



**KLAND CIVIL ENGINEERS**

## Preliminary Drainage Report

### Megerdichian Assisted Seniors Center (MASC)

8849 E CHOLLA ST, SCOTTSDALE, AZ 85260

25-ZN-2018

Kland# K15153

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Revised December 8, 2020  
Revised September 11, 2020  
August 24, 2018

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**Revised December 8, 2020**  
**Revised September 11, 2020**  
**August 24, 2018**

## 1. Introduction

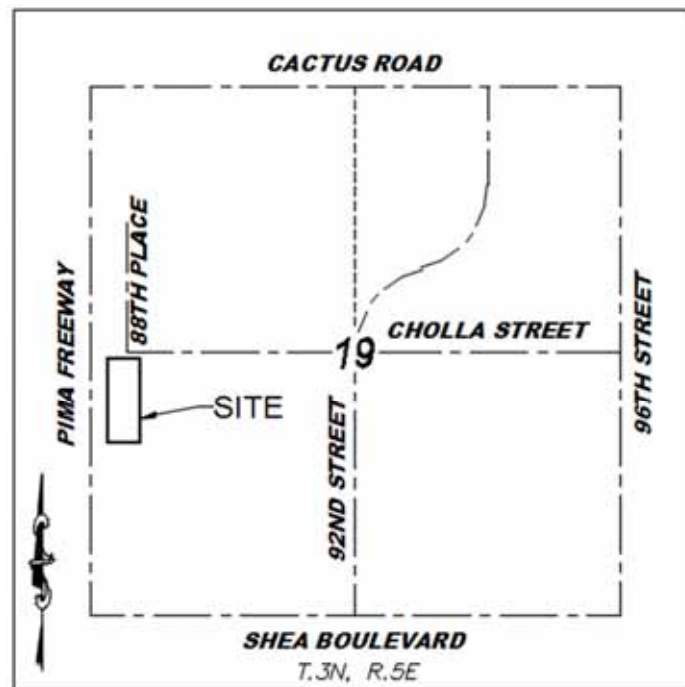
The purpose of this report is to compare the existing and proposed drainage for the Megerdichian Assisted Seniors Center (MASC) project. The proposed site is located at 8849 E Cholla Street in Scottsdale, AZ 85260.

This report consists of description of existing condition, proposed condition, methods of analysis and conclusion. The drainage report serves to confirm that the proposed project does not affect the existing drainage pattern in a significant way, and has been designed in accordance with our understanding of known applicable City of Scottsdale criteria, requirements and design standards for storm water management.

## 2. Site Description

The Megerdichian Assisted Seniors Center (MASC) is located within a portion of Lot 3 in the Southwest Quarter of Section 19, Township 3 North, Range 5 East of Gila and Salt River base and Meridian, Maricopa County, Arizona. The site is bordered on the west by Pima Freeway, on north by Cholla Street, and on the east and south by previously developed properties. The current zoning of the site is R1-35 according to Maricopa County Assessor's Office.

Please see Vicinity Map below.



### **VICINITY MAP**

N.T.S.

Currently, the site includes several parking lots and paved driveways, three single story buildings which are connected by a dirt road, and a retention area. The remaining portion on the south of the site is open space area which the proposed development will occur on. The proposed development includes a senior center building (21,800 sf), and the required parking spaces.

Please see Appendix G for Master Plan.

### Federal Emergency Management Agency (FEMA) Designation

The subject site lies within Zone X according to on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Map Number 04013C1760L, dated 10/16/2013.

The FIRM Panel defines a Zone X designation as follows:

*Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1-foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.*

See Appendix A for FEMA Exhibit.

## 3. Existing Drainage

### Offsite Drainage

There is an existing drainage channel along the north site of the site in the developed portion of the site. This drainage channel collects storm water from the existing residential neighborhood and discharges to the existing ADOT channel along the west side of the site. The north channel was designed and sized per the Armenian Apostolic Church Drainage Report prepared by Speedie and Associates, Dated 10/27/1989. According to the Drainage report the 100-year peak flow was calculated to be 74 cfs and the 10-year peak flow to be 39 cfs. The drainage channel was designed to have a capacity over 80 cfs. The ADOT channel plans show that the channel was sized for the 100-year peak flow. The profiles show that the channel generally provides 1-foot of freeboard to the 100-yr hydraulic grade line. There is a hydraulic jump at the far south end of the site that appears to be due to a maintenance access ramp into the bottom of the drainage channel. At this point the freeboard is reduced approximately 0.25-feet which provided approximately 1.7-feet of free board to the existing building.

At final design the proposed improvements will not alter the channel and that the finish floor of the proposed structure will be set to adequately protect the structure from any uncertainties of the original channel design flow.

## Onsite Drainage

The site slopes from the north to the east with an approximately 5 feet of fall. For the portion of the site that is developed there is an existing retention basin that accept most the storm water runoff.

Per the engineering documents for the developed part, the retention volume required for the 100-year-2-hour storm event is 28,770 cft and the volume provided in the retention basin is 30,400 cft. Per our modeling with Civil 3d using survey data, we calculated the retention volume provided in this basin about 17,602 cft. We are proposing expansion of this basin to provide about 37,000 cft and three drywells for water dissipation in less than 36 hours per 0.1 cfs dissipation rate. The volume provided will be adequate for this phase of development and any potential future ones.

