0.0	1.0	1.0	1.1
44	0.2	0.0	3.0	3.2	3.2	0.1	0.0	2.0	2.1	2.1	0.1	0.0	0.9	1.0	1.0
45	0.2	0.0	2.8	3.0	3.0	0.1	0.0	1.8	1.9	1.9	0.1	0.0	0.9	1.0	1.0

Residences at Morning Vista

Hydrograph summation - B2+B3+basin outflow

Final Design - 100-yr + 50% volume for underground tank

Concentration Point	B2	B3	Basin	Basin+B2	Basin+B2+B3	B2	B3	Basin	Basin+B2	Basin+B2+B3	B2	B3	Basin	Basin+B2	Basin+B2+B3
	Q100 (cfs)					Q10 (cfs)					Q2 (cfs)				
Q max (cfs)	2.7	0.4	12.3	13.7	**14.0**	1.1	0.2	4.2	4.6	**4.7**	0.4	0.1	0.6	0.8	**0.9**
Time (min)	Q100 hydrographs (cfs)					Q10 hydrographs (cfs)					Q2 hydrographs (cfs)				
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.2	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
3	0.3	0.0	0.0	0.3	0.3	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
4	0.4	0.1	0.0	0.5	0.5	0.1	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.1
5	0.6	0.1	0.1	0.7	0.8	0.2	0.0	0.0	0.3	0.3	0.1	0.0	0.0	0.1	0.1
6	0.8	0.1	0.2	1.0	1.1	0.3	0.1	0.1	0.4	0.4	0.1	0.0	0.0	0.1	0.1
7	1.0	0.1	0.2	1.2	1.4	0.3	0.1	0.2	0.5	0.6	0.1	0.0	0.1	0.2	0.2
8	1.2	0.2	0.3	1.5	1.7	0.4	0.1	0.2	0.6	0.7	0.1	0.0	0.1	0.2	0.3
9	1.5	0.2	0.3	1.8	2.0	0.5	0.1	0.2	0.7	0.8	0.1	0.1	0.1	0.3	0.3
10	1.8	0.3	0.4	2.2	2.4	0.6	0.1	0.3	0.9	1.0	0.2	0.1	0.2	0.3	0.4
11	2.1	0.3	0.4	2.5	2.8	0.7	0.2	0.3	1.0	1.2	0.2	0.1	0.2	0.4	0.5
12	2.4	0.3	0.5	2.9	3.3	0.8	0.2	0.4	1.2	1.4	0.2	0.1	0.3	0.5	0.6
13	2.7	0.4	0.6	3.2	3.6	0.9	0.2	0.4	1.3	1.5	0.2	0.1	0.3	0.5	0.6
14	2.7	0.4	0.7	3.4	3.8	1.0	0.2	0.5	1.5	1.7	0.3	0.1	0.3	0.6	0.7
15	2.6	0.4	2.6	5.2	5.6	1.1	0.2	0.5	1.6	1.8	0.3	0.1	0.4	0.7	0.8
16	2.4	0.3	5.1	7.5	7.8	1.0	0.2	0.5	1.6	1.7	0.4	0.1	0.4	0.7	0.8
17	2.2	0.3	7.4	9.6	10.0	1.0	0.2	0.6	1.5	1.7	0.4	0.1	0.4	0.8	0.9
18	2.1	0.3	9.3	11.3	11.6	0.9	0.1	0.6	1.5	1.7	0.4	0.1	0.4	0.8	0.9
19	1.9	0.3	10.7	12.6	12.8	0.9	0.1	0.7	1.5	1.7	0.4	0.1	0.4	0.8	0.9
20	1.8	0.3	11.5	13.3	13.5	0.8	0.1	1.2	2.0	2.2	0.4	0.1	0.5	0.8	0.9
21	1.6	0.2	12.1	13.7	13.9	0.7	0.1	1.9	2.6	2.8	0.3	0.1	0.5	0.8	0.9
22	1.5	0.2	12.3	13.7	14.0	0.7	0.1	2.5	3.2	3.3	0.3	0.1	0.5	0.8	0.9
23	1.4	0.2	12.2	13.6	13.8	0.6	0.1	3.1	3.8	3.8	0.3	0.1	0.5	0.8	0.8
24	1.2	0.2	12.0	13.2	13.4	0.6	0.1	3.5	4.1	4.2	0.3	0.0	0.5	0.8	0.8
25	1.1	0.2	11.6	12.7	12.9	0.6	0.1	3.9	4.4	4.5	0.3	0.0	0.5	0.8	0.8
26	1.0	0.1	11.1	12.1	12.3	0.5	0.1	4.1	4.6	4.7	0.3	0.0	0.5	0.8	0.8
27	0.9	0.1	10.5	11.5	11.6	0.5	0.1	4.2	4.6	4.7	0.2	0.0	0.5	0.8	0.8
28	0.8	0.1	10.0	10.8	10.9	0.4	0.1	4.2	4.6	4.7	0.2	0.0	0.5	0.8	0.8
29	0.8	0.1	9.3	10.1	10.2	0.4	0.1	4.2	4.6	4.6	0.2	0.0	0.5	0.7	0.8
30	0.7	0.1	8.7	9.4	9.5	0.4	0.0	4.1	4.4	4.5	0.2	0.0	0.5	0.7	0.8
31	0.6	0.1	8.1	8.7	8.8	0.3	0.0	4.0	4.3	4.3	0.2	0.0	0.5	0.7	0.7
32	0.5	0.1	7.6	8.1	8.2	0.3	0.0	3.8	4.1	4.1	0.2	0.0	0.5	0.7	0.7
33	0.5	0.1	7.0	7.5	7.6	0.3	0.0	3.6	3.9	3.9	0.2	0.0	0.5	0.7	0.7
34	0.4	0.1	6.5	6.9	7.0	0.2	0.0	3.5	3.7	3.7	0.1	0.0	0.5	0.7	0.7
35	0.4	0.1	6.0	6.4	6.5	0.2	0.0	3.3	3.5	3.5	0.1	0.0	0.6	0.7	0.7
36	0.4	0.1	5.6	5.9	6.0	0.2	0.0	3.1	3.3	3.3	0.1	0.0	0.6	0.7	0.7
37	0.3	0.0	5.2	5.5	5.5	0.2	0.0	2.9	3.1	3.1	0.1	0.0	0.6	0.7	0.7
38	0.3	0.0	4.8	5.1	5.1	0.2	0.0	2.7	2.9	2.9	0.1	0.0	0.6	0.7	0.7
39	0.3	0.0	4.4	4.7	4.7	0.1	0.0	2.6	2.7	2.7	0.1	0.0	0.6	0.7	0.7
40	0.2	0.0	4.1	4.3	4.4	0.1	0.0	2.4	2.6	2.6	0.1	0.0	0.6	0.6	0.7
41	0.2	0.0	3.8	4.0	4.0	0.1	0.0	2.3	2.4	2.4	0.1	0.0	0.6	0.6	0.6
42	0.2	0.0	3.5	3.7	3.7	0.1	0.0	2.1	2.2	2.3	0.1	0.0	0.6	0.6	0.6
43	0.2	0.0	3.3	3.4	3.5	0.1	0.0	2.0	2.1	2.1	0.1	0.0	0.6	0.6	0.6
44	0.2	0.0	3.0	3.2	3.2	0.1	0.0	1.9	2.0	2.0	0.1	0.0	0.6	0.6	0.6
45	0.2	0.0	2.8	3.0	3.0	0.1	0.0	1.8	1.9	1.9	0.1	0.0	0.6	0.6	0.6

Appendix F. Maintenance of Drainage Infrastructure

Maintenance Plan and Drainage System Inspection Checklist

This document is to be used by the Homeowner's Association to define actions for inspecting and maintaining the private drainage facilities at Residences at Morning Vista, Lots 1-18 and Common Areas "A" through "C," a subdivision located within the Town of Oro Valley.

All drainage structures shall be inspected and a summary report prepared a minimum of once a year. Copies of the annual inspection report shall be available to the Town upon request.

Every five years, all drainage structures shall be inspected and a summary report prepared by an Arizona Registered Professional Engineer. The report shall also identify the maintenance needs for the next 5-year period, including the estimated annual cost of maintenance and repair. Copies of the 5-year inspection report shall be available to the Town upon request.

The stormwater detention facility includes underground storage tanks which require special attention. Following every significant runoff event, the underground tanks, outlet pipe, and orifice plate are to be inspected by removing manhole covers and checking for standing water. Remedial measures are to be completed to remove any blockages and restore outflows from the tanks.

Drainage System Inspection Checklist			
Drainage Feature	√	**Conditions to check**	**Action needed**
Scuppers - access lane		accumulation of debris	remove debris
Riprap aprons at scuppers		erosion	repair
Riprap apron at basin weir outlet		erosion	repair
Riprap apron at basin pipe outlet		erosion	repair
Riprap apron at basin inflows		erosion	repair
Riprap swales east of Recreation Area		accumulation of debris and sediment, erosion	remove debris/sediment, restore to design condition
Grouted riprap swale Lots 10-11, Rec. Area		accumulation of debris and sediment, erosion	remove debris and sediment, repair erosion
Earthen swales along south and west property lines		accumulation of debris and sediment, erosion	remove debris and sediment, repair erosion
Detention basin		sediment accumulation (measured against graduation marker)	remove sediment, restore to design elevation
Detention basin		accumulation of debris growth of weeds	remove debris remove weeds
Grate inlets at detention basin		accumulation of debris	remove debris
Underground tanks at detention basin		remove manhole covers and check for standing water	remove obstructions
Orifice plate at tank outflow		remove manhole covers and check for standing water	remove obstructions
Basin outflow pipe		remove manhole covers and check for standing water	remove obstructions

Chapter 14. Maintenance of Drainage Infrastructure

14.1 Introduction and Purpose

Whether a facility is public or private, there is typically a stormwater control and/or conveyance component incorporated into its development. Stormwater components consist of catch basins, curb inlets, drop inlets, manholes, pipes, culverts, ditches, swales, channels, detention basins, levees, landscaping (both hardscape and softscape) and any other structure that collects, conveys and/or controls stormwater.

Maintenance of stormwater infrastructure is necessary to ensure as-designed function, stormwater quality requirements and maximization of service life. It is the responsibility of the Town of Oro Valley to ensure that all stormwater infrastructure components are properly maintained. The Town is directly responsible for those components located within the Town's right-of-way. The majority of stormwater infrastructure in the Town are privately owned and maintained by homeowner's associations (HOA's), property management companies, school districts and commercial/industrial site owners.

Subsection 2.6.11 of this Manual stipulates the preparation, during a development's design phase, of a maintenance and inspection plan as an element of the Drainage Report. The maintenance and inspection plan is to be prepared by a Civil Engineer, registered by the State of Arizona, to assure verification of proper operation and maintenance; evaluation of functional adequacy and structural stability; identification of aspects of drainage features to monitor over time; and providing a means to communicate the overall condition and aesthetics of the drainage infrastructure all while assuring the quality requirements of stormwater discharges from the site are met.

Considerations integral to a drainage infrastructure maintenance plan include growth of undesirable vegetation, debris accumulation, sediment deposition, erosion, scour, soil piping, soil settlement, structural damage and/or deterioration and adherence to Federal stormwater quality mandates.

Access required to provide maintenance of drainage infrastructure, as specified by the Drainage Report, and shown on the Improvement Plans, is considered an essential element requiring inspection and maintenance.

14.2 Criteria

14.2.1 Annual and Post-Storm Event Inspections

As specified in Subsection 2.6.11e, all drainage infrastructure and systems are to be routinely inspected, visually, at least once each year, by a Civil Engineer registered by the State of Arizona, to verify proper operation and maintenance. Inspections are also required after any storm event that could be anticipated to cause erosion, sediment deposition, deposition of trash/debris or damage to stormwater conveyance or control infrastructure.

Annual and post-storm inspections are to be documented in a brief report that will identify immediate maintenance and/or repair needs and be submitted to the owner. A copy of inspection report(s) will be available to the Town upon request.

14.2.2 Five-Year Inspections

Every 5 years a more rigorous inspection and assessment is to be conducted. The quinquennial inspection is to include a subjective evaluation by the Engineer of the criteria used at the time the drainage infrastructure was designed, inclusive of watershed and/or regulatory changes versus current design criteria in order to assess the ability of each drainage component and the overall system to function as intended as well as identify the potential need to upgrade the system to meet current design standards. Detailed design calculations are not required as part of the evaluation.

Depending on the significance of a deficiency noted during the quinquennial inspection, additional support from a Geotechnical Engineer, Structural Engineer and/or Landscape Architect registered by the State of Arizona, may, in the judgment of the Engineer, be deemed necessary. In the case where pumps may be a part of the system, a registered Electrical Engineer may be required.

The 5-year report will identify both immediate maintenance as well as anticipated maintenance needs over the ensuing 5-year period. This report will also include an opinion of the probable cost of maintenance and repair reasonably anticipated over the upcoming 5-year period to ensure adequate, available capital necessary to address such maintenance and/or repair. A copy of the 5-year inspection report is to be available to the Town upon request.

14.2.3 Report Content & Format

The inspection report is to generally address the following:

a. Project name.
b. Owner name and address.
c. Project location, including legal description and vicinity map.
d. Description of the site and all constructed stormwater control and conveyance components.
e. Purpose of the report (i.e., annual inspection, post-storm inspection or 5-year inspection)
f. History of system maintenance and deficiencies.
g. Deficiencies corrected since the last inspection and past deficiencies not yet corrected.
h. Evaluation of design criteria (quinquennial report only).
i. Inspection check list.
j. Photos depicting the current condition of drainage infrastructure.
k. Physical condition and any displacement of riprap or other forms of slope protection.
l. Verification that vegetation (trees, brush or undesirable weeds or grasses) is not creating an adverse effect on drainage infrastructure or conveyance.
m. Identification of immediate maintenance needs.

n. Identification of anticipated maintenance and/or repair needs over the upcoming 5-year period (quinquennial report only).

The report format generally will be as follows:

a. Text: Font use is limited to Helvetica, Arial, Calibri, Times and Times New Roman. Font size for general text is to be 11 or 12 point. All sections and paragraphs are to be numbered. Text is to be printed on 8-1/2 by 11-inch paper with a sufficient margin on the left for binding.

b. Content Headings:
   i. Table of Contents
   ii. Introduction
   iii. Project Information (i.e., location, vicinity map)
   iv. System Background Information (historic information including build date and past maintenance and/or repairs of significance)
   v. Inspection Findings and Evaluations
   vi. Conclusions and Recommendations
   vii. Appendices

c. Reproduction can be by any available process with printing done head-to-head, if possible.

d. Drawings or plates are to typically be 8-1/2 by 11-inch with a sufficient margin on the left for binding. Foldouts normally should not exceed 11 by 17 inches. Drawings and photos are to be included in the text or placed entirely in the appendices. Figures or drawings included in the text are to support the written material.

e. Photos taken during the inspection are to be interfaced with the appropriate inspection comments and include description, location and date taken.

f. Report covers are to be flexible paper or card stock with comb bindings or be bound in a loose-leaf binder. The name of the Civil Engineer conducting the inspection and the date of the inspection are to be noted on the cover together with the Engineer's seal.

g. The report shall also include the name of the Geotechnical Engineer, Structural Engineer, Landscape Architect and/or any other technical specialist should the inspection warrant such expertise.

h. Tree trimming, when required, is to be under the direction of a Certified Arborist who shall be identified in the report.

14.2.4 Recommendations and Follow-Up

Recommendations resulting in significant mitigation and/or repair work shall not be undertaken prior to their details, including a plan if required, being submitted to the Town of Oro Valley Stormwater Utility to assure appropriate review, acceptance and permit issuance and that follow-through by the owner occurs in a timely fashion.

Significant mitigation and/or repair is defined as any work required to resolve a threat to future damage of stormwater conveyance or control infrastructure; cause deflection of stormwater flow; or result in overtopping of stormwater conveyance or control infrastructure.

Mitigation and/or repair recommendations will assure drainage will either (i) remain in its natural state and not be altered, disturbed or obstructed; (ii) be returned to the condition noted on the Improvement Plans accepted by the Town at the time of development; or (iii) modified in conformance with a plan, submitted by a Civil Engineer registered by the State of Arizona, and accepted by the Town.

Work of a significant mitigation or repair scope will require a follow-up inspection by the Engineer-of-Record within 10 business days of its completion. The Engineer will document the findings of this inspection and append it to the applicable inspection report that served as the basis of the work being undertaken.

Removal of sediment and debris from stormwater infrastructure components is considered solid waste requiring disposal in conformance with Federal, State, and local requirements.

Pesticide applications are to be administered only by a pesticide applicator licensed by the State of Arizona. All pesticide applications are to strictly follow the manufacturer's instructions and comply with applicable Federal, State and local regulations and ordinances.

Evidence of illicit discharges into components comprising stormwater infrastructure and conveyance systems include:

- Odor
- Color
- Clarity
- Floatables
- Deposits/stains
- Vegetation condition

Any such evidence of illicit discharge is to be noted during the inspection and reported to the Town of Oro Valley. The owner shall take take all appropriate steps to mitigate the source(s) of illicit discharge(s).

14.2.5 Authority

Subsection 15-24-14Q – Authority to Inspect of the Town of Oro Valley Code provides the Town Engineer/Public Works Director or their representative the right to periodically inspect drainage and detention facilities to verify that scheduled and unscheduled maintenance activity have been adequately performed. Should the Town find the owner or owners of the drainage and/or detention facilities deficient in their obligation to adequately operate and maintain their facilities, The Town, will place the owner or owners on notice of such deficiency by issuance of a *letter of opportunity to correct*, requesting a plan of action and time frame in which the deficiency will be corrected.

14.2.6 MAINTENANCE CONSIDERATIONS FOR DRAINAGE INFRASTRUCTURE

Inspection of drainage infrastructure components shall address the maintenance considerations which follow:

14.2.6.1 Catch Basins, Curb Inlets and Drop Inlets

Catch basins, curb inlets, and drop inlets are subsurface concrete structures that receive stormwater through a metal grate or slotted opening located at the surface. Structures are

typically square or rectangular but can be round. The basin or inlet can also be designed with flow control and/or stormwater quality devices.

The primary function of the basin or inlet is to convey storm flow from the surface to a below grade conveyance system. Basins and inlets are typically designed with a sump to mitigate debris and sediment from being conveyed to and inhibiting flow in the piped conveyance system.

Catch basin, curb inlet, and drop inlet maintenance considerations include:

- Structural integrity of the grate and support frame. Ensure lid does not rock or move due to traffic.
- Pre-cast barrel sections in proper alignment, grade rings free from cracks, lifting or movement or damage.
- Free flowing inlets free of any debris or blockages.
- Evidence of infiltration into the structure at joints and/or grouting or discoloration above the sump indicating water intrusion.
- Cracks and/or deterioration of the structure or grouting including spalling concrete, exposure of reinforcing bars and/or discontinuous sections of grout or damage.
- Signs of abrasion, corrosion and/or deterioration of conveyance pipe at its connection to the basin or inlet.
- Remove sediment accumulations, debris and/or trash from inlet and/or basin. Excessive sediment accumulation is defined as that exceeding the depth of the sump or extending above the invert of the conveyance pipe.
- Mitigate sources of sediment, pollutant and/or debris impacting basins.
- First flush devices are maintained and replaced in conformance with the manufacturer's recommendations.
- ???????

14.2.6.2 Manholes, Stormdrains and Culverts

Manholes provide surface access to underground pipe systems at deflections in horizontal alignment and at specified distances in the conveyance system.

Stormdrains convey surface stormwater, collected by stormdrains, or drop inlets, to receiving bodies of water.

Culverts convey streams or washes through embankments or under roads, railroads, or other infrastructure.

a. Manhole maintenance considerations include:
    - Structural integrity of the cover and support frame. If in traffic area, ensure lid does not rock or move.

- Manhole security and access features are in place and fully functional including locking lids (if applicable) and access ladder rungs.
- Barrel sections in proper alignment, grade rings free from cracks, lifting or movement.
- Evidence of infiltration into the structure at joints and/or grouting or discoloration above the sump indicating water intrusion.
- Cracks and/or deterioration of the structure or grouting including spalling concrete, exposure of reinforcing bars and/or discontinuous sections of grout.
- Signs of abrasion, corrosion and/or deterioration of conveyance pipe at its connection to the manhole.
- Excessive sediment accumulation in basin or inlet. Excessive sediment accumulation is defined as that exceeding the depth of the sump or extending above the invert of the conveyance pipe.

b. Stormdrain and culvert pipe maintenance considerations include:

- Inlet and/or outlet structures are free of. cracks, spalling, grout deterioration or discontinuous sections of grout, exposed reinforcing bars, settlement, lifting or rotational movement of pipe sections and damage.
- Evidence of infiltration at pipe joints.
- Cracks, abrasion, corrosion and/or deterioration along the inner surface of the pipe.
- Pipe segments are in alignment and show no evidence of shifting, shearing, cracking, lifting settlement, movement, or damage.
- Removal of sediment accumulations in excess of 20 percent of the diameter or height of the culvert.
- Signs of abrasion, corrosion and/or deterioration of conveyance pipe along its length.
- Remove debris and/or vegetation inhibiting conveyance from entering or exiting the stormdrain or culvert.
- Repair erosion at stormdrain or culvert inlet and/or outlet structures including spreader aprons.
- Repair riprap at culvert inlets or outlets where filter fabric has been exposed or if thickness of rock has been reduced.
- Ensure debris barriers and trash racks are free of debris, trash, and sediment accumulations. Replace or repair bars that are deteriorated, misaligned, bent, or damaged.
- The area within a 20-foot radius of stormdrain inlets or outlets is to be vegetation free.
- ??????

Note: Manholes, stormdrains and culverts are subject to Occupational Safety and Health Administration (OSHA) confined space regulations.

14.2.6.3 Detention Basins

a. Detention basin maintenance considerations include:

- Access gates, handrail, protective fencing, and security barriers are sound and in good condition and free from damage.
- Trees of shrubs hindering access to the basin are to be trimmed or removed if within the maintenance access road.
- Signage is in good condition and legible.
- Graduated basin depth marker(s) or story pole(s) are in place with all 0.1-foot marker increments legible.
- Vegetation control shall minimize and limit disturbance to areas requiring such control.
- Remove oil or other pollutants from the surface having a thickness greater than a surface sheen.
- Basin maintenance will ensure removal of excess sediment from sediment traps. Sediment accumulations greater the 12 inches above the lowest bottom floor elevation, as noted on the as-built plans for the basin, require removal. Sediment shall be disposed of, off-site, at a permissible location.
- Water harvesting basin design depth is to be restored when the design depth of the basin is reduced by more than 4 inches.
- Vehicular traffic, to the extent possible, is to be limited to access routes and sediment trap areas.
- Unless otherwise specified in the maintenance plan, vegetation is to be left as natural as possible. Pruning of vegetation is to be minimized unless otherwise specified in the plan.
- It is generally permissible to allow native trees, shrubs, grasses, and forbs to establish naturally from seed.
- Non-native trees and invasive grasses (i.e., Buffelgrass, Johnson Grass, Fountain Grass, etc.) are to be removed. A list of invasive, non-native plants can be found in Appendix E, List of Noxious & Invasive Plant Species & Best Management Practices of the Pima County Regional Flood Control District publication *Regulated Riparian Habitat Mitigation Standards and Implementation Guidelines* available on the Rules and Procedures Page under the Riparian Habitat tab of the District's web page. The link to this document is:

https://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Flood%20Control/Rules%20and%20Procedures/Riparian%20Habitat%20Mitigation%20Plan%20Guidelines/onsite-guidelines.pdf

- Basin slope treatment does not show signs of settlement, vegetative growth, erosion, piping, slumping, sinkholes, seepage, animal burrows or other detrimental effects.
- Repair rill erosion of basin slopes, including mitigating runoff down slope areas.
- Basin inlet, outlet and overflow structures are free of sediment and debris.
- Ensure moveable components at outlet control structures are operable through their full range of motion and are free of damage.
- Repair erosion at basin inlet and/or outlet structures including spreader aprons and energy dissipators.
- Ensure inlet, outlet, overflow spillway and debris control structures are free of cracks, spalling, deterioration, exposure of reinforcing bars and/or discontinuous sections of grout, settlement, lifting, rotational movement or damage.
- Evidence of water ponding for more than 12 hours after a storm event for contributing watersheds up to 10 acres or 24 hours for contributing watersheds greater than 10 acres.
- Evidence of water ponding for longer than 24 hours for after a storm event in stormwater harvesting basins.
- Ensure aesthetic expectations.
- The area within a 20-foot radius of basin inlets, outlets and/or overflow structures are to be vegetation free.

b. Dry wells are perforated, open-bottom, circular structures used to infiltrate stormwater into subsurface, well-drained soils. Drywells are more likely to collect pollutants and oily sediments unless treatment elements are included.

- Remove sediment when its depth exceeds 10 percent of the height dry well.
- Structural integrity of the grate and the support frame. Ensure lid does not rock or move or is otherwise damaged.
- Replace drywell if it does not dissipate standing water after 24 hours of a storm event.
- Comply with all manufacturer's maintenance recommendations.

14.2.6.4 Channels

Channel maintenance considerations include:

a. General

- Access gates, handrail, protective fencing, and security barriers are sound and in good condition and free of damage.
- Trees of shrubs hindering access to the basin are to be trimmed or removed if within the maintenance access road.
- The area within a 20-foot radius of channel inlets or outlets is to be vegetation free.

b. Natural Channels

- Assess the extent of required vegetation control to ensure the design capacity of the channel has not been compromised.
- Sediment accumulations shall not exceed 20 percent of the channel depth or the design freeboard of the channel, whichever is less.
- Ensure the channel has the proper cross-section, flow line and is free of debris accumulations and obstructions.
- Maintenance equipment, to the extent possible, is to be limited to access routes and the channel bottom.
- Unless otherwise specified in the maintenance plan, vegetation on the banks is permissible and is to be left as natural as possible. Pruning of vegetation is to be limited to the conveyance area of the channel unless otherwise specified in the plan.
- Debris and/or vegetation inhibiting conveyance within the channel.
- Native trees, shrubs, grass, and forbs are generally not permitted to establish naturally from seed.
- Non-native trees and invasive grasses (i.e., Buffelgrass, Johnson Grass, Fountain Grass, etc.) are to be removed. (Refer to provisions addressing basin maintenance).
- Note areas of scour, particularly at stormdrain and culvert outlets.
- Repair rill erosion or slumping of side slopes.
- Repair rill erosion of channel slopes, including mitigating runoff down slope areas.
- Note if the channel is incurring downcutting due to excessive slope and/or clear runoff flows.
- Mitigate debris, pollutants, and sediment from being discharged into washes.

c. Constructed Channels

i. General

- Inlet and/or outlet structures are free of cracks, spalling, exposure of reinforcing bars and/or discontinuous sections of grout, settlement, lifting, rotational movement or damage.

- Evidence of infiltration at joints.
- Cracks, abrasion, corrosion and/or visual deterioration along the surface of the channel.
- No evidence of shifting, shearing, cracking, lifting, settlement, or movement.
- Sediment accumulations shall not exceed 20 percent of the channel depth or the design freeboard of the channel, whichever is less.
- Remove debris and/or obstructions from the channel.
- Remove trees and bushes within 15 feet of the side of concrete lined channels.
- Remove woody vegetation growing through riprap.
- Repair riprap in areas where filter fabric has been exposed or if thickness of rock has been reduced.
- Repair erosion at channel inlet and/or outlet structures including spreader aprons.
- Repair rill erosion of channel slopes, including diversion of runoff from slope areas.
- Animal burrows along or in proximity to

ii. Partially Lined (Bank Protected)

- Scour undermining toe of bank protection.
- ???????

iii. Fully Lined (Sides and Bottom)

- ???????
- ???????

14.2.6.5 Energy Dissipators and Outfalls

Energy dissipators are drainage elements installed to prevent erosion at storm drain outfalls, culvert outlets and where lined channels discharge into natural channels. A variety of energy dissipator designs exist including reinforced concrete structures, gabion baskets, riprap splash pads, and pools.

Outfalls are discharge points where stormwater enters a receiving wash at the end of a stormwater conveyance system.

Energy dissipator and outfall maintenance considerations include:

- Access gates, handrail, protective fencing, and security barriers are sound and in good condition.
- Trees of shrubs hindering access to the basin are to be trimmed or removed if within the maintenance access road.

- Remove accumulated litter, debris, or sediment accumulations in excess of 20 percent of the conveyance area of the stormwater outlet/outfall.
- Repair riprap in areas where filter fabric has been exposed or if thickness of rock has been reduced.
- Remove vegetation and/or debris blocking the outlet of the dissipator or outfall.
- Concrete structures are free of cracks, spalling, deterioration of grout, exposure of reinforcing bars and/or discontinuous sections of grout, settlement, lifting, rotational movement or damage.
- The area within a 20-foot radius of energy dissipators or outfalls is to be vegetation free.
- ??????

14.2.6.6 Levees

Levees are embankments whose primary purpose is to furnish flood protection from seasonal high water and subject to water loading for periods of ranging from only a few hours to several days or weeks a year.

Levee maintenance considerations include:

- Indications of seepage through the levee.
- Settlement, slumping, sliding, cracking or erosion of levee embankment.
- Rutting.
- Rodent burrows.
- Trees and vegetation having a diameter greater than 1-inch are not permitted on or within 15 feet of the tow of the levee.
- Vegetation density or height which inhibits inspection of the levee surface.
- Access roads within the levee cross section are able to support the intended maintenance traffic and do not show signs of rutting or other deficiencies in their all-weather surface.
- Top of levee is graded so as to prohibit ponding.
- Erosion protection provided on the floodwater side slope is intact. Refer to the items contained in Subsection 14.2.6.5 for Partially Lined Channels.
- Evaluation of locations where pipelines or other utility lines cross the levee for settlement or signs of leakage.
- Closure devices on gravity pipe penetrations of the levee embankment are operational.
- Pressure pipe penetrating the levee embankments can be closed in order to isolate the portion of the pipe within the levee prism.

Appendix G. Oro Valley Checklist

Drainage Report Checklist

See Cover Page of Report

Project Name:		
Firm Name:	***Engineer:***	
Address:		
City:	***State:***	***Zip:***
Phone Number:	***Fax Number:***	
Property Owner:		
Address:		
City:	***State:***	***Zip:***
Reviewed By:	***Date Reviewed:***	***Date Accepted for Review:***

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study for submittal to the Town of Oro Valley. The items listed are the minimum information required for submission to the Town. The engineer will remain responsible to ensure that the Technical Drainage Study is prepared according to guidelines set forth in the Oro Valley Drainage Criteria Manual and other applicable standards as required by the Town of Oro Valley

Cover:

- x Name, address, Township, Range, Section and Pima County Tax Code of the parcel, project or development for which the report is being submitted, as well as the Town of Oro Valley's project number.
- x Name and address of the client/owner of the parcel.
- x Name and address of the engineering/consulting firm preparing the report.

x Submittal date.
n/a state name of person preparing report, if other than registrant sealing the report.

Table of Contents:

x Seal and signature of Arizona Registered Professional Engineer (and/or on the report cover)
x Project name and legal description.
x Vicinity Map (see Location map).
x Include site location map identifying major features.
x Describe project type and size.
x Identify purpose and objectives of report (i.e. tentative plat, preliminary plat, development plan, etc.).
x Identify major drainageways and existing drainage facilities.
x Include general discussion on the topography.
x Identify the zoning.
x State whether the project site contains mapped floodplains.
x State whether detention is required.
x State sources of other reports used for the study.
x Provide a comprehensive narrative that clearly states the drainage engineer's concepts, rational, and assumptions.

2) Existing Conditions Drainage:

x On-site drainage.
i. Identify existing drainage network, patterns, watershed, and regulatory floodplain boundaries.
x Off-site watershed.

i. Note existing and future conditions, and drainage network entering the project site. Note any sheet flow conditions entering site.
ii. Identify existing drainage studies for project site or adjacent sites that 1) are impacted, or 2) impact project site.
iii.Identify existing flood hazard zones as identified by the Town of Oro Valley and/or FEMA (Include FIRM panel or applicable portion of FIRM panel).

3) Proposed Conditions Drainage Design:

x Include general description of proposed conditions, drainage facilities, and components.
x State storm water detention requirements for the proposed site as well as volume required, size and location of detention basins.
x Delineate pre-and post-runoff characteristics at concentration points exiting the site
x Identify, in detail, proposed drainage structures or drainage facilities. Include design criteria and probable effects on the existing upstream and downstream drainage system.
x Discuss any design exceptions, variations from manual, stipulations, permit issues (404 compliance statement, NPDES, FEMA), etc.

5) Hydrologic and Hydraulic Analysis:

x Hydrology
- i. Identify procedures, methods and assumptions.
- ii. Include table listing design flow rates at concentration points.

x Hydraulics
- i. Identify procedures, methods and assumptions.
- ii. Include a summary table listing channels that were analyzed with a comparison of pre-versus post-peak discharge, water surface elevation and velocities.
- iii. Describe methods used to convey onsite and offsite flows.

n/a iv. Provide standard detail # and/or regulatory agency

n/a Floodplain Analysis
- i. Describe the results of floodplain hydraulic analysis in terms of site design.
- ii. Include a summary table listing channels that were analyzed with a comparison of pre-verses post-peak discharge, water surface elevation and velocities.
- iii. Include method of floodplain boundary analysis and explain output messages, and how coefficients were determined.

x Storm Water Detention Calculations
- i. Identify procedures, methods and assumptions.
- ii. Include Table of Volume of Storage required, and Location and Storage Volume required
- iii. Include Table of Basin Outlet Discharge and Velocity.

x Drainage Facilities Design
- i. Identify procedures, methods and assumptions used for design of storm drains, culverts, etc.
- ii. Include a summary table of drainage facilities.

x Erosion Control
- i. Discuss the need for bank protection, the proposed location, materials and free board.
- ii. Discuss scour basin requirements, dimensions and materials.
- iii. Discuss procedures, methods and assumptions.
- iv. Include discussion of Storm Water Pollution Prevention Plan submittal requirements.

6) Conclusion:

x Discuss overall project objectives.

x Affirm compliance with criteria set forth in this manual and other Town of Oro Valley Standards.

x Discuss the influence of proposed development on existing conditions.

x Discuss the effectiveness of the drainage design to control damage from storm water runoff downstream of project site.

x Discuss impacts to adjacent properties and watershed drainage.

n/a Discuss if and how drainage improvements will be phased.

x Provide a summary of report's findings.

7) References:

x List all references used.

Appendix A – Hydrologic computations and backup:

See text Include land use assumptions, existing and proposed.

x Include soils information and exhibits.

x Include peak flow calculations.

x Include retention/detention inflow-outflow analysis and basin design calculations.

n/a Include computer input and output files in both hard copy and electronic format.
x Include electronic copies (AutoCAD/GIS) of basin delineations, flow paths, routing reaches, concentration points, and other supporting hydrologic data.

Appendix B – Hydraulic computations and backup:

x Include channel design calculations.
n/a Include floodplain calculations. At a minimum, include cross-section number, water surface elevation, top width, area, velocity, and Froude number.
n/a Cross-section and profile plots.
n/a Include erosion hazard setback calculations.
n/a Include culvert design calculations.
x Include curb opening and catch basin calculations.
n/a Include storm drain calculations.
n/a Include sediment and scour calculations.
x Include rip-rap sizing and stability analysis.
n/a Include finished floor elevations.
n/a i. Basis for setting finished floor elevations for floodplains and/or adjacent washes.
n/a Include computer input and output files in both hard copy and electronic format.
n/a Include electronic copies (AutoCAD/GIS) of floodplain delineations, cross section locations and 100 year water surface elevations.
x Include applicable plan set/sheets related to drainage activities and design.

Additional Information and Notes: none

Appendix H. Grenier Plans

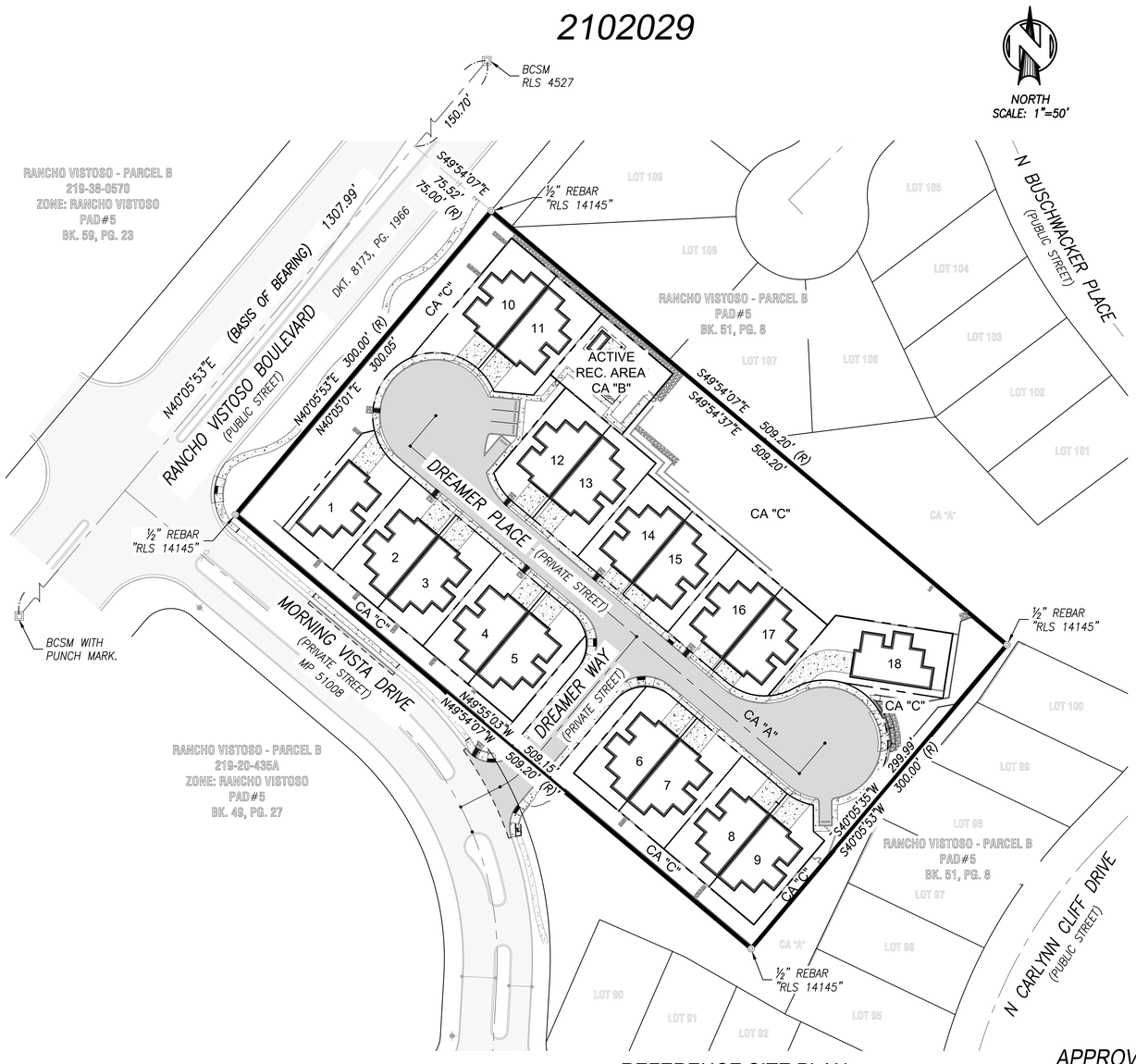
FINAL SITE PLAN AND IMPROVEMENT PLANS for

RESIDENCES AT MORNING VISTA

2102029

LEGEND

FEATURE	NEW	EXISTING
SURVEY MONUMENT		◎
BOUNDARY LINE	———	———
PROPERTY LINE	— — —	— — —
EASEMENT LINE	— — — —	— — — —
CENTER LINE	—— – ——	—— – ——
CONTOUR LINE – MAJOR	– – – 50 – – –	– – – 50 – – –
CONTOUR LINE – MINOR	------ 51 ------	------ 51 ------
A.C. PAVEMENT		
CONCRETE CURB		
DEPRESSED CURB		
CONCRETE SIDEWALK/PAD		
BUILDING EXTERIOR WALL		
WALL		
ELECTRICAL TRANSFORMER	⊠	⊠
STREET LIGHTING PULLBOX	▯	▯
ELECTRICAL METER	◇	◇
STREET LIGHT	☼	☼
ELECTRICAL MANHOLE	Ⓔ	Ⓔ
TELEPHONE MANHOLE	Ⓣ	Ⓣ
TELEPHONE PEDESTAL	▯	▯
UTILITY PEDESTAL	◈	◈
SANITARY SEWER LINE	—— S ——	— — S — —
SANITARY SEWER MANHOLE	⦿	Ⓢ
SANITARY SEWER CLEANOUT	○CO	○CO
FIRE HYDRANT	⊕	⊕
WATER LINE	—— W ——	— — W — —
RECLAIMED WATER LINE		— — RW — —
WATER METER	■W	■W
BACKFLOW PREVENTOR	⊘⊘	⊘⊘
BACKFLOW VALVE		▱
WATER VALVE	⊗	⋈
RECLAIMED WATER VALVE		⧓
WATER METER		⊕
SLOPE ARROW	~~➤	~~➤
GRADE POINT	51.00	51.00
SIGN		
BOLLARD	●	●
FENCE	—— X ——	— — X — —
IRRIGATION CONTROL VALVE		⊕
RIPRAP		
TRADE AREA FOR 25% SLOPE DISTURBANCE		
SLOPES GREATER THAN 25%		



REFERENCE SITE PLAN

BASIS OF BEARINGS

THE BASIS OF BEARING FOR THIS PROJECT IS, ACCORDING TO BOOK 51 OF MAPS AND PLATS AT PAGE 8, PIMA COUNTY, ARIZONA BETWEEN MONUMENTS FOUND ON THE CENTERLINE OF RANCHO VISTOSO BOULEVARD, AS SHOWN.

BASIS OF ELEVATIONS

THE BASIS OF ELEVATION FOR THIS PROJECT IS THE PIMA COUNTY OPUS CONTROL POINT R21. A ½" REBAR NORTH EDGE OF CONCRETE WALK NORTH SIDE OF VISTOSO HIGHLANDS DRIVE. ELEVATION BEING: 2950.40'
DATUM: NAVD88

OWNER

SPECTRUM CAPITAL HOLDINGS 2, LLC
CONTACT : MATT HORN
ADDRESS : 5425 E BROADWAY BLVD #200
TUCSON, AZ 85711

DEVELOPER

DSW COMMERCIAL REAL ESTATE
CONTACT : MICHAEL A. SARABIA
ADDRESS : 1795 E. SKYLINE DR., STE. 193
TUCSON, AZ 85718
PHONE : (520) 297-8929
EMAIL : msarabia@dswcommercial.com

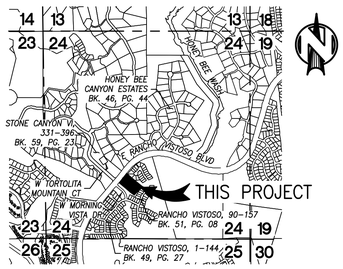
ARCHITECT

JAMES E. McMAHON ARCHITECTURE & PLANNING, PLLC
CONTACT : JAMES E. McMAHON
ADDRESS : 6340 N. CAMPBELL AVE., #270
TUCSON, AZ 85718
PHONE : (520) 321-0468
EMAIL : jimmcmahon@aol.com

LANDSCAPE ARCHITECT

NOVAK ENVIRONMENTAL, INC.
CONTACT : KAREN CESARE
ADDRESS : 4574 NORTH FIRST AVENUE, SUITE 100
TUCSON, AZ 85718
PHONE : (520) 206-0591
EMAIL : karen@novakenvironmental.com

SHEET INDEX

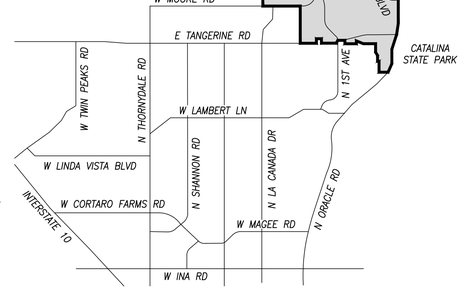


LOCATION MAP

SCALE: 3" = 1 MILE
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

CIVIL ENGINEER

GRENIER ENGINEERING, INC.
CONTACT : JASON MORSE, P.E.
ADDRESS : 6300 E. EL DORADO PLAZA, SUITE A120, TUCSON, AZ 85715
PHONE : (520) 326-7082
EMAIL : jmorse@greniereng.com



RANCHO VISTOSO PLANNED AREA DEVELOPEMENT (PAD) 5

NTS

APPROVALS

PLANNING AND ZONING ADMINISTRATOR _____ DATE _____

TOWN ENGINEER _____ DATE _____

ORO VALLEY WATER UTILITY DIRECTOR _____ DATE _____

REF.: 2003075

Rev #	Date	Description

GRENIER ENGINEERING, INC.
Structural & Civil Engineering Consultant
6300 E. El Dorado Plaza Suite A120, Tucson, Arizona 85715
Phone: 520.326.7082 ~ Fax: 520.326.7508

Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-10-23 ARIZONA U.S.A.

Sheet Name: COVER SHEET

Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S,
R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA
COUNTY, ARIZONA 85755

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale Vt:	N/A
Hz:	AS NOTED

Sheet Number: C1.0

Sheet 1 of 17

T.O.V. GENERAL NOTES:

1. GROSS AREA OF DEVELOPMENT IS 152,761.5 SQFT., OR 3.51 ACRES.
2. RESIDENTIAL UNITS (18 TOTAL) PER ACRE (3.51 AC.) FOR THIS PROJECT IS 5.1.
3. TOTAL MILES OF NEW PUBLIC STREETS IS 0.
4. TOTAL MILES OF NEW PRIVATE STREETS IS 0.12.
5. THIS PROJECT IS DESIGNED TO MEET THE RANCHO VISTOSO HILLSIDE DISTRICT CRITERIA.
6. ASSURANCES FOR WATER SERVICE, SITE STABILIZATION AND LANDSCAPING MUST BE POSTED PRIOR TO THE ISSUANCE OF GRADING PERMITS.
7. SHOULD AN EASEMENT BE IN CONFLICT WITH ANY PROPOSED BUILDING LOCATION, VACATION OF THE EASEMENT IS TO OCCUR PRIOR TO ISSUANCE OF BUILDING PERMITS.

T.O.V. PLANNING NOTES:

1. EXISTING ZONING IS PAD (PLANNED AREA DEVELOPMENT, RANCHO VISTOSO), HIGH DENSITY RESIDENTIAL, AND WILL REMAIN.
2. NO BUILDING SHALL EXCEED 3–STORIES & THE EXTERIOR HEIGHT SHALL NOT EXCEED THIRTY–FOUR (34) FEET.
3. THE PROPOSED COMMON AREAS ON THIS PROJECT WILL BE OWNED AND MAINTAINED BY A HOME OWNERS ASSOCIATION FOR USE BY THE SUBDIVISION FOR ACCESS, LANDSCAPING AND RECREATION.
4. ALL SIGNAGE AND LIGHTING TO BE ADDRESSED AS PART OF A SEPARATE REVIEW AND APPROVAL PROCESS.
5. THE FOLLOWING CODES AND STANDARDS SHALL BE APPLICABLE TO THIS DEVELOPMENT AS ADOPTED BY THE TOWN OF ORO VALLEY:
   - INTERNATIONAL BUILDING CODES WITH LOCAL AMENDMENTS
   - NATIONAL ELECTRICAL CODE
   - ADA STANDARDS FOR ACCESSIBLE DESIGN
   - GOLDER RANCH FIRE DISTRICT STANDARDS AND FORMS
   - TOWN OF ORO VALLEY POOL CODE
   - PAG STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC IMPROVEMENTS
   - TOWN OF ORO VALLEY DRAINAGE CRITERIA MANUAL
   - TOWN OF ORO VALLEY SUBDIVISION STREET STANDARDS AND POLICIES MANUAL
   - TOWN OF ORO VALLEY ZONING CODE, CURRENT REVISED
   - ORO VALLEY TOWN CODE, CURRENT REVISED
6. RETAINING WALLS, ANY STRUCTURE USED TO RETAIN SLOPES SHALL BE DESIGNED TO BLEND WITH THE SURROUNDING NATURAL COLORS OF THE NATIVE ROCK AND SOILS OF THE SITE. THE SURFACE SHALL BE ROUGH TEXTURED WITH HEAVY SHADOW PATTERNS, WHICH MAY BE ACHIEVED BY COLOR–TREATED OR VENEERED SURFACES (OR OTHER METHODS APPROVED BY THE TOWN).

OPEN SPACE AREA CALCULATIONS

NATURAL OPEN SPACE (PORTION OF CA "C")	16,271 S.F.
LANDSCAPE AREA (PORTION OF CA "C")	26,012 S.F.
RECREATIONAL AREA (CA "B")	4,227 S.F.
TOTAL OPEN SPACE (MINIMUM 30% REQUIRED PER RANCHO VISTOSO PAD)	46,510 S.F. (30.4% OF SITE)

- A.P.N.: 219–20–001C
- JURISDICTION: TOWN OF ORO VALLEY
- MIN. LOT AREA PER DWELLING UNIT: 2,000 S.F.
- REQUIRED PERIMETER YARD SETBACKS:
  FRONT: 20'
  SIDE: 5' (0 FOR COMMON WALLS)
  REAR: 5'
- REQUIRED SEPARATION BETWEEN BUILDINGS:
  (STRUCTURE SEPARATION PER R–6 STANDARDS)
  –BETWEEN 2 SINGLE STORY BUILDINGS: 10'
  –BETWEEN A SINGLE STORY AND A TWO STORY BUILDING: 15'
  –BETWEEN 2 – TWO STORY BUILDINGS: 20'
  PROVIDED SEPERATION BETWEEN BUILDINGS: 10'
- REQUIRED BUFFERYARDS:
  ALONG RANCHO VISTOSO: 25' TYPE B
  ALONG MORNING VISTA: 15' TYPE A
  ALONG ADJACENT RESIDENTIAL: NONE

VEHICULAR PARKING CALCULATIONS

	REQUIRED	PROVIDED
RESIDENTIAL PARKING – 1.75 SPACES PER DWELLING UNIT 18 X 1.75 = 32 SPACES	32	36 (IN ATTACHED GARAGES)
VISITOR PARKING – 1 SPACE PER EVERY 4 DWELLING UNITS	5	5

18 / 4 = 5 SPACES

GRADING CALCULATIONS

GRADABLE AREA
(PARCEL AREA MINUS 25% SLOPES) = 142,520 S.F.

25% SLOPE DISTURBANCE AREA = 4,922 S.F.
(3.45% OF GRADABLE AREA)

PROVIDED TRADE AREA = 16,271 S.F.

T.O.V. ENGINEERING NOTES:

1. THE DESIGN SPEED FOR THIS PROJECT IS 25 MPH AND THE DESIGN VEHICLE TO BE USED FOR THIS PROJECT IS A WB–40.
2. ALL NEW PUBLIC ROADS WITHIN AND ADJACENT TO THIS PROJECT WILL BE CONSTRUCTED IN ACCORDANCE WITH APPROVED PLANS. SEPARATE PUBLIC IMPROVEMENT AND CONSTRUCTION PLANS WILL BE SUBMITTED TO THE TOWN ENGINEER'S OFFICE FOR REVIEW AND APPROVAL.
3. ANY RELOCATION OR MODIFICATION OF EXISTING UTILITIES AND/OR PUBLIC IMPROVEMENTS NECESSITATED BY THE PROPOSED DEVELOPMENT WILL BE AT NO EXPENSE TO THE PUBLIC.
4. THE BASIS OF BEARING FOR THIS PROJECT IS, ACCORDING TO BOOK 51 OF MAPS AND PLATS AT PAGE 8, PIMA COUNTY, ARIZONA BETWEEN MONUMENTS FOUND ON THE CENTERLINE OF RANCHO VISTOSO BOULEVARD, AS SHOWN.
5. THE BASIS OF ELEVATION FOR THIS PROJECT IS THE PIMA COUNTY OPUS CONTROL POINT R21. A ½" REBAR NORTH EDGE OF CONCRETE WALK NORTH SIDE OF VISTOSO HIGHLANDS DRIVE. ELEVATION BEING: 2950.40' DATUM: NAVD88
6. MATERIALS WITHIN SIGHT VISIBILITY TRIANGLES MUST BE PLACED SO AS NOT TO INTERFERE WITH A VISIBILITY PLANE DESCRIBED BY TWO HORIZONTAL LINES LOCATED THIRTY (30) INCHES AND SEVENTY–TWO (72) INCHES ABOVE FINISHED GRADE OF THE ROADWAY SURFACE.
7. CIVIL IMPROVEMENT PLAN MUST BE APPROVED PRIOR TO THE ISSUANCE OF ANY PERMITS BY THE TOWN ENGINEER AND/OR BUILDING OFFICIAL.
8. ALL WEATHER ACCESS MUST BE PROVIDED TO ALL LOTS WITHIN THE SUBDIVISION.

T.O.V. DRAINAGE NOTES

1. ALL DRAINAGE WAYS WILL BE CONSTRUCTED ACCORDING TO APPROVED PLANS PRIOR TO THE ISSUANCE OF ANY BUILDING PERMITS FROM THE BUILDING OFFICIAL FOR PARCELS AFFECTED BY REGULATORY FLOODPLAIN. PARCELS AFFECTED BY REGULATORY FLOODPLAIN MUST BE SPECIFICALLY IDENTIFIED EITHER BY NUMBER, IN NOTE OR BY OUTLINE ON THE DEVELOPMENT PLAN.
2. DRAINAGE MUST BE COLLECTED AND RELEASED FROM A PROPOSED DEVELOPMENT AT THE LOCATIONS AND IN THE MANNER EXISTING PRIOR TO DEVELOPMENT.
3. DRAINAGE WAYS MUST BE PROVIDED WHERE NECESSARY TO CARRY DRAINAGE FLOWS THROUGH OR FROM THE DEVELOPMENT AND SUCH DRAINAGE WAYS MUST BE DEDICATED AND MAINTAINED BY PROPERTY OWNERS OR PROPERTY OWNER'S ASSOCIATION.
4. ALL DRAINAGE WAYS, DRAINAGE STRUCTURES AND DETENTION BASINS ARE PROVIDED WITH ADEQUATE MAINTENANCE ACCESS AND ARE INCLUDED AS PART OF ANY DRAINAGE EASEMENT.
5. DRAINAGE WAYS MUST BE DESIGNED TO NOT DISCHARGE ONTO PAVED STREETS, EASEMENTS OR PARKING AREAS.
6. PARKING AREAS MUST NOT BE USED AS DETENTION BASINS.
7. ALL DRAINAGE STRUCTURES SHALL BE INSPECTED AND A SUMMARY REPORT PREPARED A MINIMUM OF ONCE EACH YEAR IN ACCORDANCE WITH THE PROCEDURES IN THE APPROVED DRAINAGE REPORT. COPIES OF THE ANNUAL INSPECTION REPORTS SHALL BE MADE AVAILABLE TO THE TOWN UPON REQUEST.
8. ALL DRAINAGE STRUCTURES SHALL BE INSPECTED AND A SUMMARY REPORT PREPARED BY AN ARIZONA REGISTERED CIVIL ENGINEER A MINIMUM OF ONCE EVERY FIVE YEARS IN ACCORDANCE WITH THE PROCEDURES IN THE APPROVED DRAINAGE REPORT. COPIES OF THE 5–YEAR ANNUAL INSPECTION REPORTS SHALL BE MADE AVAILABLE TO THE TOWN UPON REQUEST. THE REPORT SHALL IDENTIFY THE MAINTENANCE NEEDS FOR THE NEXT 5–YEAR PERIOD, INCLUDING AN ANTICIPATED ANNUAL COST OF MAINTENANCE AND REPAIR.

ORO VALLEY WATER UTILITY NOTES

1. ORO VALLEY WATER UTILITY WILL BE THE WATER SERVICE PROVIDER.
2. THIS DEVELOPMENT MUST COMPLY WITH THE ORO VALLEY WATER UTILITY SPECIFICATIONS MANUAL DURING ALL PHASES OF CONSTRUCTION.
3. THIS PROJECT WILL BE SERVED BY ORO VALLEY WATER UTILITY WHICH HAS BEEN DESIGNATED AS HAVING AN ASSURED 100 YEAR WATER SUPPLY BY THE DIRECTOR OF WATER RESOURCES.
4. ALL WELLS MUST BE ABANDONED PER ADWR REGULATIONS.
5. A LINE EXTENSION AGREEMENT MUST BE IN PLACE PRIOR TO ANY PUBLIC WATER INFRASTRUCTURE CONSTRUCTION WORK COMMENCING FOR THIS PROJECT.
6. WATER INFRASTRUCTURE AS REPRESENTED ON THE PLAT OR DEVELOPMENT PLAN IS FOR INFORMATIONAL PURPOSES ONLY. A SEPARATE PUBLIC WATER IMPROVEMENT PLAN MUST BE SUBMITTED TO THE ORO VALLEY WATER UTILITY FOR TECHNICAL REVIEW AND COMPLIANCE WITH APPLICABLE STATUES, CODES AND SPECIFICATIONS. ADDITIONAL PUBLIC WATER INFRASTRUCTURE MAY BE DEEMED NECESSARY UPON REVIEW OF THE PUBLIC WATER IMPROVEMENT PLAN SUBMITTAL.

GOLDER RANCH FIRE GENERAL NOTES

1. APPROVED FIRE APPARATUS ACCESS ROADWAYS AND FIRE HYDRANTS CONNECTED TO AN APPROVED WATER SUPPLY OF 1500 GPM FOR FIRE PROTECTION MUST BE INSTALLED AND IN SERVICE PRIOR TO COMBUSTIBLE MATERIAL DELIVERY TO THE SITE. TEMPORARY CONSTRUCTION OFFICE TRAILERS ARE CONSIDERED COMBUSTIBLE MATERIAL.
2. ROADWAYS SHALL BE SURFACED WITH AN ALL–WEATHER MATERIAL CAPABLE OF SUPPORTING AN IMPOSED LOAD OF 82,000 POUNDS.
3. TEMPORARY STREET SIGNS MUST BE INSTALLED AT EACH STREET INTERSECTION WHEN CONSTRUCTION OF NEW ROADWAYS ALLOWS PASSAGE OF VEHICLES. ALL STRUCTURES UNDER CONSTRUCTION MUST BE CLEARLY IDENTIFIED WITH AN APPROVED ADDRESS.
4. ELECTRIC GATE OPERATORS SHALL BE LISTED IN ACCORDANCE WITH UL 325. GATES INTENDED FOR AUTOMATIC OPERATION SHALL BE DESIGNED, CONSTRUCTED AND INSTALLED TO COMPLY WITH THE REQUIREMENTS OF ASTM F 2200.

ABBREVIATIONS

ABC	AGGREGATE BASE COARSE	N	NORTH
AC	ASPHALTIC CONCRETE	NAVD	NORTH AMERICAN VERTICAL DATUM
ADEQ	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	NE	NORTHEAST
ALT	ALTERNATE	NO	NUMBER
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	NOI	NOTICE OF INTENT
APC	AUTOMATED PLASTIC CONTAINER	NTS	NOT TO SCALE
ARCH	ARCHITECTURAL	NW	NORTHWEST
ARS	ARIZONA REVISED STATUTES	OC	ON CENTER
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	OV	ORO VALLEY
AZPDES	ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM	PC/COT	PIMA COUNTY/CITY OF TUCSON
BC	BACK OF CURB	P	PAVEMENT
BCS	BUSINESS CONNECTION SEWER	PCC	PORTLAND CEMENT CONCRETE
BK	BOOK	PDSD	PLANNING & DEVELOPMENT SERVICES
BLDG	BUILDING	PE	POLYETHYLENE
BLVD	BOULEVARD	PG	PAGE
C	CONCRETE, COMPUTED	PN	PLAN NUMBER
CF	CUBIC FEET	PSI	POUNDS PER SQUARE INCH
CFS	CUBIC FEET PER SECOND	PUE	PUBLIC UTILITY EASEMENT
CI	CAST IRON	PVC	POLYVINYL CHLORIDE
CLR	CLEAR	PVMT	PAVEMENT
CMU	CONCRETE MASONRY UNIT	R	RANGE, RADIUS, RECORD
CONC	CONCRETE	RCP	REINFORCED CONCRETE PIPE
COT	CITY OF TUCSON	RD	ROAD
CY	CUBIC YARDS	RLS	REGISTERED LAND SURVEYOR
DIP	DUCTILE IRON PIPE	ROW	RIGHT–OF–WAY
DKT	DOCKET	RWRD	REGIONAL WASTEWATER RECLAMATION DEPARTMENT
DTL	DETAIL	S	SLOPE, SOUTH, SECTION
DR	DRIVE	SE	SOUTHEAST
E	EAST	SEQ	SEQUENCE
EG	EXISTING GRADE	SF	SQUARE FEET
ELEV	ELEVATION	SSPI	STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS
EQUIV	EQUIVALENT	STD	STANDARD
EX	EXISTING	SVT	SIGHT VISIBILITY TRIANGLE
EXIST	EXISTING	SW	SIDEWALK, SOUTHWEST
FC	FACE OF CURB	SWR	SEWER
FFE	FINISHED FLOOR ELEVATION	SWPPP	STORM WATER POLLUTION PREVENTION PLAN
FG	FINISHED GRADE	T	TOWNSHIP
FL	FLOW LINE	TC	TOP OF CURB
FT	FEET	TYP	TYPICAL
G	GUTTER	TW	TOP OF WALL
G&SRM	GILA & SALT RIVER MERIDIAN	UDC	UNIFIED DEVELOPMENT CODE
GA	GAUGE	UNO	UNLESS NOTED OTHERWISE
GAL	GALLONS	VCP	VITRIFIED CLAY PIPE
GFA	GROSS FLOOR AREA	VERT	VERTICAL
HDPE	HIGH–DENSITY POLYETHYLENE	W	WEST, WIDTH
IBC	INTERNATIONAL BUILDING CODE	WK	WEEK
ICC	INTERNATIONAL CODE COUNCIL	WSEL	WATER SURFACE ELEVATION
INV	INVERT	WTR	WATER
L	LENGTH	WWF	WELDED WIRE FABRIC
LBS	POUNDS	YR	YEAR
LF	LINEAR FEET		
LP	LOOP		
M	MEASURED		
M&P	MAPS & PLATS		
MAG	MARICOPA ASSOCIATION OF GOVERNMENTS		
MAX	MAXIMUM		
ME	MATCH EXISTING		
MIN	MINIMUM		

REF.: 2003075

Rev #	Date	Description

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Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-06-2023 ARIZONA U.S.A.

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale: Vt:	N/A
Hz:	AS NOTED

Sheet Name
NOTES

Project
RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Sheet Number:
C1.1

T.O.V. GENERAL GRADING NOTES

1. ALL MATERIALS AND WORKMANSHIP ARE TO BE IN ACCORDANCE WITH PIMA ASSOCIATION OF GOVERNMENTS STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS (P.A.G. S.S.P.I.), EDITION OF 2003, EXCEPT AS MODIFIED HEREBY.
2. ALL CONSTRUCTION AND TESTING METHODS SHALL BE IN CONFORMANCE WITH P.A.G. S.S.P.I., EDITION OF 2003, EXCEPT AS MODIFIED HEREBY.
3. ALL WORK SHALL BE IN CONFORMANCE TO GRADING STANDARDS, CHAPTER 15 OF THE ORO VALLEY ZONING CODE REVISED.
4. EXCAVATION AND BACKFILL FOR STRUCTURES SHALL CONFORM TO P.A.G. S.S.P.I., SECTION 203-5.
5. ALL CONCRETE SHALL CONFORM TO P.A.G. S.S.P.I., SECTION 1006, CLASS S, 3,000-PSI COMPRESSIVE STRENGTH AT 28 DAYS, UNLESS OTHERWISE SPECIFIED.
6. A STAMPED SET OF APPROVED PLANS SHALL BE KEPT IN AN EASILY ACCESSIBLE LOCATION ON THE JOB SITE AT ALL TIMES OR DURING CONSTRUCTION.
7. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS.
8. CONTRACTOR SHALL CALL BLUE STAKE (1-800-782-5348) TO VERIFY LOCATION OF ALL UTILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION.
9. CONTRACTORS SHALL OBTAIN ALL PERMITS REQUIRED BY GOVERNMENTAL AGENCIES.
10. UPON COMMENCEMENT OF WORK, TRAFFIC CONTROL DEVICES SHALL BE POSTED AND MAINTAINED BY THE CONTRACTOR UNTIL SUCH TIME AS THE WORK IS COMPLETED. ALL WARNING SIGNS, BARRICADES, ETC., SHALL BE IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES ADOPTED BY THE STATE OF ARIZONA PURSUANT TO A.R.S 28-650.
11. IF UNANTICIPATED CONDITIONS ARE ENCOUNTERED DURING THE COURSE OF CONSTRUCTION AND ARE BEYOND THE SCOPE OF THE DESIGN, THE ENGINEER SHALL SUBMIT THE NECESSARY REVISED OR SUPPLEMENTAL IMPROVEMENT PLANS FOR REVIEW AND APPROVAL BY THE TOWN OF ORO VALLEY PRIOR TO SUCH REVISONS/CHANGES BEING MADE IN THE FIELD.
12. ALL STATIONING SHOWN ON PLAN AND PROFILE ARE ALONG CONSTRUCTION CENTERLINE UNLESS OTHERWISE NOTED.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CARE AND MAINTENANCE OF EXISTING IMPROVEMENTS AND VEGETATION IN THE WORK AREA. PAVEMENT, CURBS, CART PATHS AND ANY OTHER OBSTRUCTIONS DAMAGED DURING CONSTRUCTION ARE TO BE REPLACED BY THE CONTRACTOR. ANY UNDERGROUND PIPES, IRRIGATION LINES, IRRIGATION CONTROLS, DRAINS, STRUCTURES, OR OBSTRUCTIONS NOT SHOWN ON THESE PLANS SHALL BE MOVED, ALTERED, OR REPAIRED BY THE CONTRACTOR WHEN ENCOUNTERED, AS DIRECTED BY THE ENGINEER, AND IS A DEFINITE PART OF THIS PROJECT.
14. ACCEPTANCE OF THESE PLANS DOES NOT CONSTITUTE OR IMPLY ACCEPTANCE OF ANY OF THE FOLLOWING:
    a) WALL(S), RETAINING OR OTHER TYPE(S).
    b) ANY REINFORCED CONCRETE STRUCTURE(S).
    c) ANY EMBANKMENT(S) WHOSE PRIMARY PURPOSE IS TO FUNCTION AS A RETENTION/DETENTION STRUCTURE.
    THE ITEMS LISTED ABOVE ARE APPROVED FOR LOCATION ONLY. SEPARATE PLAN CHECKS AND PERMITS ARE REQUIRED, ALL IN ACCORDANCE WITH THE APPLICABLE CODES OF THE TOWN OF ORO VALLEY.
15. THE CONTRACTOR SHALL GIVE FORTY-EIGHT (48) HOURS NOTICE WHEN HE SHALL REQUIRE THE SERVICES OF THE ENGINEER OR ANY OTHER PERSON PROPERLY AUTHORIZED FOR SUCH PURPOSE FOR LAYING OUT ANY PORTION OF THE WORK. HE SHALL ALSO DIG ALL STAKE HOLES NECESSARY TO GIVE LINE AND LEVELS AND SHALL PROVIDE ASSISTANCE CALLED FOR BY THE ENGINEER OR HIS ASSISTANTS UPON ANY PART OF THE WORK WHENEVER SO REQUESTED, AND SHALL PRESERVE ALL STAKES SET FOR THE LINES, LEVELS OR MEASUREMENTS OF THE WORK IN THEIR PROPER PLACES UNTIL AUTHORIZED TO REMOVE THEM BY THE ENGINEERS. ANY EXPENSE INCURRED IN REPLACING ANY STAKES WHICH THE CONTRACTOR OR HIS SUBORDINATE'S MAY HAVE FAILED TO PRESERVE SHALL BE CHARGED TO THE CONTRACTOR.
16. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH, HAUL AND APPLY ALL WATER REQUIRED FOR COMPACTION AND FOR THE CONTROL OF DUST FROM CONSTRUCTION ACTIVITY. THE COST THEREOF IS TO BE INCLUDED IN THE GRADING CONSTRUCTION PRICE.
17. IT SHALL BE THE CONTRACTOR'S REPSPONSIBILITY TO FULLY COMPLY WITH ADEQ STORMWATER DISCHARGE PERMIT IN ACCORDANCE WITH THE REPORT AND POLLUTION PLANS PREPARED BY THE ENGINEER. THE COST THEREOF TO BE INCLUDED IN THE GRADING CONSTRUCTION PRICE.
18. BUILDING SITES SHALL BE CONSTRUCTED TO WITHIN 0.10 FOOT OF FINISH BUILDING PAD ELEVATIONS AS STAKED BY THE ENGINEER. STREETS AND PARKING AREAS SHALL BE CONSTRUCTED TO WITHING +0.10 FEET OF FINISH SUBGRADE AS STAKED BY THE ENGINEER.
19. A REPORT OF SOILS INVESTIGATIONS HAS BEEN PREPARED FOR THIS PROJECT SEE ENGINEER'S NOTE #2.
20. THE SOILS ENGINEER SHALL OBSERVE, INSPECT AND TEST ALL CONSTRUCTION OPERATIONS, INCLUDING BUT NOT LIMITED TO: CLEARING, GRUBBING, SUBGRADE PREPARATION, STRUCTURAL, TRENCH EXCAVATION AND BACKFILL, MATERIAL TESTING, TOGETHER WITH PLACEMENT OF FILL. SAID ENGINEER SHALL CERTIFY IN WRITING, THAT ALL SOILS OPERATIONS AND MATERIALS USED FOR THIS DEVELOPMENT WERE PERFORMED IN ACCORDANCE WITH THE RECOMMENDATIONS AS SET FORTH IN THE GEOTECHNICAL INVESTIGATION OF RECORD AND ARE IN CONFORMANCE WITH THE ACCEPTED PLANS AND SPECIFICATIONS. CERTIFICATION, IN WRITING, IS TO BE RECEIVED BY THE TOWN OF ORO VALLEY PRIOR TO THE REQUEST FOR FINAL INSPECTION AND RELEASE OF ASSURANCES.

T.O.V. GENERAL GRADING NOTES - CONT.

21. GRADING BOUNDARIES SHALL BE CLEARLY MARKED, AND ALL WORK WILL BE CONFINED TO APPROVED PROJECT LIMITS AS SHOWN ON THESE PLANS.
22. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND/OR THE SURVEYOR PROVIDING THE CONSTRUCTION LAYOUT TO VERIFY THE BENCHMARK AND COMPARE THE SITE CONDITIONS WITH THE PLANS AND SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES OBSERVED. SHOULD ANY BENCHMARK, GRADE OR DESIGN INDICATED ON THE PLANS BE SUSPECT, THE ENGINEER SHALL BE NOTIFIED OF SAID BENCHMARK, GRADE OR DESIGN PROBLEM AT LEAST TWENTY-FOUR HOURS BEFORE CONSTRUCTION IS SCHEDULED TO BEGIN ON THE AFFECTED AREA.
23. IT SHALL BE THE SOLE RESPONSIBILITY OF THE OWNER(S), THEIR SUCCESSORS OR ASSIGNS, (AND/OR THEIR CONTRACTOR, THEIR SUCCESSORS OR ASSIGNS AS APPLICABLE) TO PURSUE ANY NEGOTIATIONS, OBTAIN ANY AGREEMENTS AND/OR PERMITS, ETC., FROM ALL NECESSARY OWNERS, PRIVATE AND/OR GOVERNMENTAL AGENCIES IN CHARGE OF PROPERTIES AND/OR RIGHTS-OF-WAY ADJACENT TO (OR NEIGHBORING) THIS PROJECT, THAT MAY BE REQUIRED TO DO ANY WORK (CONSTRUCTION, ACCESS, MODIFICATIONS, GRADING, DRAINAGE, STRUCTURES, ROADS, ETC.,) ENCROACHING OR AFFECTING - DIRECTLY OR INDIRECTLY - ON THESE ADJACENT PROPERTIES AND RIGHTS-OF-WAY IN ANY CONCEIVABLE MANNER, REGARDLESS OF WHETHER OR NOT THIS WORK IS SHOWN OR DESCRIBED ON THESE PLANS (OR) ON THIS PLAT.
24. THE PROFESSIONAL ENGINEER OF RECORD SHALL SUBMIT AS-BUILT RECORD DRAWINGS AND CERTIFY IN WRITING THAT ALL IMPROVEMENTS, WHETHER PRIVATE OR PUBLIC, HAVE BEEN CONSTRUCTED, PLACED, INSTALLED, ETC. IN SUBSTANTIAL CONFORMANCE WITH THE ACCEPTED PLANS FOR THIS DEVELOPMENT. CERTIFICATIONS IN WRITING AND THE AS-BUILT RECORD DRAWINGS ARE TO BE RECEIVED BY THE TOWN OF ORO VALLEY A MINIMUM OF TWO (2) WEEKS PRIOR TO THE REQUEST FOR CERTIFICATES OF OCCUPANCY AND/OR FINAL INSPECTION BY THE DEPARTMENT OF PUBLIC WORKS AND THE RELEASE OF ASSURANCES, EXCEPT FOR MODEL HOMES INTENDED TO BE USED FOR SALES PURPOSES. IF THE PROJECT IS PHASED THE ABOVE PERTAINS TO EACH PHASE.
25. FOR THE PROJECT BASIS OF ELEVATION SEE T.O.V. ENGINEERING NOTE #5.
26. ALL EASEMENTS MUST BE ACQUIRED BY OWNER/BUILDER PRIOR TO CONSTRUCTION.

T.O.V. TYPE 2 GRADING STANDARD CONDITIONS

1. A COPY OF THE APPROVED GRADING PERMIT, AS WELL AS ANY SPECIAL CONDITIONS, AND A SET OF THE APPROVED GRADING PLANS SHALL BE KEPT IN AN EASILY ACCESSIBLE LOCATION ON THE SITE AT ALL TIMES.
2. ANY CHANGES TO THE APPROVED PLANS SHALL REQUIRE THE SUBMITTAL OF A REVISION TO THE TOWN OF ORO VALLEY FOR REVIEW AND APPROVAL PRIOR TO THE CONSTRUCTION OF SAID CHANGES IN THE FIELD.
3. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AND PROPERLY MAINTAINED TO PREVENT EROSION OF SLOPES, AND CLEARED, BRUSHED, GRUBBED OR GRADED AREAS.
4. THE CONTRACTOR SHALL INSTALL STABILIZATION DEVICES WHEN NECESSARY TO PREVENT EROSION OR SEDIMENT TRANSPORT FROM THE CONSTRUCTION SITE.
5. ALL EXPOSED GRADED AREAS, CUT AND FILL SLOPES SHALL BE RE-VEGETATED, STABILIZED, AND/OR CONSTRUCTED PRIOR TO THE EXPIRATION OF THE GRADING PERMIT. ALL WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE REGULATIONS, CODES AND APPROVED PLANS.
6. THE TOP OF A CUT SLOPE SHALL BE MADE NOT NEARER TO THE SITE BOUNDARY LINE THAN ONE-FIFTH THE VERTICAL HEIGHT OF CUT, WITH A MINIMUM OF TWO FEET. THE TOE OF A FILL SLOPE SHALL BE MADE NOT NEARER TO THE SITE BOUNDARY THAN ONE-HALF THE VERTICAL HEIGHT OF THE FILL, WITH A MINIMUM OF TWO FEET.
7. NO GRADING ACTIVITY SHALL BE ALLOWED IN ANY FLOODPLAIN, EXCEPT AS PROVIDED IN THE TOWN OF ORO VALLEY FLOODPLAIN MANAGEMENT ORDINANCE AND AUTHORIZED BY PERMIT FROM THE TOWN OF ORO VALLEY.
8. EARTH AND VEGETATION REMOVED FROM THE SITE SHALL BE DISPOSED OF IN AN APPROVED LOCATION.
9. NOISE GENERATED BY CONSTRUCTION, DEMOLITION, EXCAVATION OR GRADING ACCORDING TO THE FOLLOWING RESTRICTIONS.
10. CONCRETE. THE POURING OF CONCRETE AND ALL ASSOCIATED WORK MAY BE CONDUCTED FROM APRIL 15 THROUGH OCTOBER 15 BETWEEN THE HOURS OF 5:00 A.M. AND 7:00 P.M. AND FROM OCTOBER 16 THROUGH APRIL 14 BETWEEN THE HOURS OF 6:00 A.M. AND 6:00 P.M. OR AS AUTHORIZED PURSUANT TO AN EXTENDED CONSTRUCTION HOURS WORK PERMIT (ECHWP) ISSUED UNDER ORO VALLEY TOWN CODE SECTION 10-1-4.
11. ALL OTHER CONSTRUCTION. WITHIN 500 FT. OF A RESIDENTIAL ZONE, ALL OTHER CONSTRUCTION MAY OCCUR BETWEEN THE HOURS OF 6:00 A.M. AND 6:00 P.M. CONSTRUCTION SITES MORE THAN 500 FT. FROM A RESIDENTIAL ZONE MAY CONDUCT WORK BETWEEN THE HOURS OF 5:00 A.M. AND 6:00 P.M. CONSTRUCTION HOURS MAY BE EXTENDED PURSUANT TO AN ECHWP ISSUED UNDER ORO VALLEY TOWN CODE SECTION 10-1-4. THE DISTANCE FROM A RESIDENTIAL ZONE SHALL BE DETERMINED BY MEASURING FROM ALL PROPERTY LINES OF THE CONSTRUCTION SITE.
12. NO VEHICLES OR EQUIPMENT SHALL ENCROACH ONTO AREAS DESIGNATED TO REMAIN IN A NATURAL STATE ON THE APPROVED FINAL PLAT, DEVELOPMENT PLAN, GRADING, LANDSCAPE OR NATIVE SALVAGE PLANS. POINTS OF ENTRY TO THE SITE DURING GRADING SHALL BE ONLY AS DESIGNATED ON THE APPROVED GRADING PLAN.
13. DURING GRADING AND UNTIL RE-VEGETATION OR STABILIZATION HAS TAKEN PLACE, DUST SHALL BE MINIMIZED THROUGH THE APPLICATION OF APPROVED DUST CONTROLS IN ACCORDANCE WITH SECTION 27.9,2A OF THE ORO VALLEY ZONING CODE REVISED (OVZCR).
14. PUBLIC RIGHTS-OF-WAY, SIDEWALKS AND OTHER IMPROVEMENTS SHALL BE MAINTAINED DURING GRADING IN A NEAT AND CLEAN CONDITION, FREE OF LOOSE SOIL, CONSTRUCTION DEBRIS AND TRASH. ANY DAMAGED AREAS SHALL BE RESTORED TO ORIGINAL APPEARANCE AT NO COST TO THE TOWN OF ORO VALLEY. DEBRIS, FILL MATERIAL OR EQUIPMENT SHALL NOT BE STORED WITHIN A PUBLIC RIGHT-OF-WAY WITHOUT THE WRITTEN APPROVAL OF THE TOWN ENGINEER.
15. THE PERMIT HOLDER SHALL PROVIDE NOTIFICATION TWENTY-FOUR (24) HOURS PRIOR TO AN INSPECTION REQUEST, OR AS SPECIFIED BY THE GRADING PERMIT.
16. THE CONTRACTOR SHALL CALL FOR ROUGH GRADING, CERTIFICATION OF THE BUILDING PAD ELEVATION, AND FINAL GRADING INSPECTIONS.
17. NOTICE OF VIOLATION, STOP WORK ORDER, AND/OR CITATION MAY BE ISSUED WHENEVER TOWN OF ORO VALLEY DETERMINES THAT THE GRADING DOES NOT COMPLY WITH TOWN OF ORO VALLEY APPROVED PLANS OR PERMIT CONDITIONS.
18. A TYPE 2 GRADING PERMIT SHALL BE NULL AND VOID IF THE AUTHORIZED WORK HAS NOT BEEN COMPLETED WITHIN ONE YEAR OF PERMIT ISSUANCE.

T.O.V. TYPE 2 GRADING SPECIAL CONDITIONS

1. A RIGHT-OF-WAY USER PERMIT IS REQUIRED FOR ANY WORK WITHIN THE TOWN RIGHT-OF-WAY.
2. PRIOR TO CONSIDERATION FOR CERTIFICATION OF OCCUPANCY (C. OF O.) AND/OR RELEASE OF ASSURANCES.

    A. AS-BUILTS OF THE PROJECT WILL NEED TO BE STAMPED BY THE ENGINEER OF RECORD ALONG WITH A LETTER OF SUBSTANTIAL COMPLETION.

    B. ALL SURVEILLANCE NOTES WILL BE HANDED IN FROM THE ENGINEER OF RECORD OR HIS REPRESENTATIVE.

    C. IF DURING THE COURSE OF REVIEWING THE PROJECT THERE ARE MORE THAN 10 PUNCH LIST ITEMS, THE TOWN OF ORO VALLEY WILL CONSIDER THE PROJECT NOT TO BE IN SUBSTANTIAL COMPLETION AND A MEETING WILL BE HELD WITH THE ENGINEER OF RECORD TO DETERMINE THE STATUS OF THE PROJECT AND WHEN FINAL ASSURANCES MAY BE RELEASED.
3. THE APPLICANT HEREBY CERTIFIES THAT HE/SHE UNDERSTANDS THAT THE GRANTING OF A GRADING PERMIT DOES NOT GIVE HIM/HER THE AUTHORITY TO COMMENCE CONSTRUCTION OF ANY WATER IMPROVEMENTS OR RELATED WORKS. HE/SHE FURTHER CERTIFIES THAT HE/SHE UNDERSTANDS THAT CONSTRUCTION OF ANY WATER IMPROVEMENTS REQUIRES A PRIOR APPROVAL TO CONSTRUCT ISSUED BY THE PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY, PURSUANT TO ARIZONA ADMINISTRATIVE CODE RULE R18-4-505, AND THE SATISFACTION OF ANY OTHER APPLICABLE RULES, REGULATIONS, LAWS OR ORDINANCES.
4. A FIELD PRE-CONSTRUCTION MEETING SHALL BE SCHEDULED AT LEAST FIVE (5) WORKING DAYS PRIOR TO THE START OF ANY WATER SYSTEM CONSTRUCTION. CONTACT MARK MOORE, ORO VALLEY WATER UTILITY, 229-5017.
5. BY RECEIPT OF THIS PERMIT, THE PROPERTY OWNER/APPLICANT AGREES THAT TOWN OF ORO VALLEY DESIGNEES MAY ENTER ONTO THE PROPERTY IN ORDER TO MAKE INSPECTIONS OF THE PROPERTY FOR COMPLIANCE WITH TOWN OF ORO VALLEY CODES.
6. ANY STOCKPILE ON THIS SITE SHALL NOT EXCEED SIX FEET IN HEIGHT AND SHALL BE LOCATED ONLY WITHIN THE APPROVED LIMITS OF GRADING UNDER THIS PERMIT.
7. TRASH DUMPSTERS MUST BE PROVIDED FOR TRASH DISPOSAL AT THE CONSTRUCTION SITE. WIRE RECEPTACLES ARE NOT ALLOWED FOR TRASH STORAGE.
8. STORMWATER POLLUTION PREVENTION MEASURES SHALL BE INSTALLED PRIOR TO THE ONSET OF CONSTRUCTION ACTIVITIES AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN AND PERMITTED BY ADEQ.
9. A STORMWATER PREVENTION PLAN IS PROVIDED FOR THIS SITE. THE PLAN IDENTIFIES THE MINIMUM MEASURES REQUIRED DURING CONSTRUCTION. THE MEASURES SUCH AS CONSTRUCTION ENTRANCE(S), SILT FENCES, AND STRAW BALE AREAS HAVE BEEN STABILIZED WITH PERMANENT EROSION CONTROL MEASURES.
10. TEMPORARY STORMWATER POLLUTION PREVENTION MEASURES SHALL BE REMOVED AND PROPERLY DISPOSED OF WHEN THE GRADED AREAS HAVE BEEN SATISFACTORILY STABILIZED.
11. AS-BUILT PLANS AND ENGINEER AND GEOTECHNICAL LETTER OF CERTIFICATION SHALL BE SUBMITTED A MINIMUM OF TWO WEEKS PRIOR TO THE EXPIRATION DATE OF THE PERMIT AND MUST BE ACCEPTED BY THE TOWN OF ORO VALLEY.
12. IN ALL CASES THE TYPE 2 GRADING PERMIT MUST REMAIN ACTIVE UNTIL THE SITE CERTIFICATION HAS BEEN ACCEPTED BY THE TOWN OF ORO VALLEY. APPLICANT SHALL REAPPLY OR EXTEND PERMIT AS NECESSARY.
13. IF CULTURAL RESOURCES ARE DISCOVERED DURING DEVELOPMENT, WORK SHALL CEASE UNTIL A QUALIFIED ARCHEOLOGIST INSPECTS THE SITE AND MATERIALS AND MAKES RECOMMENDATIONS REGARDING TREATMENT. IF HUMAN REMAINS ARE DISCOVERED, THE CONTRACTOR SHALL COORDINATE WITH THE TOWN AND THE STATE MUSEUM TO CONTACT RELATED TRIBES OR COMMUNITIES WHO MAY HAVE ANCESTRAL TIES TO THE REMAINS.
14. MONTHLY REPORTING IS REQUIRED. REPORTS SHALL CONTAIN:
    1) ENGINEER'S OBSERVATION REPORTS
    2) MATERIAL (SITE) GEOTECHNICAL REPORTS.

REF.: 2003075

Rev #	Date	Description

GRENIER ENGINEERING, INC.
Structural & Civil Engineering Consultant
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Phone: 520.326.7082 ~ Fax: 520.326.7508

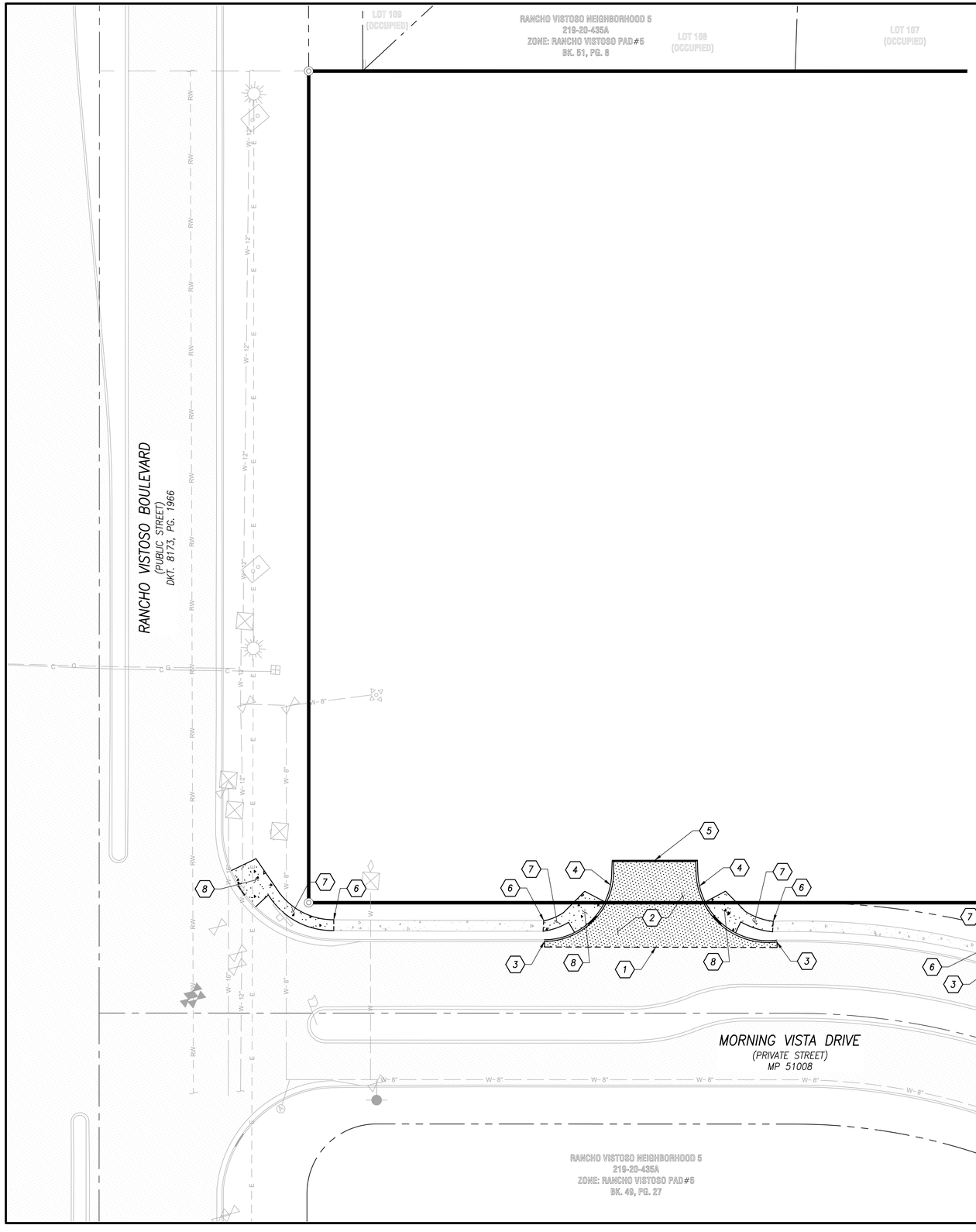
Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-06-23 ARIZONA U.S.A.

Sheet Name: NOTES

Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale: Vt:	N/A Hz: AS NOTED

Sheet Number: C1.2



DEMOLITION NOTES

1. THE CONTRACTOR SHALL OBTAIN ALL PERMITS, INCLUDING DEMOLITION PERMIT, REQUIRED BY GOVERNMENTAL AGENCIES.
2. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL REGULATIONS AND REQUESTS BY PIMA COUNTY REGARDING DUST POLLUTION.
3. UTILITY LOCATIONS AS SHOWN ON THE PLANS ARE BASED ON A SEARCH OF AVAILABLE RECORDS AND INFORMATION PROVIDED BY THE UTILITY COMPANIES OR AGENCIES. UTILITY LOCATIONS SHOWN ARE APPROXIMATE, AND THERE MAY BE EXISTING UTILITIES WHICH ARE NOT SHOWN ON THESE PLANS; THEREFORE, THE POSSIBILITY OF CONFLICTS WITH UTILITIES IN SERVICE EXISTS. THE CONTRACTOR SHALL CALL "BLUE STAKE CENTER" AT 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION, TO REQUEST VERIFICATION OF THE LOCATION AND ELEVATION OF ALL UTILITIES WITHIN THE WORK AREA. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR COSTS INCURRED AS A RESULT OF DAMAGE TO UTILITIES CAUSED BY HIS OPERATIONS.
4. THE CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES PRIOR TO COMMENCING WORK TO DISCONNECT, SHUT OFF, OR STUB OUT ANY EXISTING UTILITIES AFFECTED BY THE DEMOLITION.
5. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS.
6. THE CONTRACTOR AGREES TO PROTECT ALL ADJACENT PROPERTY AND EXISTING IMPROVEMENTS. INCLUDING POSITIVE CONTROL OF EARTH SPILLAGE, CONSTRUCTION WATER, AND RUNOFF WATERS.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CARE, MAINTENANCE, REPAIR AND/OR REPLACEMENT OF EXISTING IMPROVEMENTS IN THE WORK AREA WHICH HAVE BEEN REMOVED AND/OR DAMAGED DURING THE COURSE OF CONSTRUCTION. ALL REPAIR, REPLACEMENT, AND/OR CLEANUP SHALL BE DONE TO THE SATISFACTION OF THE OWNER.
8. THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOBSITE CONDITIONS DURING THE COURSE OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.
9. THE CONTRACTOR SHALL DISPOSE OF ALL DEMOLITION MATERIALS PER CITY AND/OR COUNTY REGULATIONS.
10. AN APPROVED COPY OF THIS PLAN SHALL BE KEPT ON LOCATION AT THE JOBSITE AT ALL TIMES DURING CONSTRUCTION.
11. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH, HAUL AND APPLY ALL WATER REQUIRED FOR THE CONTROL OF DUST FROM DEMOLITION ACTIVITIES. THE COST THEREOF IS TO BE INCLUDED IN THE CONTRACT PRICE.

DEMOLITION NOTES - CONTINUED

12. THE EXISTENCE AND LOCATION OF ANY EXISTING UNDERGROUND UTILITIES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. APPROVAL OF THIS PLAN DOES NOT CONSTITUTE A REPRESENTATION OF THE ACCURACY OR COMPLETENESS OF THE LOCATION OR THE EXISTENCE OR NON-EXISTENCE OF ANY UNDERGROUND UTILITY OR STRUCTURE WITHIN THE LIMITS OF THIS PROJECT. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEANS TO PROTECT ANY UTILITY NOT OF RECORD OR NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL VERIFY LOCATIONS AND ELEVATIONS OF ALL UTILITIES PRIOR TO ANY CONSTRUCTION.
13. THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS FROM PIMA COUNTY DEPARTMENT OF ENVIRONMENTAL QUALITY, INCLUDING DUST CONTROL AND ASBESTOS/NESHAP.
14. THE CONTRACTOR SHALL OBTAIN APPROVAL AND CLEARANCE FROM GOLDER RANCH FIRE DEPARTMENT PRIOR TO PROCEEDING WITH ANY DEMOLITION WORK.
15. REGARDING DEMOLITION OF EXISTING LANDSCAPE IMPROVEMENT, THE CONTRACTOR SHALL:
    - A. CUT AND CAP ALL LANDSCAPE IRRIGATION LINES SERVING PLANTS TO BE REMOVED.
    - B. ENSURE CONTINUED IRRIGATION SERVICE TO PLANT MATERIAL TO REMAIN.
    - C. PROTECT ALL PLANT MATERIAL TO REMAIN: DO NOT COMPACT SOIL OR PLACE CONSTRUCTION EQUIPMENT OR MATERIAL WITHIN THE AREA UNDER THE PLANT CANOPY.
    - D. SALVAGE AND OFFER ALL LANDSCAPE IRRIGATION EQUIPMENT TO THE OWNER.
    - E. ALL STUMPS OF REMOVED TREES MUST BE COMPLETELY REMOVED BELOW GRADE.
    - F. ALL EXISTING BACKFLOW PREVENTORS SHALL BE SALVAGED.
16. CONTRACTOR SHALL COORDINATE WITH WATER DEPARTMENT FOR EXISTING WATER SERVICES TO BE ABANDONED.
17. CONTRACTOR SHALL COORDINATE WITH OWNER AND/OR ARCHITECT FOR MATERIALS TO BE SALVAGED FOR REUSE OR STORAGE.
18. CONTRACTOR MUST PROTECT THE PUBLIC AT ALL TIMES WITH FENCING, BARRICADES, ENCLOSURES, ETC., TO THE BEST PRACTICES AND APPROVED CITY AND/OR COUNTY REGULATIONS.
19. PRIOR TO DEMOLITION OCCURRING, EROSION CONTROL DEVICES ARE TO BE INSTALLED WHERE NECESSARY.
20. CONTINUOUS ACCESS SHALL BE MAINTAINED FOR THE SURROUNDING PROPERTIES AT ALL TIMES DURING DEMOLITION OF THE EXISTING FACILITIES.

KEYNOTES

1. SAWCUT EXISTING PAVEMENT, SEE HORIZONTAL CONTROL PLAN (C8.0) FOR LIMITS OF NEW CONSTRUCTION.
2. EXISTING A.C. PAVEMENT TO BE REMOVED.
3. SAWCUT EXISTING CONCRETE VERTICAL CURB, SEE HORIZONTAL CONTROL PLAN (C8.0) AND ROAD PLAN AND PROFILE (C6.0) FOR LIMITS OF NEW CONSTRUCTION.
4. EXISTING CONCRETE VERTICAL CURB TO BE REMOVED.
5. EXISTING CONCRETE HEADER TO BE REMOVED.
6. SAWCUT EXISTING CONCRETE SIDEWALK, SEE HORIZONTAL CONTROL PLAN (C8.0) FOR LIMITS OF NEW CONSTRUCTION.
7. EXISTING CONCRETE SIDEWALK TO BE REMOVED.
8. EXISTING CURB ACCESS RAMP TO BE REMOVED.

REF.: 2003075

Rev #	Date	Description

GRENIER ENGINEERING, INC.
Structural & Civil Engineering Consultant
6300 E. El Dorado Plaza Suite A120, Tucson, Arizona 85715
Phone: 520.326.7082 ~ Fax: 520.326.7508

Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-16-23 ARIZONA U.S.A.

Sheet Name: DEMOLITION PLAN

Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S,
R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA
COUNTY, ARIZONA 85755

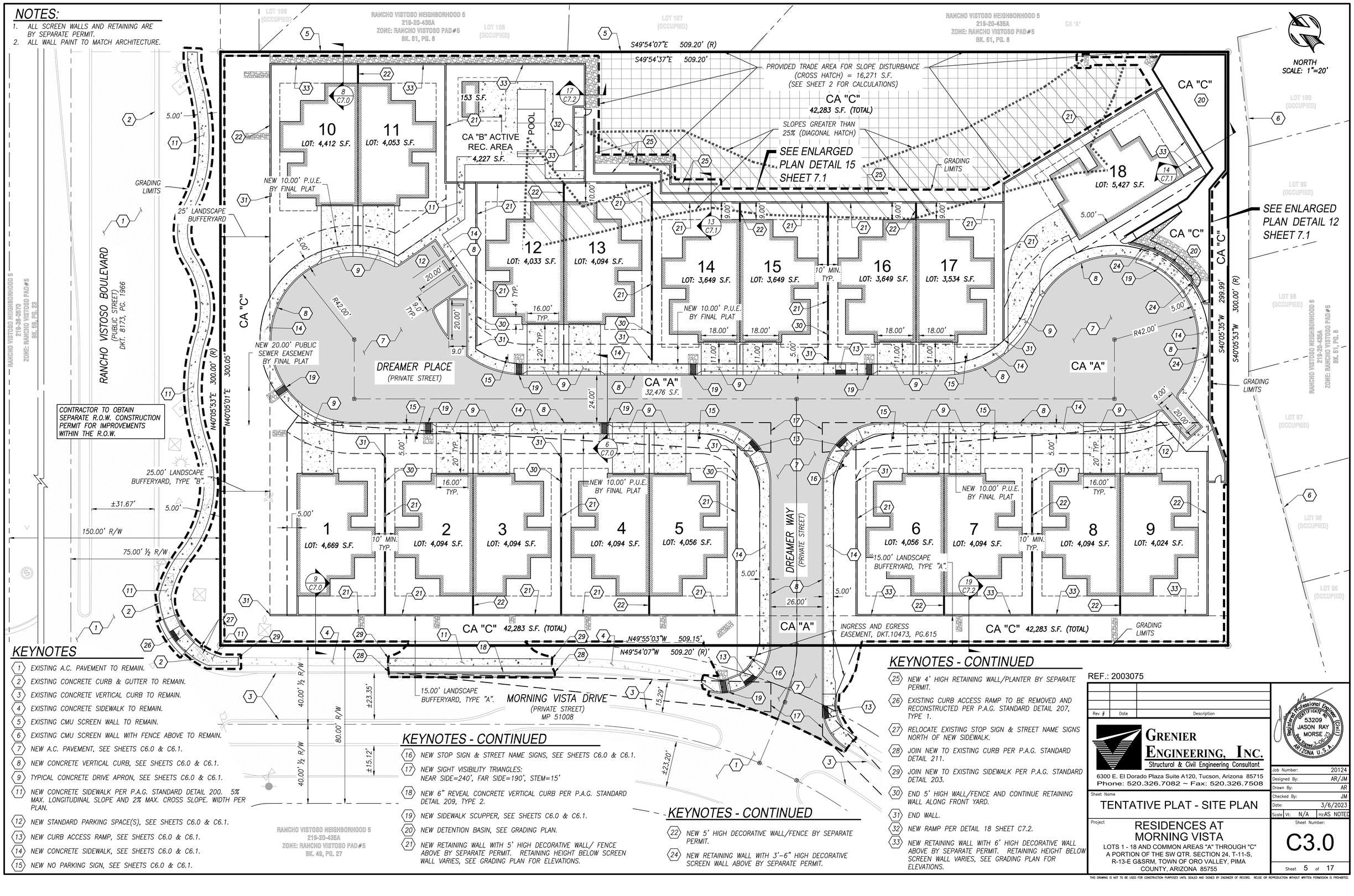
Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale Vt:	N/A Hz: AS NOTED

Sheet Number: C2.0

Sheet 4 of 17

NOTES:

1. ALL SCREEN WALLS AND RETAINING ARE BY SEPARATE PERMIT.
2. ALL WALL PAINT TO MATCH ARCHITECTURE.



KEYNOTES

1. EXISTING A.C. PAVEMENT TO REMAIN.
2. EXISTING CONCRETE CURB & GUTTER TO REMAIN.
3. EXISTING CONCRETE VERTICAL CURB TO REMAIN.
4. EXISTING CONCRETE SIDEWALK TO REMAIN.
5. EXISTING CMU SCREEN WALL TO REMAIN.
6. EXISTING CMU SCREEN WALL WITH FENCE ABOVE TO REMAIN.
7. NEW A.C. PAVEMENT, SEE SHEETS C6.0 & C6.1.
8. NEW CONCRETE VERTICAL CURB, SEE SHEETS C6.0 & C6.1.
9. TYPICAL CONCRETE DRIVE APRON, SEE SHEETS C6.0 & C6.1.
11. NEW CONCRETE SIDEWALK PER P.A.G. STANDARD DETAIL 200. 5% MAX. LONGITUDINAL SLOPE AND 2% MAX. CROSS SLOPE. WIDTH PER PLAN.
12. NEW STANDARD PARKING SPACE(S), SEE SHEETS C6.0 & C6.1.
13. NEW CURB ACCESS RAMP, SEE SHEETS C6.0 & C6.1.
14. NEW CONCRETE SIDEWALK, SEE SHEETS C6.0 & C6.1.
15. NEW NO PARKING SIGN, SEE SHEETS C6.0 & C6.1.

KEYNOTES - CONTINUED

16. NEW STOP SIGN & STREET NAME SIGNS, SEE SHEETS C6.0 & C6.1.
17. NEW SIGHT VISIBILITY TRIANGLES: NEAR SIDE=240', FAR SIDE=190', STEM=15'
18. NEW 6" REVEAL CONCRETE VERTICAL CURB PER P.A.G. STANDARD DETAIL 209, TYPE 2.
19. NEW SIDEWALK SCUPPER, SEE SHEETS C6.0 & C6.1.
20. NEW DETENTION BASIN, SEE GRADING PLAN.
21. NEW RETAINING WALL WITH 5' HIGH DECORATIVE WALL/ FENCE ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE GRADING PLAN FOR ELEVATIONS.

KEYNOTES - CONTINUED

22. NEW 5' HIGH DECORATIVE WALL/FENCE BY SEPARATE PERMIT.
24. NEW RETAINING WALL WITH 3'–6" HIGH DECORATIVE SCREEN WALL ABOVE BY SEPARATE PERMIT.

KEYNOTES - CONTINUED

25. NEW 4' HIGH RETAINING WALL/PLANTER BY SEPARATE PERMIT.
26. EXISTING CURB ACCESS RAMP TO BE REMOVED AND RECONSTRUCTED PER P.A.G. STANDARD DETAIL 207, TYPE 1.
27. RELOCATE EXISTING STOP SIGN & STREET NAME SIGNS NORTH OF NEW SIDEWALK.
28. JOIN NEW TO EXISTING CURB PER P.A.G. STANDARD DETAIL 211.
29. JOIN NEW TO EXISTING SIDEWALK PER P.A.G. STANDARD DETAIL 203.
30. END 5' HIGH WALL/FENCE AND CONTINUE RETAINING WALL ALONG FRONT YARD.
31. END WALL.
32. NEW RAMP PER DETAIL 18 SHEET C7.2.
33. NEW RETAINING WALL WITH 6' HIGH DECORATIVE WALL ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE GRADING PLAN FOR ELEVATIONS.

REF.: 2003075

Rev #	Date	Description

GRENIER ENGINEERING, INC.
Structural & Civil Engineering Consultant
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Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-10-23 ARIZONA U.S.A.

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale Vt:	N/A Hz: AS NOTED

Sheet Name: TENTATIVE PLAT - SITE PLAN

Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Sheet Number: C3.0

Sheet 5 of 17

BCSM
RLS 4527

150.70'

½" REBAR
"RLS 14145"

S49°54'07"E
75.52' 75.00' (R)

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-457O
ZONE: RANCHO VISTOSO PAD#5
BK. 69, PG. 23

N40°05'53"E (BASIS OF BEARING) 1307.99'

RANCHO VISTOSO BOULEVARD
(PUBLIC STREET)
DKT. 8173, PG. 1966

N40°05'53"E 339.88'

150.00' R/W

75.00' ½ R/W

817.41'

BCSM WITH
PUNCH MARK.

LOT 109
(OCCUPIED)

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-435A
ZONE: RANCHO VISTOSO PAD#5
BK. 51, PG. 8

LOT 108
(OCCUPIED)

LOT 107
(OCCUPIED)

S49°54'07"E 509.20' (R)
S49°54'37"E 509.20'

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-435A
ZONE: RANCHO VISTOSO PAD#5
BK. 51, PG. 8

CA "A"

½" REBAR
"RLS 14145"

N40°05'53"E 300.00' (R)
N40°05'01"E 300.05'

S49°55'03"E 44.50' | S49°55'03"E 44.50' | S49°55'03"E 70.50'

10
4,412 S.F.

11
4,053 S.F.

CA "B" ACTIVE
REC. AREA
4,227 S.F.

CA "C"
42,283 S.F. (TOTAL)

N40°04'57"E 118.34'
N40°04'57"E 92.00'
S40°04'57"W 59.96'
S40°04'57"W 59.96'
S40°04'57"W 20.39'

N49°55'03"W 15.00'
S49°55'03"E 44.50'
S49°55'03"E 33.50'
S49°55'03"E 11.00'
N40°04'57"E 10.00'

NEW 10.00' P.U.E.
BY FINAL PLAT

S84°35'56"E 29.78'

Δ=65°45'29"
R=47.63'
L=54.66'

Δ=25°06'23"
R=47.63'
L=20.87'

12
4,033 S.F.

13
4,094 S.F.

14
3,649 S.F.

15
3,649 S.F.

16
3,649 S.F.

17
3,534 S.F.

N40°04'57"E 84.37'
N40°04'57"E 92.00'
N40°04'57"E 82.00'
S40°04'57"W 82.00'
N40°04'57"E 82.00'
N40°04'57"E 82.00'
S40°04'57"W 69.88'

Δ=34°05'51"
R=44.38'
L=26.41'

NEW 10.00' P.U.E.
BY FINAL PLAT

N49°55'03"W 19.62'
N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50'
N49°55'03"W 14.03'

Δ=80°07'35"
R=47.63'
L=66.60'

NEW 20.00' PUBLIC
SEWER EASEMENT
BY FINAL PLAT

DREAMER PLACE
(PRIVATE STREET)

CA "A"
32,476 S.F.

18
5,427 S.F.

S81°10'48"E 89.51'
N08°49'12"E 49.50'
N81°10'48"W 76.63'
N40°04'57"E 9.64'

NEW 10.00' P.U.E.
BY FINAL PLAT

CA "C"

Δ=46°00'56"
R=47.62'
L=38.25'

Δ=119°40'50"
R=47.62'
L=99.48'

Δ=26°16'35"
R=44.38'
L=20.35'

Δ=43°22'09"
R=44.38'
L=33.59'

N76°27'28"E 9.67'

Δ=36°22'31"
R=47.63'
L=30.24'

S49°55'03"E 15.52'

S49°55'03"E 44.50' | S49°55'03"E 44.50' | S49°55'03"E 44.50' | S49°55'03"E 25.87'

NEW 10.00' P.U.E.
BY FINAL PLAT

Δ=38°22'37"
R=30.00'
L=20.09'

Δ=51°37'23"
R=30.00'
L=27.03'

Δ=51°37'23"
R=30.00'
L=27.03'

S49°55'03"E 25.88'
S49°55'03"E 44.50' | S49°55'03"E 44.50' | S49°55'03"E 41.64'

Δ=38°22'37"
R=30.00'
L=20.09'

Δ=26°01'48"
R=47.63'
L=21.64'

S00°26'11"E 19.88'
S49°55'03"E 11.01'

NEW 10.00' P.U.E.
BY FINAL PLAT

1
4,669 S.F.

2
4,094 S.F.

3
4,094 S.F.

4
4,094 S.F.

5
4,056 S.F.

6
4,056 S.F.

7
4,094 S.F.

8
4,094 S.F.

9
4,024 S.F.

N40°04'57"E 93.50'
N40°04'57"E 92.00'
S40°04'57"W 85.52'
N40°04'57"E 77.00'
S40°04'57"W 77.00'
N40°04'57"E 85.52'
S40°04'57"W 92.00'
N40°04'57"E 92.09'
S40°04'57"W 83.05'

N49°55'03"W 49.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50'
N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50' | N49°55'03"W 44.50'

CA "C"

½" REBAR
"RLS 14145"

272.52'

37.25'

199.37'

CA "C"

½" REBAR
"RLS 14145"

-N49°55'03"W 509.15'
N49°54'07"W 509.20' (R)

INGRESS AND EGRESS
EASEMENT, DKT.10473, PG.615

40.00' ½ R/W
40.00' ½ R/W
80.00' R/W

MORNING VISTA DRIVE
(PRIVATE STREET)
MP 51008

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-635A
ZONE: RANCHO VISTOSO PAD#5
BK. 49, PG. 27

NORTH
SCALE: 1"=20'

LOT 100
(OCCUPIED)

LOT 99
(OCCUPIED)

LOT 98
(OCCUPIED)

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-435A
ZONE: RANCHO VISTOSO PAD#5
BK. 51, PG. 8

S40°05'53"W 300.00' (R)
S40°05'35"W 299.99'
S40°04'57"W 51.56'
S40°04'57"W 83.05'

LOT 97
(OCCUPIED)

LOT 96
(OCCUPIED)

LOT 95
(OCCUPIED)

LOT 94
(OCCUPIED)

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-435A
ZONE: RANCHO VISTOSO PAD#5
BK. 51, PG. 8

REF.: 2003075

Rev #	Date	Description

GRENIER ENGINEERING, INC.
Structural & Civil Engineering Consultant
6300 E. El Dorado Plaza Suite A120, Tucson, Arizona 85715
Phone: 520.326.7082 ~ Fax: 520.326.7508

Registered Professional Engineer (Civil)
CERTIFICATE NO.
53209
JASON RAY
MORSE
Date Signed 3-10-23
ARIZONA U.S.A.

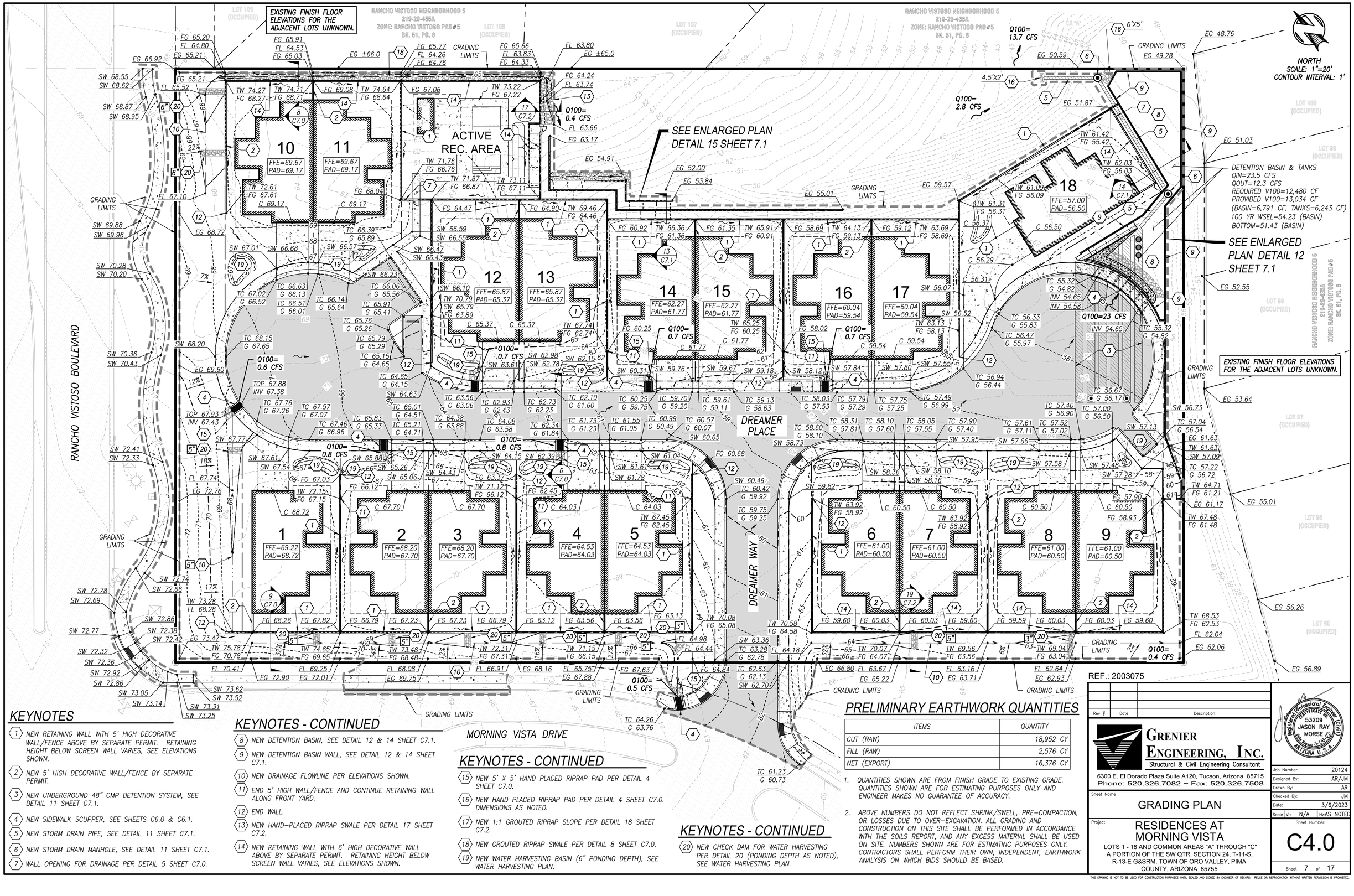
Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale Vt:	N/A HzAS NOTED

Sheet Name
TENTATIVE PLAT - ANNOTATION

Project
RESIDENCES AT
MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S,
R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA
COUNTY, ARIZONA 85755

Sheet Number:
C3.1

Sheet 6 of 17



KEYNOTES

1. NEW RETAINING WALL WITH 5' HIGH DECORATIVE WALL/FENCE ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE ELEVATIONS SHOWN.
2. NEW 5' HIGH DECORATIVE WALL/FENCE BY SEPARATE PERMIT.
3. NEW UNDERGROUND 48" CMP DETENTION SYSTEM, SEE DETAIL 11 SHEET C7.1.
4. NEW SIDEWALK SCUPPER, SEE SHEETS C6.0 & C6.1.
5. NEW STORM DRAIN PIPE, SEE DETAIL 11 SHEET C7.1.
6. NEW STORM DRAIN MANHOLE, SEE DETAIL 11 SHEET C7.1.
7. WALL OPENING FOR DRAINAGE PER DETAIL 5 SHEET C7.0.

KEYNOTES - CONTINUED

8. NEW DETENTION BASIN, SEE DETAIL 12 & 14 SHEET C7.1.
9. NEW DETENTION BASIN WALL, SEE DETAIL 12 & 14 SHEET C7.1.
10. NEW DRAINAGE FLOWLINE PER ELEVATIONS SHOWN.
11. END 5' HIGH WALL/FENCE AND CONTINUE RETAINING WALL ALONG FRONT YARD.
12. END WALL.
13. NEW HAND-PLACED RIPRAP SWALE PER DETAIL 17 SHEET C7.2.
14. NEW RETAINING WALL WITH 6' HIGH DECORATIVE WALL ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE ELEVATIONS SHOWN.

KEYNOTES - CONTINUED

15. NEW 5' X 5' HAND PLACED RIPRAP PAD PER DETAIL 4 SHEET C7.0.
16. NEW HAND PLACED RIPRAP PAD PER DETAIL 4 SHEET C7.0. DIMENSIONS AS NOTED.
17. NEW 1:1 GROUTED RIPRAP SLOPE PER DETAIL 18 SHEET C7.2.
18. NEW GROUTED RIPRAP SWALE PER DETAIL 8 SHEET C7.0.
19. NEW WATER HARVESTING BASIN (6" PONDING DEPTH), SEE WATER HARVESTING PLAN.

KEYNOTES - CONTINUED

20. NEW CHECK DAM FOR WATER HARVESTING PER DETAIL 20 (PONDING DEPTH AS NOTED), SEE WATER HARVESTING PLAN.

PRELIMINARY EARTHWORK QUANTITIES

ITEMS	QUANTITY
CUT (RAW)	18,952 CY
FILL (RAW)	2,576 CY
NET (EXPORT)	16,376 CY

1. QUANTITIES SHOWN ARE FROM FINISH GRADE TO EXISTING GRADE. QUANTITIES SHOWN ARE FOR ESTIMATING PURPOSES ONLY AND ENGINEER MAKES NO GUARANTEE OF ACCURACY.
2. ABOVE NUMBERS DO NOT REFLECT SHRINK/SWELL, PRE-COMPACTION, OR LOSSES DUE TO OVER-EXCAVATION. ALL GRADING AND CONSTRUCTION ON THIS SITE SHALL BE PERFORMED IN ACCORDANCE WITH THE SOILS REPORT, AND ANY EXCESS MATERIAL SHALL BE USED ON SITE. NUMBERS SHOWN ARE FOR ESTIMATING PURPOSES ONLY. CONTRACTORS SHALL PERFORM THEIR OWN, INDEPENDENT, EARTHWORK ANALYSIS ON WHICH BIDS SHOULD BE BASED.

REF.: 2003075

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Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-16-23 ARIZONA U.S.A.

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale Vt:	N/A Hz AS NOTED

Sheet Name: GRADING PLAN

Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Sheet Number: C4.0

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NORTH
SCALE: 1"=20'

RANCHO VISTOSO BOULEVARD
(PUBLIC STREET)
DKT. 8173, PG. 1966

EX. 10" PUBLIC SEWER

EXISTING TEP ELECTRIC MAIN.

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-435A
ZONE: RANCHO VISTOSO PAD#5
BK. 51, PG. 8

LOT 109 (OCCUPIED)
LOT 108 (OCCUPIED)
LOT 107 (OCCUPIED)
LOT 100 (OCCUPIED)
LOT 99 (OCCUPIED)
LOT 98 (OCCUPIED)
LOT 97 (OCCUPIED)
LOT 96 (OCCUPIED)
LOT 95 (OCCUPIED)

CA "A"
CA "B" ACTIVE REC. AREA
CA "C"

POOL

LOTS 4–9 & LOTS 14–18 REQUIRE INSTALLATION OF A SANITARY SEWER BACKWATER VALVE. SEE BUILDING PLANS FOR SPECIFICATIONS AND DETAILS.

10 FFE=69.67
11 FFE=69.67
12 FFE=65.87
13 FFE=65.87
14 FFE=62.27
15 FFE=62.27
16 FFE=60.04
17 FFE=60.04
18 FFE=57.00
1 FFE=69.22
2 FFE=68.20
3 FFE=68.20
4 FFE=64.53
5 FFE=64.53
6 FFE=61.00
7 FFE=61.00
8 FFE=61.00
9 FFE=61.00

NEW 10.00' P.U.E. BY FINAL PLAT

NEW 20.00' PUBLIC SEWER EASEMENT BY FINAL PLAT

S1 STA 100+00.00 MANHOLE #1 RIM=2971.92

S2 263.04 L.F. CL MH TO CL MH (259.04 L.F. 8" PVC PIPE S49°53'36"E

S1 STA 102+63.04= STA 200+00.00 MANHOLE #2 RIM=2964.68

S4 STA 200+78.41 MANHOLE #5 RIM=2966.33

S5 78.41 L.F. CL MH TO CL MH (74.41 L.F. 8" PVC PIPE N40°06'24"E

SEE PROFILE 3 SHT C5.1

SEE PROFILE 1 SHT C5.1

S4 STA 104+08.73 MANHOLE #3 RIM=2959.40

S5 145.69 L.F. CL MH TO CL MH (141.69 L.F. 8" PVC PIPE S49°53'36"E

S5 110.18 L.F. CL MH TO CL MH (106.18 L.F. 8" PVC PIPE S40°04'57"W

S4 STA 105+18.91 MANHOLE #4 RIM=2963.93

SEE PROFILE 1 SHT C5.1

DREAMER PLACE
(PRIVATE STREET)

DREAMER WAY
(PRIVATE STREET)

S6 STA. 106+17.41 CLEANOUT #1 RIM 63.75

S6 STA. 107+14.79 CLEANOUT #2 RIM 62.63

SEE PROFILE 2 SHT C5.1

S5 98.50 L.F. CL MH TO CL CO (96.50 L.F. 6" PVC PIPE S49°55'03"E

S5 97.37 L.F. CL CO TO CL CO (97.37 L.F. 6" PVC PIPE S49°55'03"E

100+00
101+00
102+00
103+00
104+00
105+00
106+00
107+00
200+00

±141.58'
150.00' R/W
75.00' ½ R/W
40.00' ½ R/W
80.00' R/W

MORNING VISTA DRIVE
(PRIVATE STREET)
MP 51008

RANCHO VISTOSO NEIGHBORHOOD 5
219-20-435A
ZONE: RANCHO VISTOSO PAD#5
BK. 48, PG. 27

NEW 8" PUBLIC WATER CONNECTION TO THE EXISTING 8" PUBLIC WATER MAIN WITHIN MORNING VISTA DRIVE R/W.

UTILITY KEYNOTES

U1 EXISTING UTILITY INFRASTRUCTURE TO REMAIN. CONTRACTOR TO PROTECT IN PLACE. IF ANY UTILITY IS IN CONFLICT WITH NEW IMPROVEMENTS, CONTRACTOR TO COORDINATE RELOCATION WITH UTILITY COMPANY.

WATER KEYNOTES

W1 CONNECT TO EXISTING PUBLIC WATER MAIN.

W2 NEW PUBLIC WATER MAIN PER SEPARATELY SUBMITTED PUBLIC WATER PLANS.

W3 NEW FIRE HYDRANT PER SEPARATELY SUBMITTED PUBLIC WATER PLANS.

W4 NEW WATER SERVICE LINE AND METER PER SEPARATELY SUBMITTED PUBLIC WATER PLANS.

W5 NEW RECLAIMED IRRIGATION SERVICE AND 1" IRRIGATION METER

W6 ADJUST WATER METER BOX TO NEW FINISH GRADE.

SEWER KEYNOTES

S1 NEW PUBLIC SANITARY SEWER MANHOLE PER PUBLIC SEWER PLANS. SEE PROFILE ON SHEET C5.1.

S2 NEW PUBLIC SANITARY SEWER MAIN PER PUBLIC SEWER PLANS. SEE PROFILE ON SHEET C5.1.

S3 NEW SANITARY SEWER H.C.S. PER PUBLIC SEWER PLANS.

S4 NEW PRIVATE SANITARY SEWER MANHOLE PER PRIVATE SEWER PLANS. SEE PROFILE ON SHEET C5.1.

S5 NEW PRIVATE SANITARY SEWER MAIN PER PRIVATE SEWER PLANS. SEE PROFILE ON SHEET C5.1.

S6 NEW SANITARY SEWER CLEANOUT PER PRIVATE SEWER PLANS.

S7 NEW SANITARY SEWER H.C.S. PER PRIVATE SEWER PLANS.

S8 NEW SANITARY SEWER FORCE MAIN SERVICE LINES TO LOTS 16–18. PUMPS TO BE INSTALLED PER BUILDING PLANS.

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Registered Professional Engineer
CERTIFICATE NO. 53209
JASON RAY MORSE
Date Signed 3-10-23
ARIZONA U.S.A.

Sheet Name: UTILITY PLAN

Project: RESIDENCES AT MORNING VISTA
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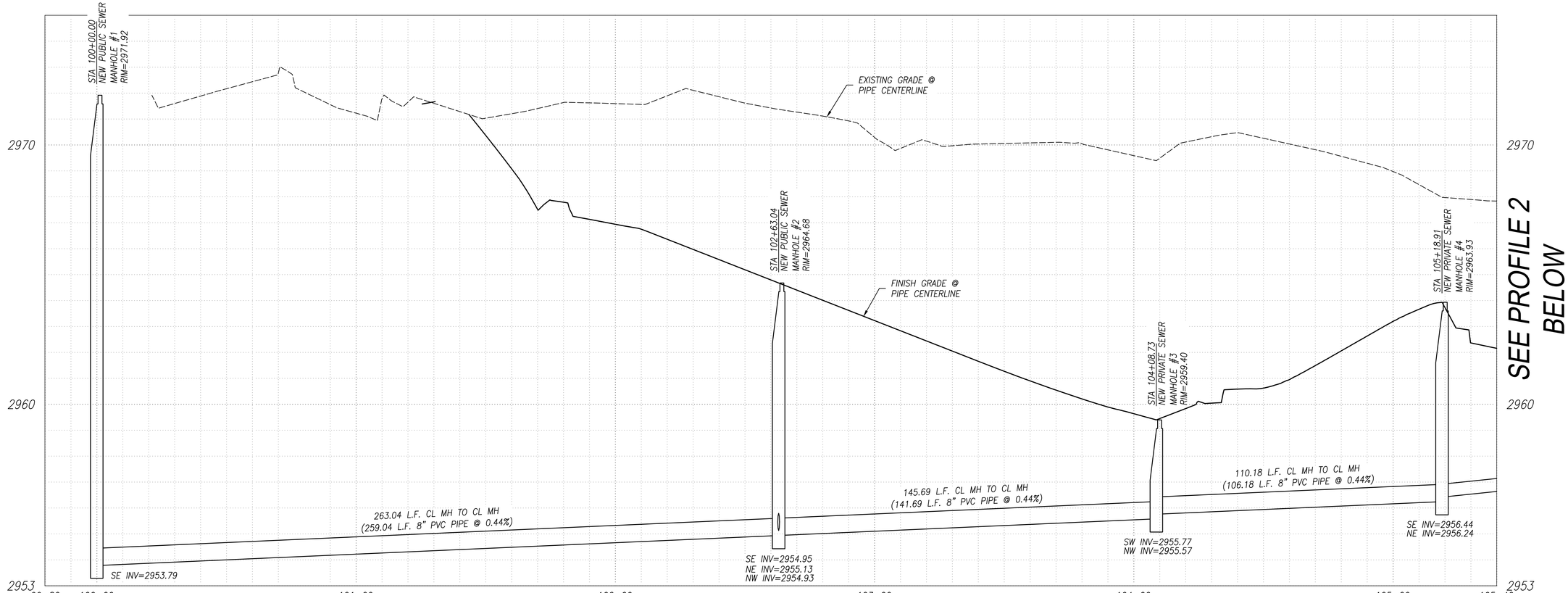
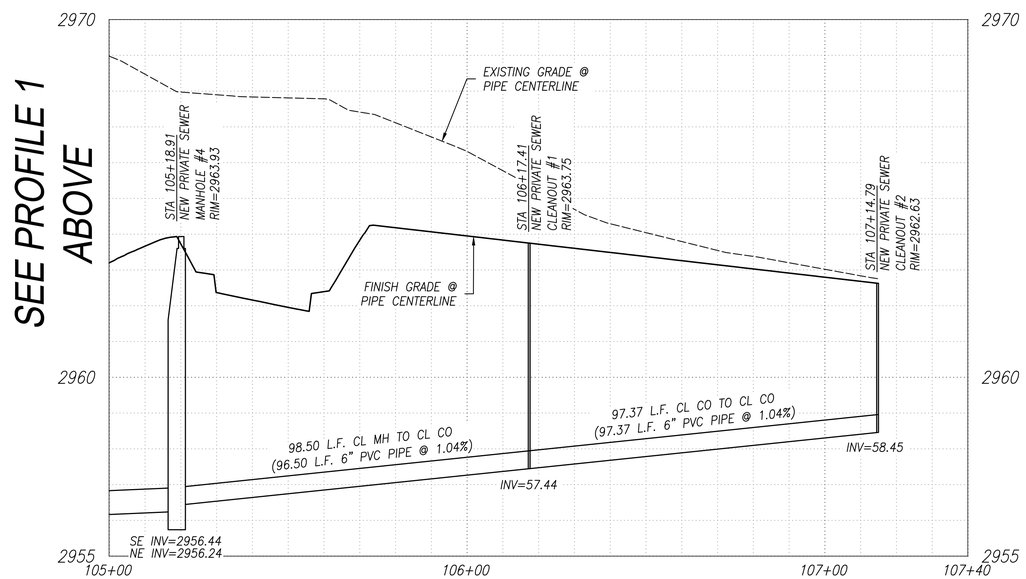
Sheet 8 of 17



SEWER PROFILE 1

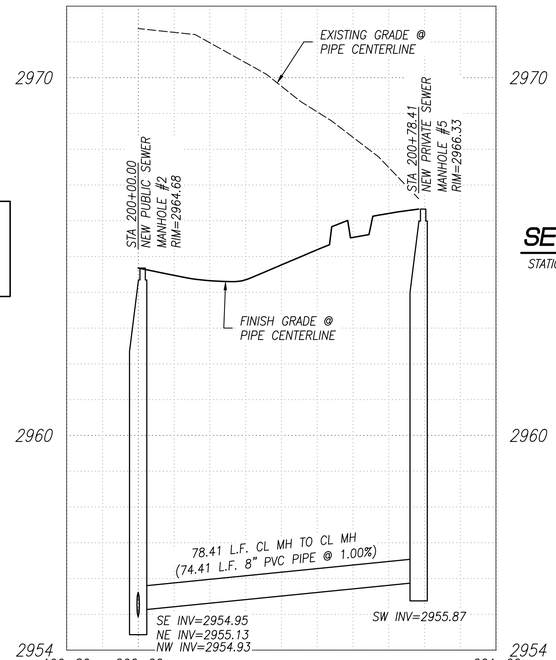
STATIONING IS ALONG PIPE CENTERLINE
SCALE: 1"=20' HORIZONTAL
SCALE: 1"=2' VERTICAL



SEWER PROFILE 2

STATIONING IS ALONG PIPE CENTERLINE
SCALE: 1"=20' HORIZONTAL
SCALE: 1"=2' VERTICAL

PUBLIC AND PRIVATE SEWER MANHOLES AND MAINS ARE BY SEPARATE PERMIT AND ARE SHOWN FOR REFERENCE ONLY. SEE PUBLIC AND PRIVATE SEWER PLANS FOR FINAL CONSTRUCTION DOCUMENTS



SEWER PROFILE 3

STATIONING IS ALONG PIPE CENTERLINE
SCALE: 1"=20' HORIZONTAL
SCALE: 1"=2' VERTICAL

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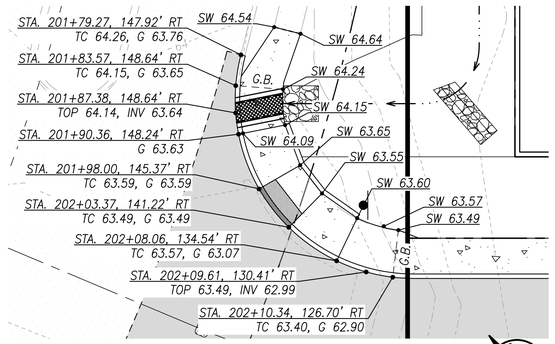
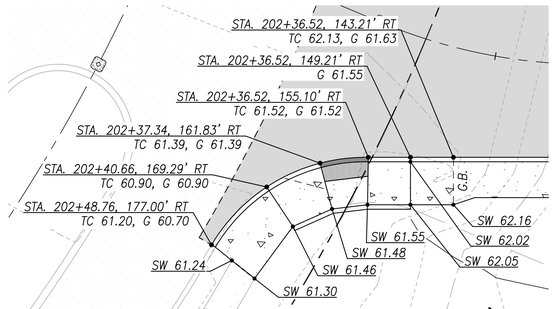
Sheet Number:
C5.1

Sheet 9 of 17



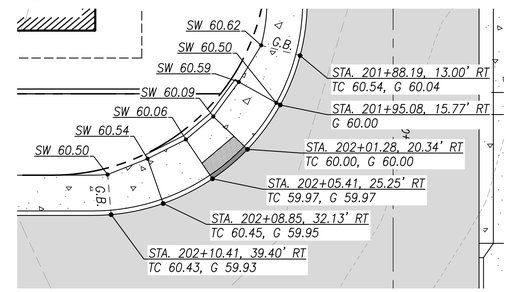
C RAMP DETAIL

SCALE: 1"=10'



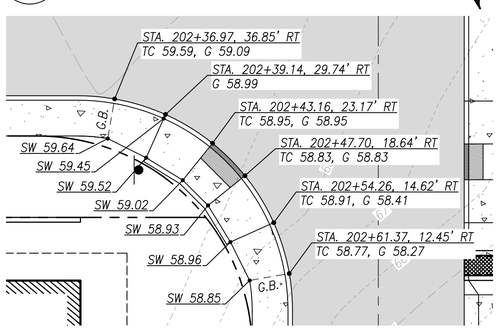
D RAMP DETAIL

SCALE: 1"=10'



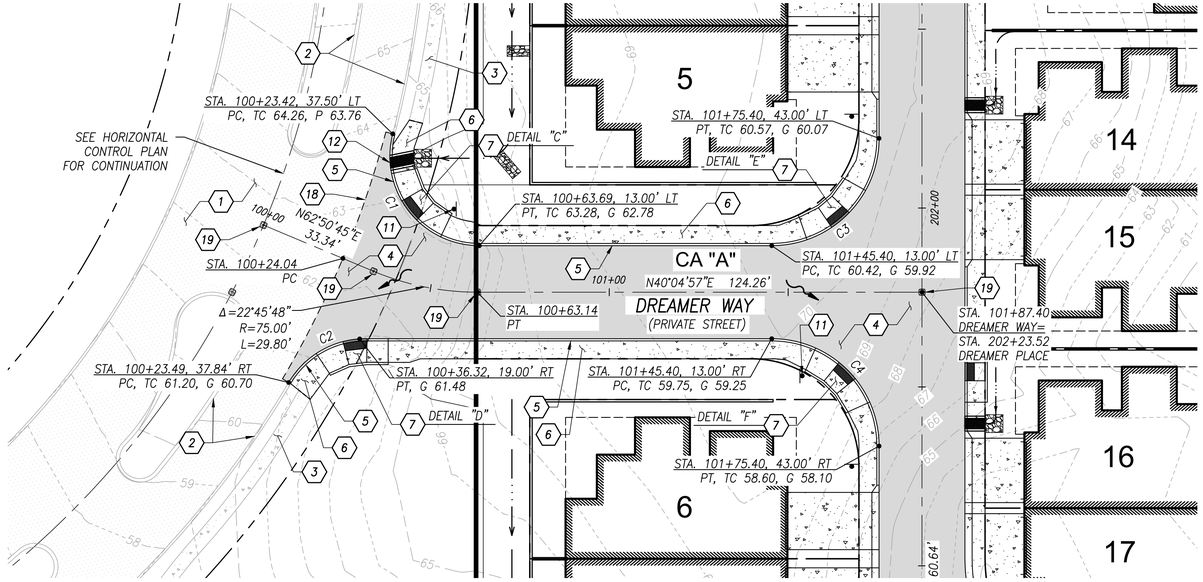
E RAMP DETAIL

SCALE: 1"=10'



F RAMP DETAIL

SCALE: 1"=10'



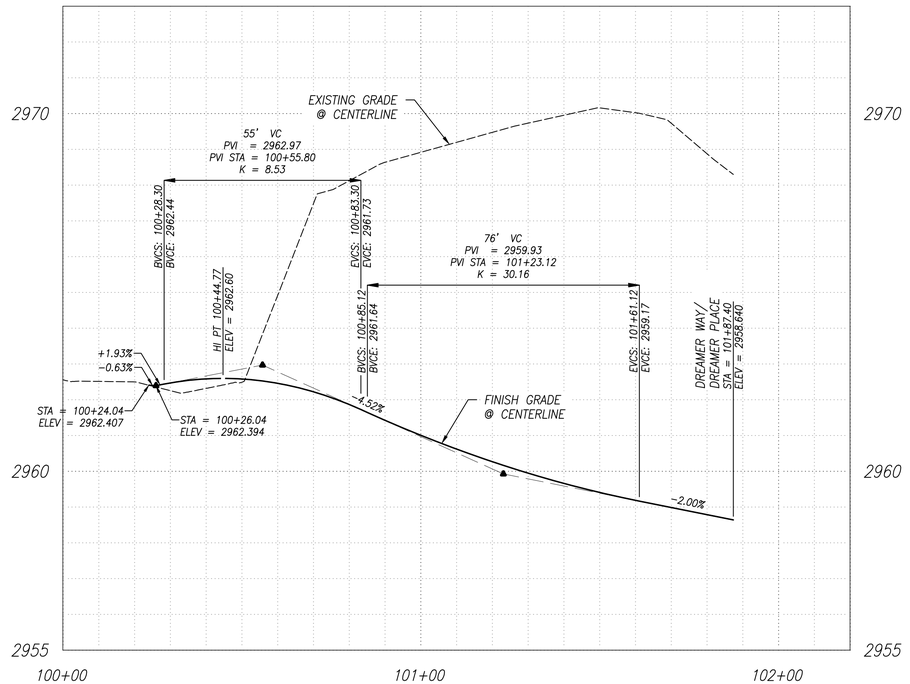
DREAMER WAY PLAN

CONSTRUCTION CENTERLINE IS ALONG ROAD MONUMENT LINE
SCALE: 1" = 20' HORIZONTAL

NORTH
CONTOUR INTERVAL: 1'

KEYNOTES

1. EXISTING A.C. PAVEMENT TO REMAIN.
2. EXISTING CONCRETE VERTICAL CURB TO REMAIN.
3. EXISTING CONCRETE SIDEWALK TO REMAIN.
4. NEW A.C. PAVEMENT PER DETAIL 3 SHEET C7.0.
5. NEW 6" REVEAL CONCRETE VERTICAL CURB PER P.A.G. STANDARD DETAIL 209, TYPE 2.
6. NEW CONCRETE SIDEWALK PER P.A.G. STANDARD DETAIL 200. 5% MAX. LONGITUDINAL SLOPE AND 2% MAX. CROSS SLOPE. WIDTH PER PLAN.
7. NEW TYPE 1 CURB ACCESS RAMP PER P.A.G. STANDARD DETAIL 207. SEE DETAIL NOTED FOR GRADES & STATIONS.
11. NEW STOP SIGN (R1-1) & (2) STREET NAME SIGNS (D-3) PER MUTCD AND PC/COT SIGNING & PAVEMENT MARKING MANUAL LATEST EDITION.
12. NEW TYPE 2 SIDEWALK SCUPPER PER P.A.G. STANDARD DETAIL 205, CELL WIDTH 'A' = 2'-6".
18. TRIM, TACK, & JOIN NEW TO EXISTING PAVEMENT.
19. NEW SURVEY MONUMENT PER P.A.G. STANDARD DETAIL 103.



DREAMER WAY PROFILE

CONSTRUCTION CENTERLINE IS ALONG ROAD MONUMENT LINE
SCALE: 1" = 20' HORIZONTAL
SCALE: 1' = 2' VERTICAL

CURVE TABLE **			
CURVE #	RADIUS	LENGTH	DELTA
C1	25.00'	45.59'	104°29'32"
C2	25.00'	25.87'	59°17'51"
C3	30.00'	47.12'	90°00'00"
C4	30.00'	47.12'	90°00'00"

** NOTE: CURVE DATA IS ALONG FACE OF CURB

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Sheet Name
ROAD PLAN & PROFILE

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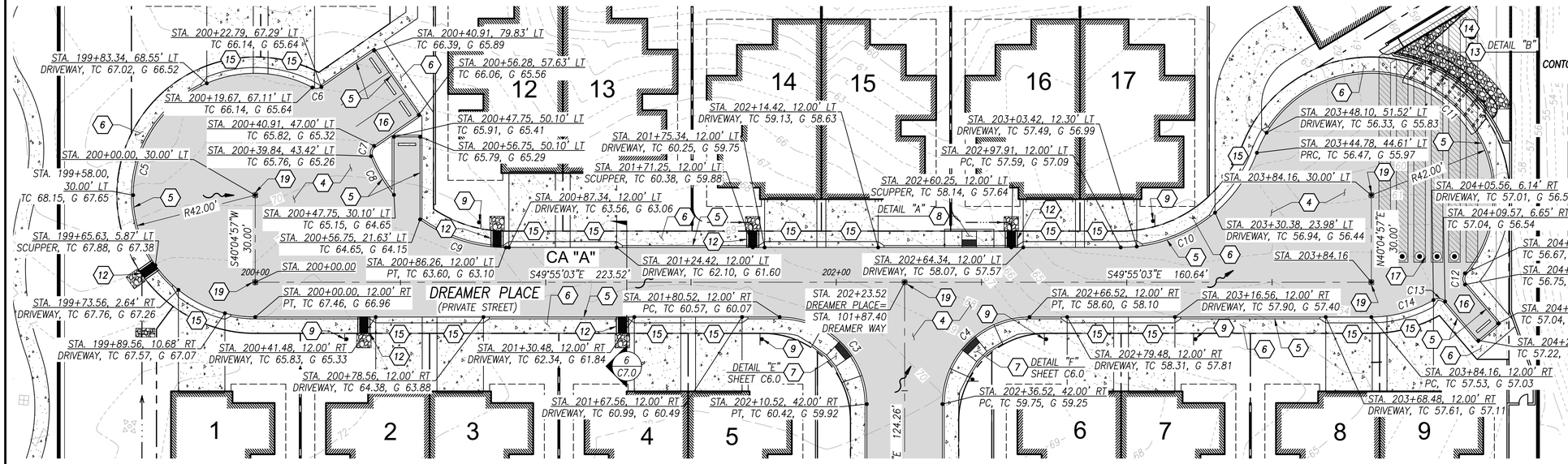
Sheet Number:
C6.0

Sheet 10 of 17



NORTH
CONTOUR INTERVAL: 1'

KEYNOTES

4. NEW A.C. PAVEMENT PER DETAIL 3 SHEET C7.0.
5. NEW 6" REVEAL CONCRETE VERTICAL CURB PER P.A.G. STANDARD DETAIL 209, TYPE 2.
6. NEW CONCRETE SIDEWALK PER P.A.G. STANDARD DETAIL 200. 5% MAX. LONGITUDINAL SLOPE AND 2% MAX. CROSS SLOPE. WIDTH PER PLAN.
7. NEW TYPE 1 CURB ACCESS RAMP PER P.A.G. STANDARD DETAIL 207. SEE DETAIL NOTED FOR GRADES & STATIONS.
8. NEW TYPE 3 CURB ACCESS RAMP PER P.A.G. STANDARD DETAIL 207. SEE DETAIL NOTED FOR GRADES & STATIONS.
9. NEW NO PARKING SIGN (R8-3a) PER MUTCD AND PC/COT SIGNING & PAVEMENT MARKING MANUAL LATEST EDITION.
12. NEW TYPE 2 SIDEWALK SCUPPER PER P.A.G. STANDARD DETAIL 205, CELL WIDTH 'A' = 2'-6".
13. NEW TYPE 3 SIDEWALK SCUPPER PER P.A.G. STANDARD 205.5 (SIX 4' WIDE CELLS). SEE DETAIL NOTED FOR GRADES & STATIONS.
14. NEW DETENTION BASIN, SEE DETAIL 12 SHEET C7.1.
15. NEW CONCRETE DRIVEWAY APRON PER DETAIL 10 SHEET C7.0. SEE GRADING PLAN FOR ADDITIONAL GRADES.
16. NEW STANDARD PARKING SPACE(S) WITH WHEEL STOPS PER DETAIL 1 SHEET C7.0.
17. NEW UNDERGROUND DETENTION TANKS PER DETAIL 11 SHEET C7.1.
19. NEW SURVEY MONUMENT PER P.A.G. STANDARD DETAIL 103.

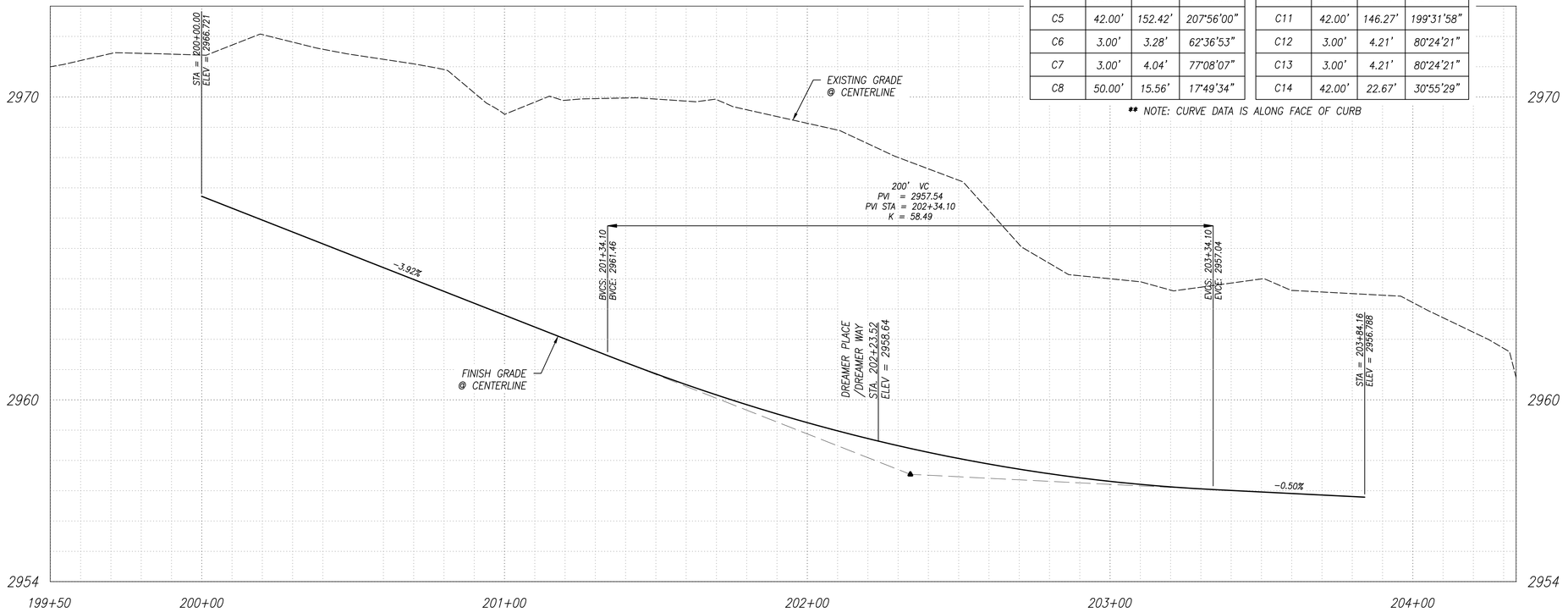
DREAMER PLACE PLAN

CONSTRUCTION CENTERLINE IS
ALONG ROAD MONUMENT LINE
SCALE: 1" = 20' HORIZONTAL

CURVE TABLE **			
CURVE #	RADIUS	LENGTH	DELTA
C3	30.00'	47.12'	90°00'00"
C4	30.00'	47.12'	90°00'00"
C5	42.00'	152.42'	207°56'00"
C6	3.00'	3.28'	62°36'53"
C7	3.00'	4.04'	77°08'07"
C8	50.00'	15.56'	17°49'34"

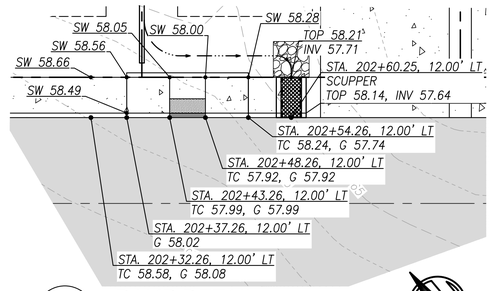
CURVE TABLE **			
CURVE #	RADIUS	LENGTH	DELTA
C9	50.00'	31.56'	36°09'34"
C10	50.00'	60.78'	69°38'44"
C11	42.00'	146.27'	199°31'58"
C12	3.00'	4.21'	80°24'21"
C13	3.00'	4.21'	80°24'21"
C14	42.00'	22.67'	30°55'29"

** NOTE: CURVE DATA IS ALONG FACE OF CURB

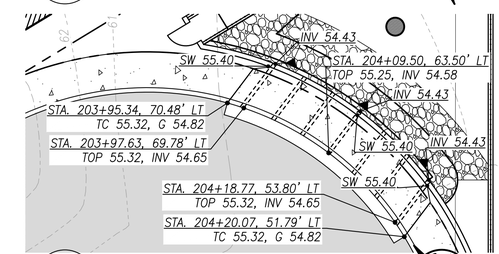


DREAMER PLACE PROFILE

CONSTRUCTION CENTERLINE IS
ALONG ROAD MONUMENT LINE
SCALE: 1" = 20' HORIZONTAL
SCALE: 1' = 2' VERTICAL



A RAMP DETAIL
SCALE: 1"=10'



B SCUPPER DETAIL
SCALE: 1"=10'

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Sheet Name
ROAD PLAN & PROFILE

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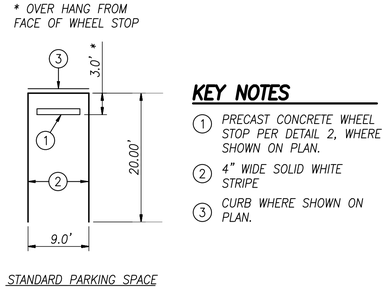
Sheet Number:
C6.1

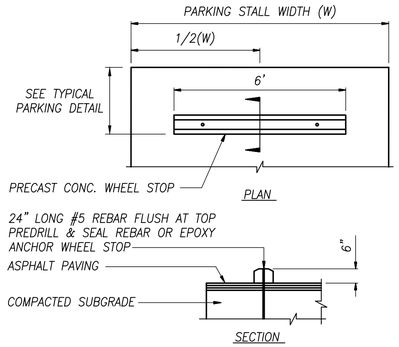
Sheet 11 of 17



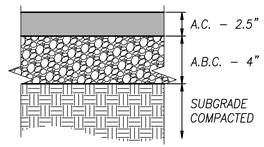
STANDARD PARKING SPACE

KEY NOTES

1. PRECAST CONCRETE WHEEL STOP PER DETAIL 2, WHERE SHOWN ON PLAN.
2. 4" WIDE SOLID WHITE STRIPE
3. CURB WHERE SHOWN ON PLAN.

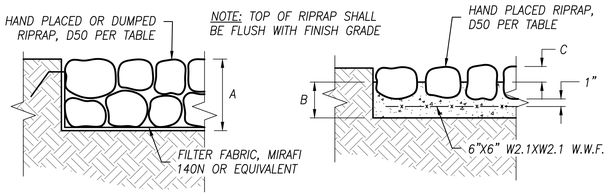


NOTE: SEE P.A.G. SPECIFICATIONS & GEOTECHNICAL ENGINEERING REPORT FOR ASPHALT REQUIREMENTS



A.C. PAVEMENT

TYPE	D50	A	B	C
GROUTED	6"	–	6"	3"
HANDPLACED/DUMPED	6"	12"	–	–

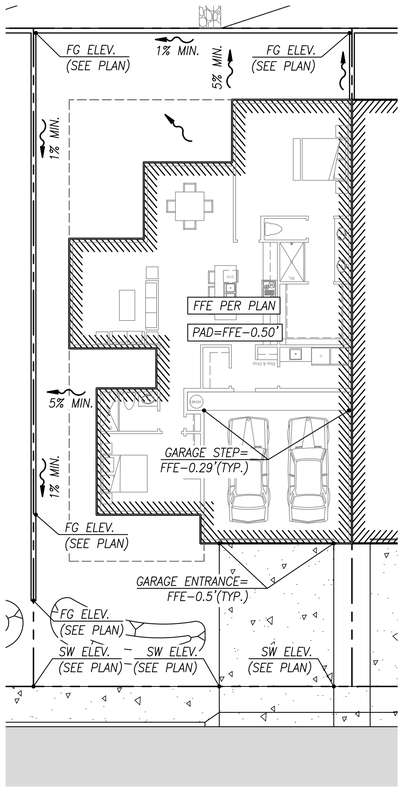


HAND-PLACED/DUMPED RIPRAP

GROUTED RIPRAP

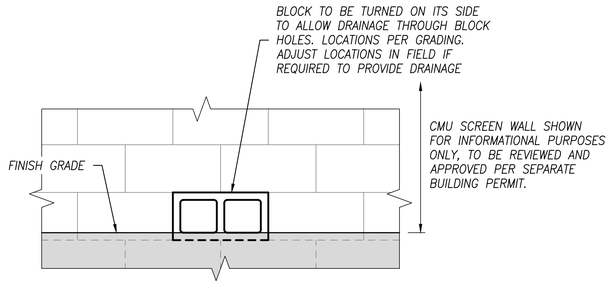
1 TYPICAL PARKING

N.T.S.



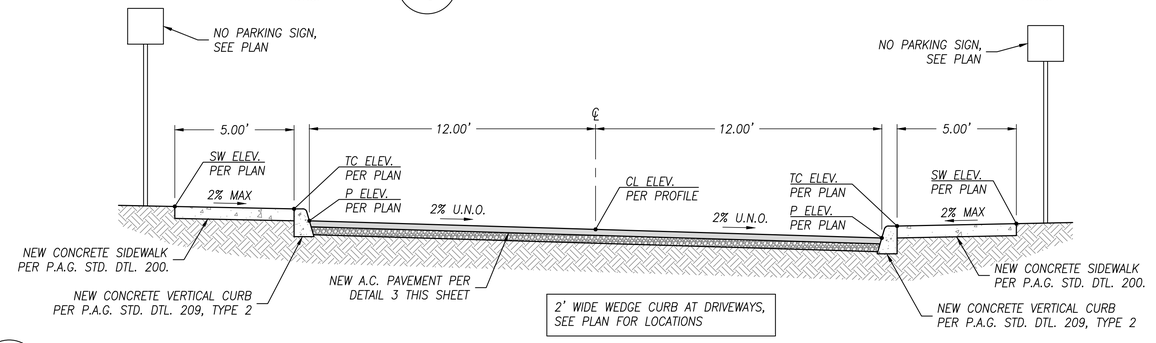
2 WHEEL STOP

N.T.S.



3 PAVEMENT

N.T.S.

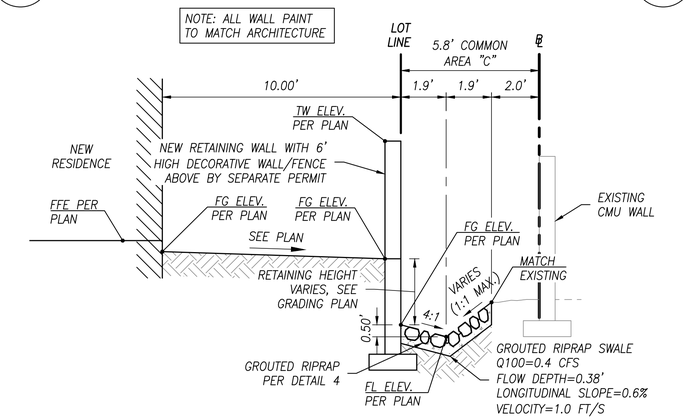


4 RIPRAP

N.T.S.

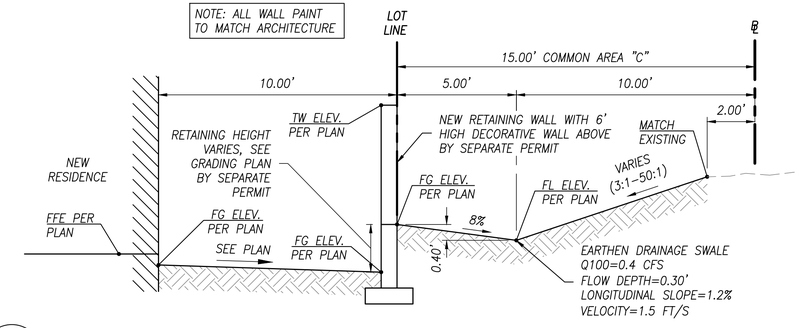
5 TYPICAL WALL OPENING FOR DRAINAGE

N.T.S.



6 ROAD SECTION

N.T.S.



7 TYPICAL LOT DRAINAGE

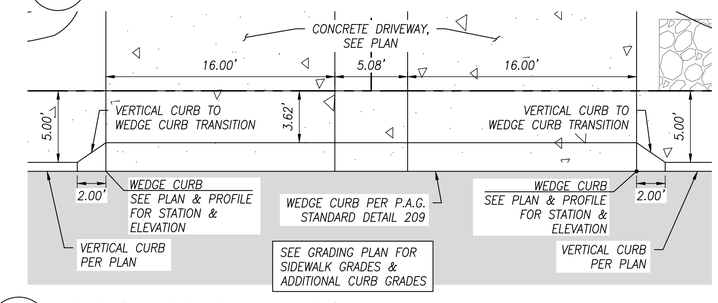
N.T.S.

8 SECTION

N.T.S.

9 SECTION

N.T.S.



10 TYPICAL DRIVEWAY APRON

N.T.S.

REF.: 2003075

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Phone: 520.326.7082 ~ Fax: 520.326.7508

Registered Professional Engineer (Civil) CERTIFICATE NO. 53209 JASON RAY MORSE Date Signed 3-6-2023 ARIZONA U.S.A.

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale: Vt:	N/A Hz: AS NOTED

Sheet Name: DETAILS

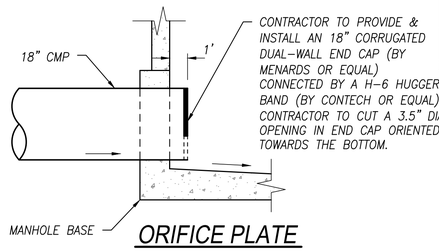
Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Sheet Number: C7.0

Sheet 11 of 17

KEYNOTES

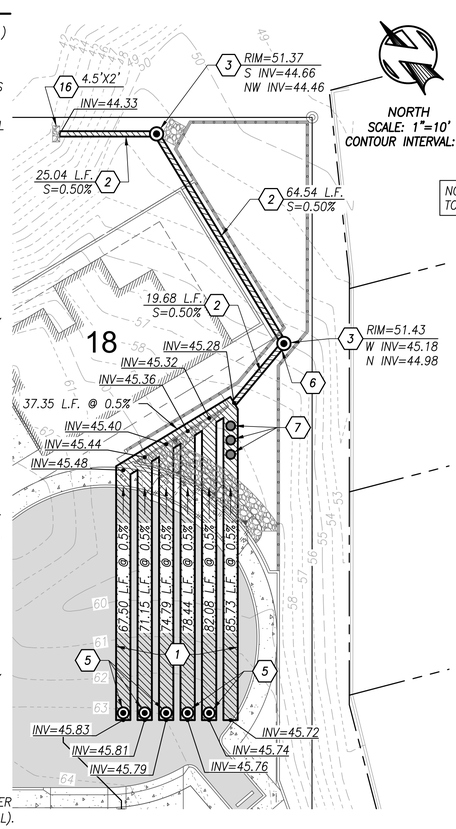
1. NEW UNDERGROUND 48" CMP DETENTION SYSTEM (497 L.F., 6,243 C.F.) BY CONTECH OR APPROVED EQUAL. SEE UNDERGROUND DETENTION NOTE THIS SHEET.
2. NEW 18" CMP (SMOOTH INTERIOR) BLEEDER PIPE, LENGTH & SLOPE AS NOTED.
3. NEW STORM DRAIN MANHOLE PER P.A.G. STANDARD DETAIL 302. INSTALL WATERTIGHT FRAME AND COVER.
4. WALL OPENING PER DETAIL 5 SHEET C7.0.
5. NEW ACCESS MANHOLE WITH 30" DIA. FRAME & SOLID LID PER TANK MANUFACTURER, SEE SHEET C10.0.
6. INSTALL ORIFICE PLATE AT END OF PIPE PER DETAIL BELOW.
7. NEW 30" DIA. FRAME & GRATE PER TANK MANUFACTURER, SEE SHEET C10.0. TOP OF GRATE TO BE SET 0.2' ABOVE BOTTOM OF BASIN.
8. NEW RIPRAP SWALE PER DETAIL 16 THIS SHEET.
9. NEW RETAINING WALL WITH 5' HIGH DECORATIVE WALL/FENCE ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE ELEVATIONS SHOWN.
10. NEW WEIR PER DETAIL ON THIS SHEET.
11. NEW DETENTION BASIN RETAINING WALL WITH 42" HIGH WROUGHT IRON FENCE ABOVE.
12. NEW RETAINING WALL BY SEPARATE PERMIT.
13. PROVIDE WALL OPENING FOR FULL WIDTH OF SCUPPER CELLS.
14. NEW GROUTED RIPRAP SLOPE (1:1) PER DETAIL 4 SHEET C7.0.
15. NEW RETAINING WALL WITH 3'–6" HIGH DECORATIVE WALL/FENCE ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE ELEVATIONS SHOWN.
16. NEW RIPRAP PAD PER DETAIL 4 SHEET C7.0 AND DIMENSIONS NOTED.
17. NEW GRADUATED MARKER OR STORY POLL WITH 0.1' INCREMENTS. INSTALL PER MANUFACTURER SPECIFICATIONS.
18. NEW 42" HIGH WROUGHT IRON FENCE ALONG EDGE OF RAMP BY SEPARATE PERMIT.
19. NEW RETAINING WALL WITH 6' HIGH DECORATIVE WALL/FENCE ABOVE BY SEPARATE PERMIT. RETAINING HEIGHT BELOW SCREEN WALL VARIES, SEE ELEVATIONS SHOWN.



ORIFICE PLATE

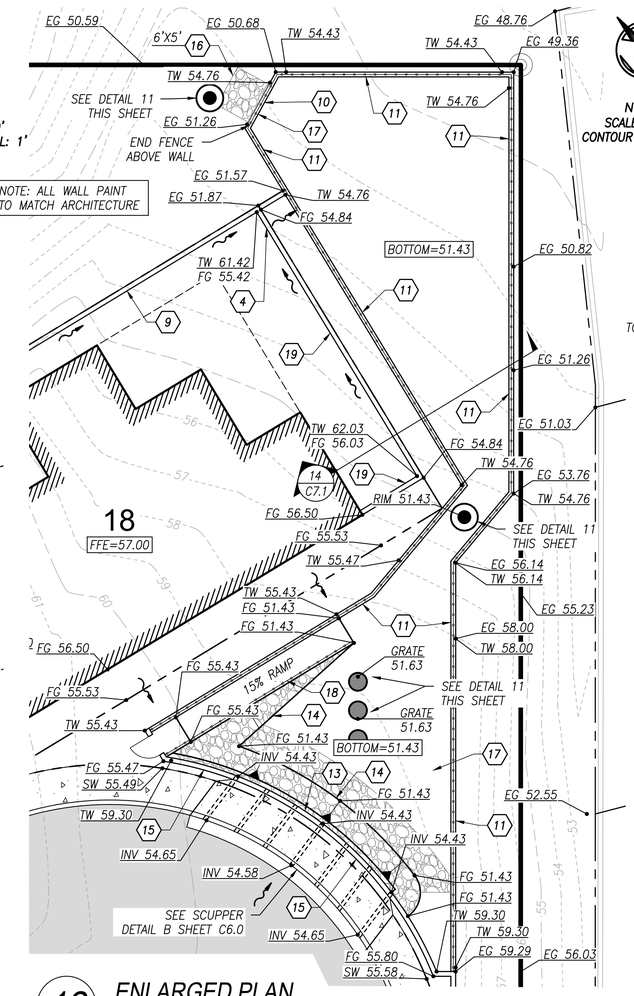
UNDERGROUND DETENTION NOTES:

1. CONTRACTOR TO COORDINATE DESIGN AND INSTALLATION WITH SUPPLIER.
2. UNDERGROUND DETENTION SYSTEM SHALL BE CAPABLE OF STORING 6,243 CUBIC FEET OF STORM WATER.
3. SPECIAL INSPECTION REQUIRED BY THIRD PARTY INSPECTOR, SEE SHEET C10.0 FOR ADDITIONAL INFORMATION.



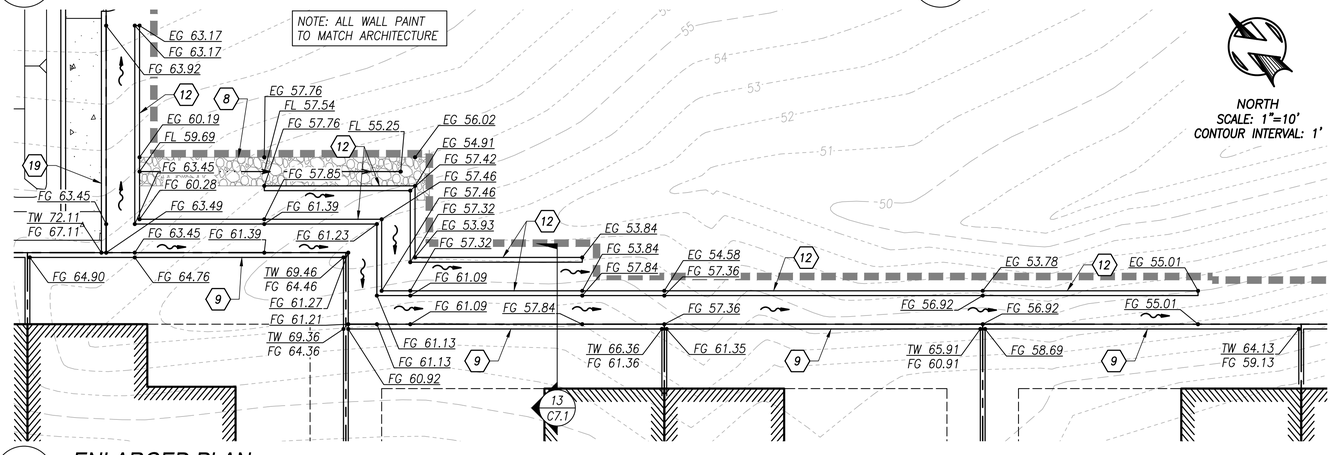
11 UNDERGROUND DETENTION

N.T.S.



12 ENLARGED PLAN

N.T.S.



15 ENLARGED PLAN

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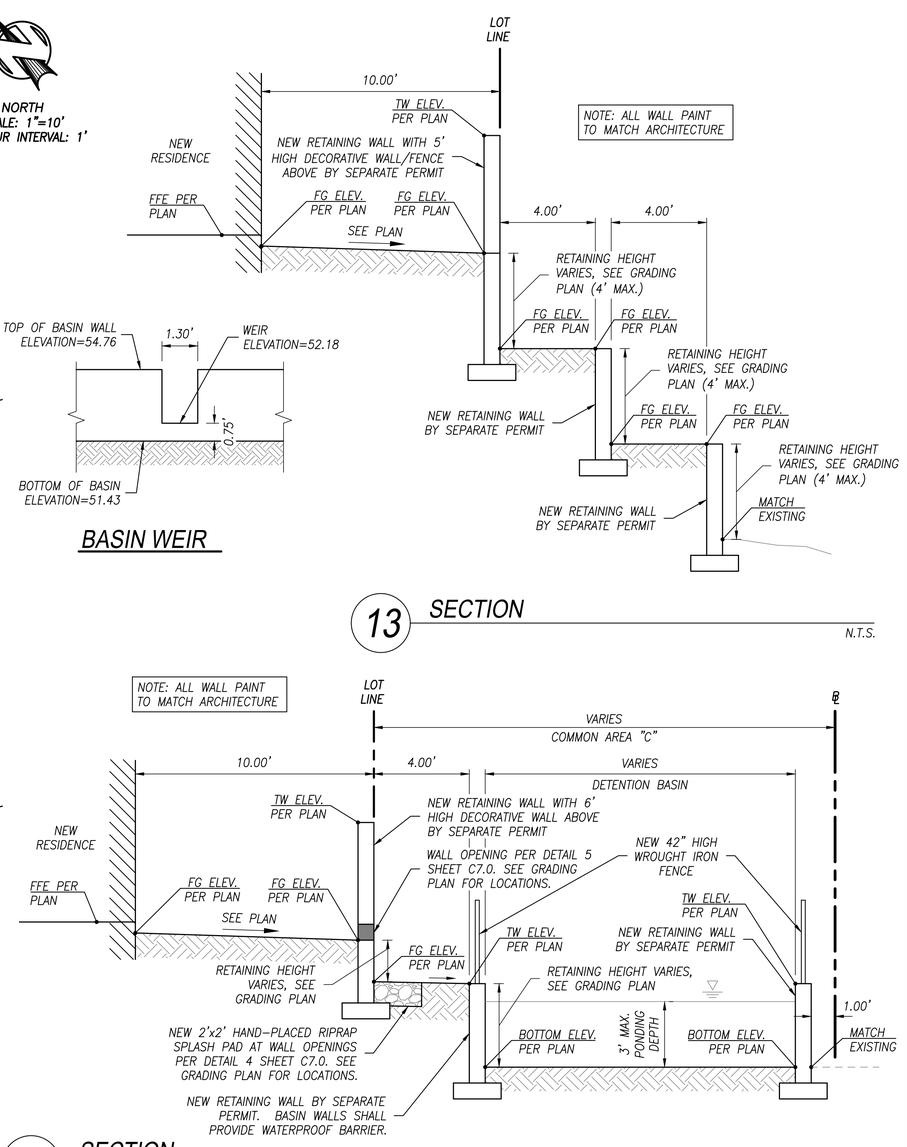


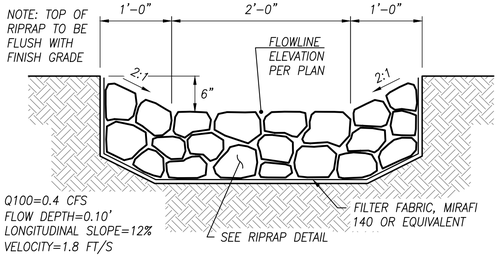
BASIN WEIR

13 SECTION

N.T.S.

14 SECTION

N.T.S.



16 RIPRAP SWALE

N.T.S.

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Sheet Number: C7.1

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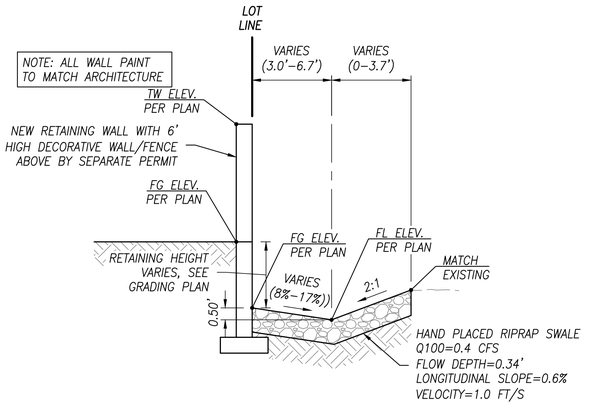

17 SECTION

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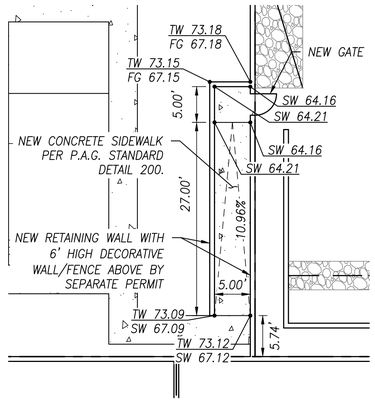
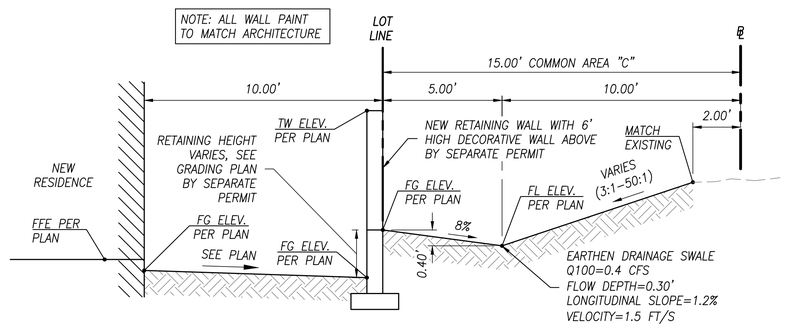


18 MAINTENANCE RAMP

N.T.S.



19 SECTION

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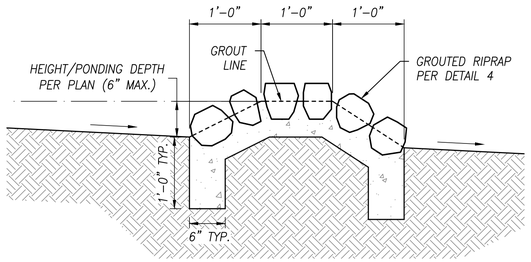

20 CHECK DAM

N.T.S.

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Scale Vt:	N/A Hz: AS NOTED

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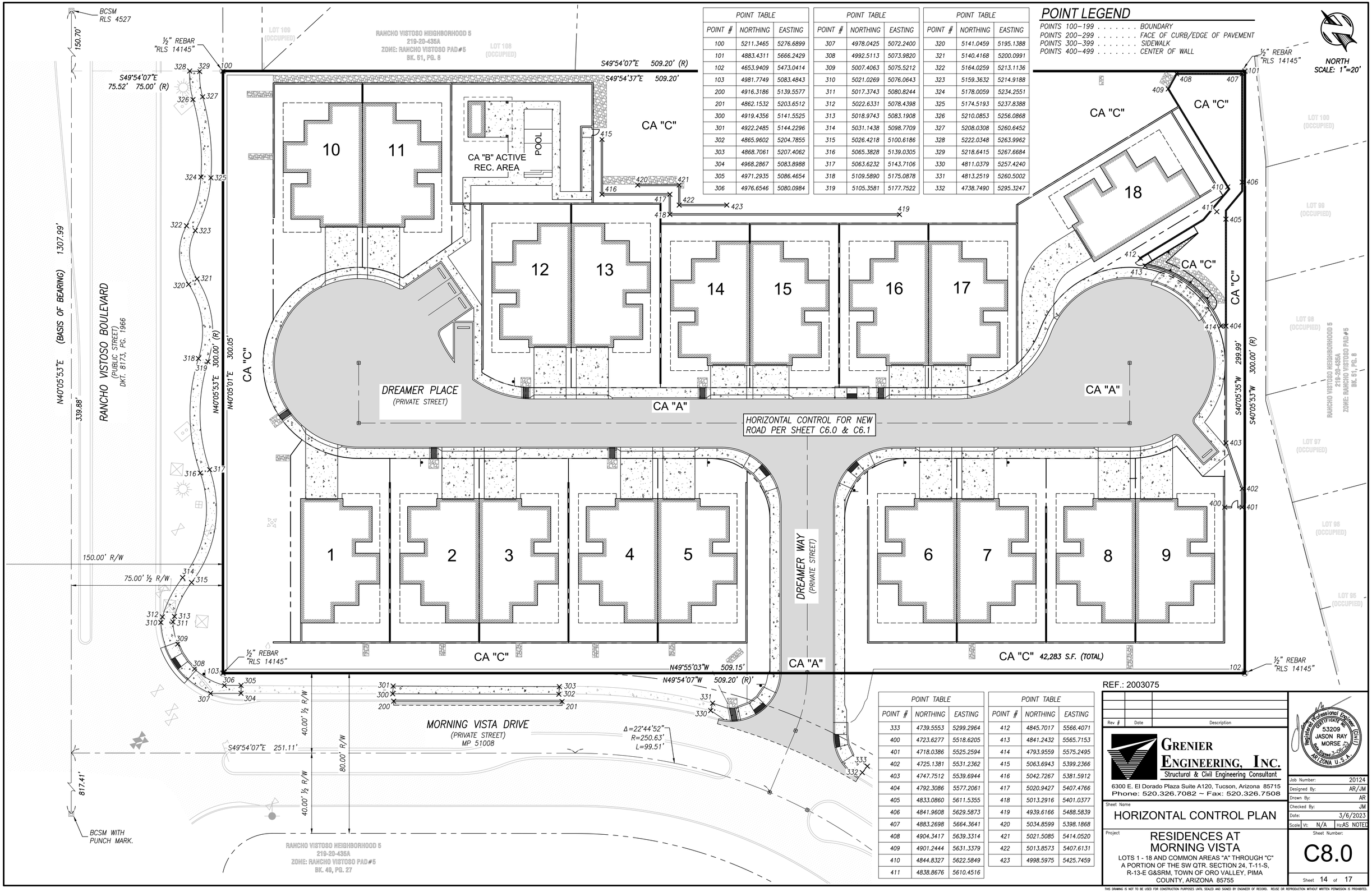

POINT TABLE		
POINT #	NORTHING	EASTING
100	5211.3465	5276.6899
101	4883.4311	5666.2429
102	4653.9409	5473.0414
103	4981.7749	5083.4843
200	4916.3186	5139.5577
201	4862.1532	5203.6512
300	4919.4356	5141.5525
301	4922.2485	5144.2296
302	4865.9602	5204.7855
303	4868.7061	5207.4062
304	4968.2867	5083.8988
305	4971.2935	5086.4654
306	4976.6546	5080.0984

POINT TABLE		
POINT #	NORTHING	EASTING
307	4978.0425	5072.2400
308	4992.5113	5073.9820
309	5007.4063	5075.5212
310	5021.0269	5076.0643
311	5017.3743	5080.8244
312	5022.6331	5078.4398
313	5018.9743	5083.1908
314	5031.1438	5098.7709
315	5026.4218	5100.6186
316	5065.3828	5139.0305
317	5063.6232	5143.7106
318	5109.5890	5175.0878
319	5105.3581	5177.7522

POINT TABLE		
POINT #	NORTHING	EASTING
320	5141.0459	5195.1388
321	5140.4168	5200.0991
322	5164.0259	5213.1136
323	5159.3632	5214.9188
324	5178.0059	5234.2551
325	5174.5193	5237.8388
326	5210.0853	5256.0868
327	5208.0308	5260.6452
328	5222.0348	5263.9962
329	5218.6415	5267.6684
330	4811.0379	5257.4240
331	4813.2519	5260.5002
332	4738.7490	5295.3247

POINT LEGEND

POINTS 100–199 . . . . . BOUNDARY
POINTS 200–299 . . . . . FACE OF CURB/EDGE OF PAVEMENT
POINTS 300–399 . . . . . SIDEWALK
POINTS 400–499 . . . . . CENTER OF WALL

NORTH
SCALE: 1"=20'

POINT TABLE		
POINT #	NORTHING	EASTING
333	4739.5553	5299.2964
400	4723.6277	5518.6205
401	4718.0386	5525.2594
402	4725.1381	5531.2362
403	4747.7512	5539.6944
404	4792.3086	5577.2061
405	4833.0860	5611.5355
406	4841.9608	5629.5873
407	4883.2698	5664.3641
408	4904.3417	5639.3314
409	4901.2444	5631.3379
410	4844.8327	5622.5849
411	4838.8676	5610.4516

POINT TABLE		
POINT #	NORTHING	EASTING
412	4845.7017	5566.4071
413	4841.2432	5565.7153
414	4793.9559	5575.2495
415	5063.6943	5399.2366
416	5042.7267	5381.5912
417	5020.9427	5407.4766
418	5013.2916	5401.0377
419	4939.6166	5488.5839
420	5034.8599	5398.1868
421	5021.5085	5414.0520
422	5013.8573	5407.6131
423	4998.5975	5425.7459

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CERTIFICATE NO. 53209
JASON RAY MORSE
Date Signed 3-06-23
ARIZONA U.S.A.

Sheet Name
HORIZONTAL CONTROL PLAN

Project
RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
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C8.0

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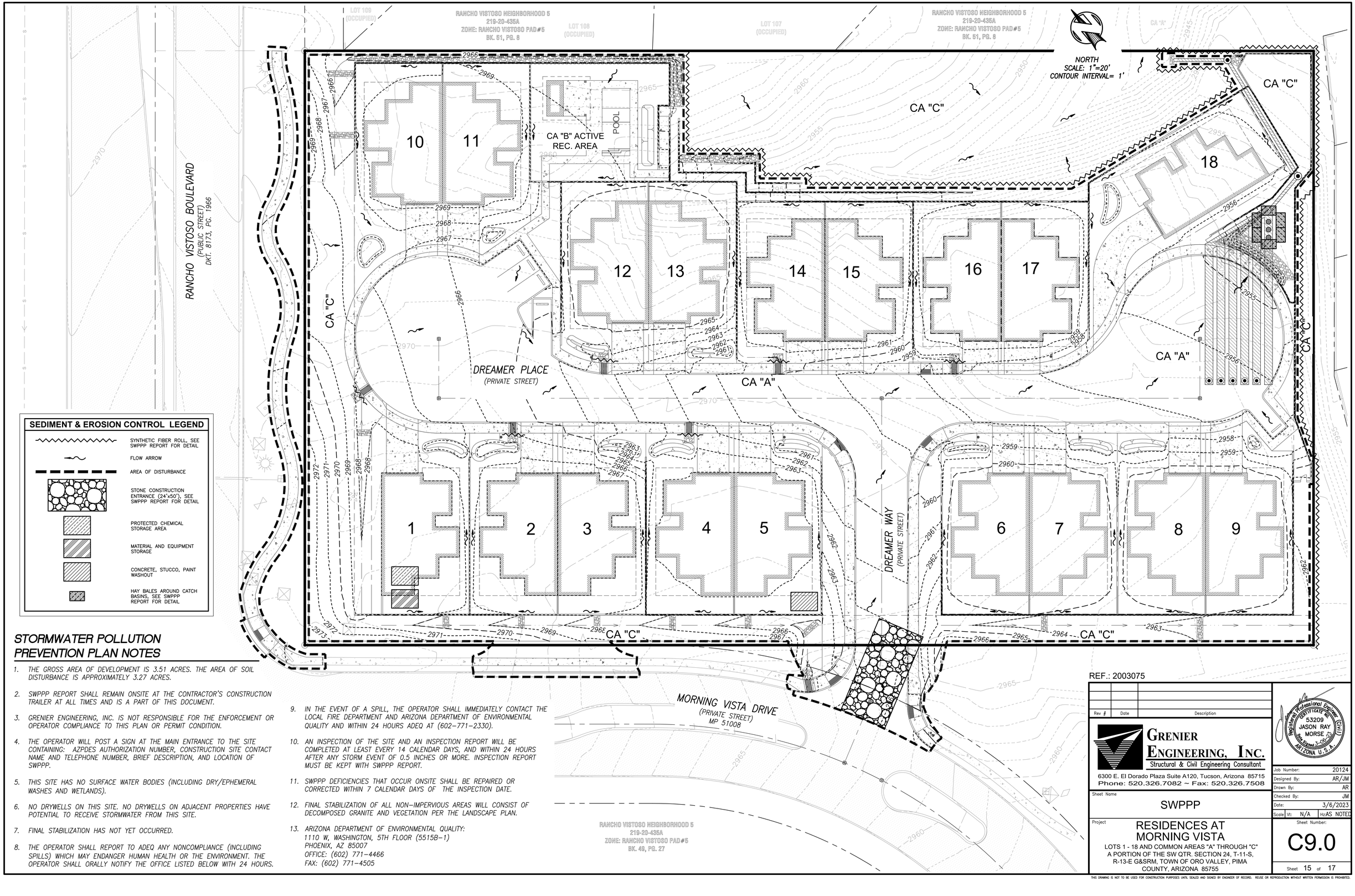

SEDIMENT & EROSION CONTROL LEGEND

- SYNTHETIC FIBER ROLL, SEE SWPPP REPORT FOR DETAIL
- FLOW ARROW
- AREA OF DISTURBANCE
- STONE CONSTRUCTION ENTRANCE (24'x50'), SEE SWPPP REPORT FOR DETAIL
- PROTECTED CHEMICAL STORAGE AREA
- MATERIAL AND EQUIPMENT STORAGE
- CONCRETE, STUCCO, PAINT WASHOUT
- HAY BALES AROUND CATCH BASINS, SEE SWPPP REPORT FOR DETAIL

STORMWATER POLLUTION PREVENTION PLAN NOTES

1. *THE GROSS AREA OF DEVELOPMENT IS 3.51 ACRES. THE AREA OF SOIL DISTURBANCE IS APPROXIMATELY 3.27 ACRES.*
2. *SWPPP REPORT SHALL REMAIN ONSITE AT THE CONTRACTOR'S CONSTRUCTION TRAILER AT ALL TIMES AND IS A PART OF THIS DOCUMENT.*
3. *GRENIER ENGINEERING, INC. IS NOT RESPONSIBLE FOR THE ENFORCEMENT OR OPERATOR COMPLIANCE TO THIS PLAN OR PERMIT CONDITION.*
4. *THE OPERATOR WILL POST A SIGN AT THE MAIN ENTRANCE TO THE SITE CONTAINING: AZPDES AUTHORIZATION NUMBER, CONSTRUCTION SITE CONTACT NAME AND TELEPHONE NUMBER, BRIEF DESCRIPTION, AND LOCATION OF SWPPP.*
5. *THIS SITE HAS NO SURFACE WATER BODIES (INCLUDING DRY/EPHEMERAL WASHES AND WETLANDS).*
6. *NO DRYWELLS ON THIS SITE. NO DRYWELLS ON ADJACENT PROPERTIES HAVE POTENTIAL TO RECEIVE STORMWATER FROM THIS SITE.*
7. *FINAL STABILIZATION HAS NOT YET OCCURRED.*
8. *THE OPERATOR SHALL REPORT TO ADEQ ANY NONCOMPLIANCE (INCLUDING SPILLS) WHICH MAY ENDANGER HUMAN HEALTH OR THE ENVIRONMENT. THE OPERATOR SHALL ORALLY NOTIFY THE OFFICE LISTED BELOW WITH 24 HOURS.*
9. *IN THE EVENT OF A SPILL, THE OPERATOR SHALL IMMEDIATELY CONTACT THE LOCAL FIRE DEPARTMENT AND ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY AND WITHIN 24 HOURS ADEQ AT (602-771-2330).*
10. *AN INSPECTION OF THE SITE AND AN INSPECTION REPORT WILL BE COMPLETED AT LEAST EVERY 14 CALENDAR DAYS, AND WITHIN 24 HOURS AFTER ANY STORM EVENT OF 0.5 INCHES OR MORE. INSPECTION REPORT MUST BE KEPT WITH SWPPP REPORT.*
11. *SWPPP DEFICIENCIES THAT OCCUR ONSITE SHALL BE REPAIRED OR CORRECTED WITHIN 7 CALENDAR DAYS OF THE INSPECTION DATE.*
12. *FINAL STABILIZATION OF ALL NON-IMPERVIOUS AREAS WILL CONSIST OF DECOMPOSED GRANITE AND VEGETATION PER THE LANDSCAPE PLAN.*
13. *ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY:*
    1110 W, WASHINGTON, 5TH FLOOR (5515B-1)
    PHOENIX, AZ 85007
    OFFICE: (602) 771-4466
    FAX: (602) 771-4505

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Sheet Name: SWPPP

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Sheet Number: C9.0

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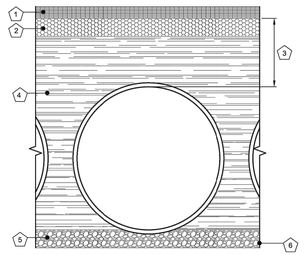


KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102"
   AND LARGER MEASURED TO TOP OF RIGID
   OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145
   A1, A2 OR A3, OR APPROVED EQUAL,
   PLACED IN 8" LIFTS (COMPACTED TO MIN.
   90% STANDARD DENSITY PER AASHTO T99.)
   INCLUDING 3/8" MINUS ANGULAR STONE.
   THE FOLLOWING SOIL CORROSIVITY
   RANGES SHOULD BE REQUIRED FOR THE
   BACKFILL WITHIN THE PIPE ZONE FOR THE
   COATING UTILIZED TO OFFER A DESIGN
   SERVICE LIFE OF 50 YEARS AS FOLLOWS:
   POLYMER COATING
   3 ≤ pH ≤ 11
   MIN RESISTIVITY = 250 OHMS-CM
   ALUMINIZED TYPE II
   5 ≤ pH ≤ 9
   MIN RESISTIVITY = 1500 OHMS-CM
   GALVANIZED
   6 ≤ pH ≤ 10
   MIN RESISTIVITY = 2000 OHMS-CM
5. GRANULAR BEDDING, ROUGHLY SHAPED TO
   FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH
6. CONTECH C-40 OR C-45 NON-WOVEN
   GEOTEXTILE REQUIRED TO WRAP ENTIRE TRENCH.

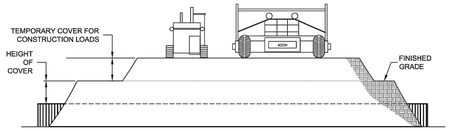
FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, 4" - 6" OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL SHALL BE AN A1, A2 OR A3 GRANULAR FILL PER AASHTO M145, OR A WELL-GRADED GRANULAR FILL AS APPROVED BY THE SITE ENGINEER (SEE INSTALLATION GUIDELINES). THE MATERIAL SHALL BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

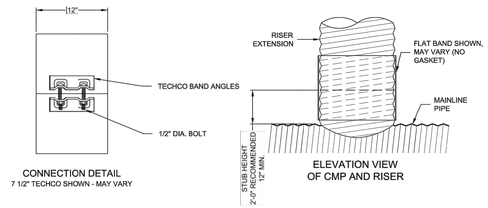


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.



CONNECTION DETAIL
7 1/2" TECHCO SHOWN - MAY VARY

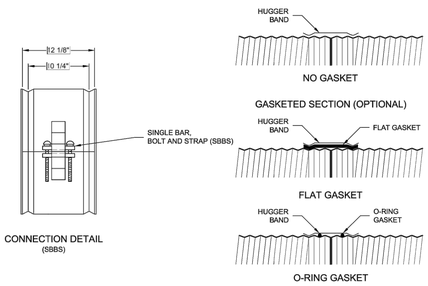
ELEVATION VIEW
OF CMP AND RISER

PLAIN END CMP RISER PIPE

GENERAL NOTES:

1. **DELIVERED BAND STYLE AND FASTENER TYPE MAY VARY BY FABRICATION PLANT.**
2. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
3. BAND MATERIAL AND GAGE TO BE SAME AS RISER MATERIAL.
4. IF RISER HAS A HEIGHT OF COVER OF 10' OR MORE, USE A SLIP JOINT.
5. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" 2-PIECES
6. ALL RISER JOINT COMPONENTS WILL BE FIELD ASSEMBLED.
7. MANHOLE RISERS IN APPLICATIONS WHERE TRAFFIC LOADS ARE IMPOSED REQUIRE SPECIAL DESIGN CONSIDERATIONS.
8. DIMENSIONS SUBJECT TO MANUFACTURING TOLERANCES.

12" RISER BAND DETAIL
NOT TO SCALE



CONNECTION DETAIL
(SBBS)

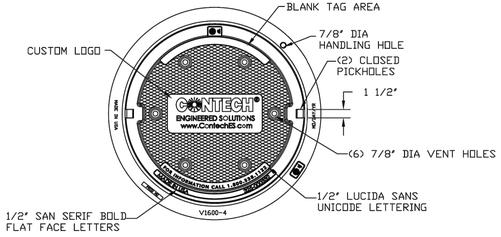
2 2/3"x1/2" RE-ROLLED END HEL-COR PIPE

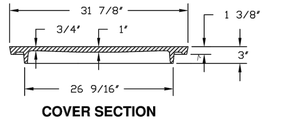
GENERAL NOTES:

1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE SHAPED TO MATCH THE PIPE-ARCH WHEN APPLICABLE.
4. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" THRU 96" 2-PIECES
   - 102" THRU 144" 3-PIECES
5. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
6. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2"
7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

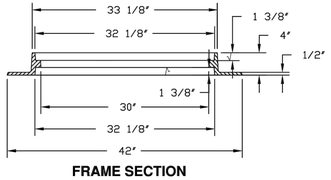
H-12 HUGGER BAND DETAIL
NOT TO SCALE

30"x4" REVERSIBLE FRAME & SOLID COVER



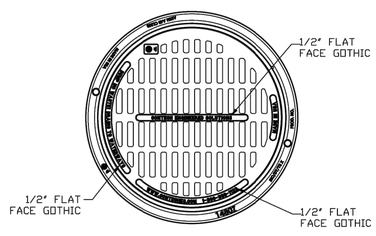


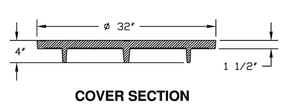
COVER SECTION



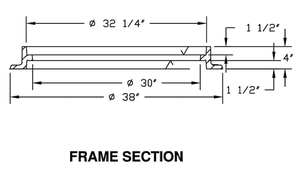
FRAME SECTION

30"x4" REVERSIBLE FRAME & GRATE



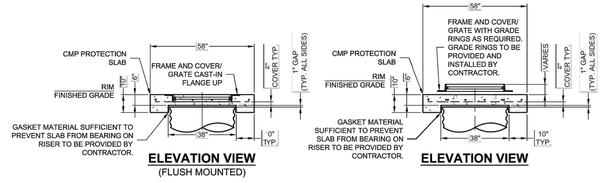


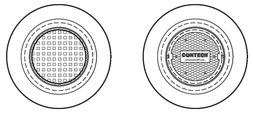
COVER SECTION



FRAME SECTION

PROVIDED FOR INFORMATION ONLY
INTENDED FOR PLANT USE





PLAN VIEW
(GRATED CASTING)
30"Ø HS25 LOAD RATED

PLAN VIEW
(SOLID CASTING)
24"Ø HS25 LOAD RATED
30"Ø HS25 LOAD RATED

CHECK ONE:
- ☐ CAST-IN COVER
- ☐ SEPARATE COVER

CHECK ONE:
- ☐ 24"Ø COVER
- ☐ 30"Ø COVER
- ☐ 30"Ø GRATE

FABRICATION NOTES:

1. CONCRETE STRENGTH = 4,000 PSI
2. REINFORCING STEEL - ASTM A615, GRADE 60, OR EQUIVALENT WELDED WIRE FABRIC.
3. NICE LIGHT BROOM FINISH FOR UNITS W/ CAST-IN FRAME AND COVER
4. LIFTERS IN SIDE FOR UNITS W/ CAST-IN FRAME AND COVER AND LIFTERS IN TOP SLAB FOR UNITS W/ SEPARATE COVER

GENERAL NOTES:

1. DESIGN LOAD HS20/HS25
2. EARTH COVER = 1' MAX
3. RISER CAP MUST BE ADEQUATELY SUPPORTED WITH PROPER BEDDING AND BEARING PRESSURE OF 3350 PSF AS TO NOT TRANSFER LOADS ONTO RISER.
4. HEAVY PICK WEIGHT = 1,900 LBS

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

58" OD CMP RISER CAP
UP TO 36" RISERS
PRECASTER: SEALY, TX

CONTECH CMP DETENTION SYSTEMS

DATE: 04/07/2021 | SCALE: NONE | PROJECT No.: | SEQUENCE No.: | DRAWN: TJS | CHECKED: KMR

SPECIAL INSPECTION NOTES:

1. *BACKFILL MUST BE COMPACTED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT AND MANUFACTURER'S SPECIFICATIONS.*
2. *COMPACTION DENSITIES SHALL BE TEST AND DETERMINED BY PAG SPECIFICATION 501.*
3. *END CAPS AND PIPE STUBS FOR UNDERGROUND DETENTION SHALL BE PRE-FABRICATED AND ATTACHED TO THE PIPE BY THE MANUFACTURER AND APPROVED BY ENGINEER PRIOR TO INSTALLATION.*
4. *MANUFACTURER'S INSTALLATION INSTRUCTIONS SHALL BE AVAILABLE ON-SITE FOR FIELD INSPECTOR.*
5. *SPECIAL INSPECTION BY A CERTIFIED INSPECTOR IS REQUIRED FOR THE UNDERGROUND DETENTION SYSTEM, THE CONTRACTOR SHALL CONTRACT AND PAY FOR ALL THE COSTS FOR THE PRIVATE CERTIFIED INSPECTOR.*
6. *BACKFILL MUST BE COMPLETED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL REPORT AND THE MANUFACTURER'S SPECIFICATIONS.*
7. *ALL SPECIAL INSPECTION WILL BE PERFORMED BY THE OWNER'S REPRESENTATIVE WITH COPIES PROVIDED TO THE TOWN OF ORO VALLEY.*

REF.: 2003075

Rev #	Date	Description

GRENIER ENGINEERING, INC.
Structural & Civil Engineering Consultant
6300 E. El Dorado Plaza Suite A120, Tucson, Arizona 85715
Phone: 520.326.7082 ~ Fax: 520.326.7508

Sheet Name: UNDERGROUND DETENTION TANK DETAILS

Project: RESIDENCES AT MORNING VISTA
LOTS 1 - 18 AND COMMON AREAS "A" THROUGH "C"
A PORTION OF THE SW QTR. SECTION 24, T-11-S, R-13-E G&SRM, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA 85755

Job Number:	20124
Designed By:	AR/JM
Drawn By:	AR
Checked By:	JM
Date:	3/6/2023
Scale Vt:	N/A HzAS NOTED

Sheet Number: C10.0

ALL DETAILS SHOWN ON THIS SHEET ARE FOR REFERENCE ONLY. UNDERGROUND DETENTION SYSTEM TO BE DESIGNED BY CONTECH ENGINEED SOLUTIONS LLC.