The historic outfall for this basin is via a catch basin provided at the proposed highwater elevation, which connects to an existing 12” storm drain pipe that continues to the west. This pipe will be removed in our proposed plans, and the outfall will be from the parking lot to the east of the basin to the next tributary area and eventually to the ultimate outfall of the site.

There is a small portion of access drive and the trash enclosure that drains directly to the ADOT drainage channel on the west side of the site. In addition, the retention basin has a pipe connection to the ADOT channel that allows excess storm water to overflow to the channel. The south portion of the site that is undeveloped discharges directly to the ADOT channel through a spillway located approximately 250-feet north of the south property line.

Please see Appendix C for Drainage Channel Report and ADOT plans and Appendix E for Existing Drainage Map.

## 4. Proposed Drainage

### Offsite Drainage

No offsite drainage changes are planned with this development. The new development will provide 100-year 2-hour retention which will reduce the current storm water discharge to the ADOT channel. In addition, the overflow pipe from the existing retention basin will be removed. For storm events great than the 100-year storm the site outfall will remain to the ADOT drainage channel as it has historically.

At final design the proposed improvements will not alter the channel and that the finish floor of the proposed structure will be set to adequately protect the structure from any uncertainties of the original channel design flow.

## Onsite Drainage

For the purpose of the stormwater management the required retention will be provided in surface basins and underground retention tanks. The existing retention basin will be enlarged with this development as narrated above in the Existing Drainage/Onsite. In addition there are 4 proposed surface basins along the east and south side of the new development. The 10' diameter underground retention tanks are located in the southeast corner of the site.

All existing and new finished floors are set to be at least 1' above the high water elevations and outfall elevations of the retention basins. In order to maintain the existing drainage pattern, we are providing catch basins to catch the storm water flow through the drives. The catch basins are connected to the underground storage tanks via storm drain pipes. The underground retention tanks are in the parking area on the east side of the southern portion of the property to not impact the ability to plant trees or intrude into water easement. Storm water in excess of the retention tank volume will back up the storm pipe and overflow at the ultimate outfall/ historic out fall for the site.

The Ultimate out fall for the site is located on the west site and drains into an existing drainage channel.

See Appendix F for Proposed Drainage Map and Appendix G for Master Plan.

## First Flush

Since the site retention volume is designed to retain 100-year-2-hour storm event, it will also hold the first flush volume.

## 5. Methodology

The onsite storm drain system will be modeled using Haestad Methods, StormCAD v5.5 at the time of final design. Calculations will be provided in the final drainage report. The anticipated 100-year peak flows contributing to the storm drain inlets and building roof drains were calculated using the Rational Method. To study the effect of this development on the natural drainage characteristics, the weighted runoff coefficient was calculated to be 0.81. The 100-year intensity was also determined using NOAA Atlas 14, Volume 1, Version 5 for a 5 minute time-of-concentration.

$$Q_{100} = CIA$$

$Q_{100}$  = Peak Flow in cubic feet for the selected storm reoccurrence interval

C = Runoff Coefficient

I = Rainfall Intensity (7.55 in/hr per NOAA Atlas 14, Volume 1, Version 5)

A = Drainage Area in Acres

The weighted runoff coefficient for the site is calculated based on the runoff coefficients used by the City of Scottsdale which are 0.5 for Landscape and permeable surfaces and 0.95 for Impermeable surfaces:

$$C = (C_p \times A_p + C_i \times A_i) \div (A_p + A_i)$$

$A_p = 112,810$  sft (Landscape and permeable surfaces)

$A_i = 209,680$  sft (Impermeable surfaces)

$C_p = 0.5$

$C_i = 0.95$

$C = 0.81$

The required retention volume for precipitation depth for 100-year-2-hour storm event was determined by using the following equation:

$$V_r = (P/12) \times (C \times A)$$

$V_r$  = Volume of storm water retention in cubic feet for the selected storm reoccurrence interval

$C = 0.81$  Runoff Coefficient

$P$  = Rainfall Depth, in inches (2.22" per NOAA Atlas 14, Volume 1, Version 5)

$A$  = Drainage Area in square feet

The required retention for this site will be provided in 282 linear feet of 10' diameter underground retention tanks (retention volume = 22,148 cf) and four retention basins (retention volume = 40,452 cf) providing a total volume equal to 62,425 cf.

See Appendix B for Drainage Calculations and Appendix for Weighted 'C' Exhibit.

## 6. Summary

Based on KLAND's understanding of the applicable City of Scottsdale criteria, requirements and design standards associated with drainage, it can be concluded that:

- The onsite storm drain system will be modeled using Haestad Methods, StormCAD v5.5 at the time of final design.
- The anticipated 100-year peak flows contributing to the storm drain inlets and building roof drains will be calculated using the Rational Method.
- The retention will be provided through both the surface basins and underground storage tanks for the anticipated runoff from the 100 year 2 hour storm event.
- The retention tank will be designed to dewater in less than 36 hours via drywells.
- The proposed conditions of the site do not significantly alter runoff pattern from the existing condition.
- Offsite flows are not impacting the site.
- The finish floor is set at 1 foot above the 100 year 2 hour retention high water.

## REFERENCES

1. Drainage Design Manual for Maricopa County, Arizona - Volume I Hydrology, Flood Control District of Maricopa County 2003
2. Drainage Design Manual for Maricopa County, Arizona - Volume II Hydraulics, Flood Control District of Maricopa County, 2003
3. Drainage Policies and Standards for Maricopa County, Arizona, Flood Control District of Maricopa County, 2007

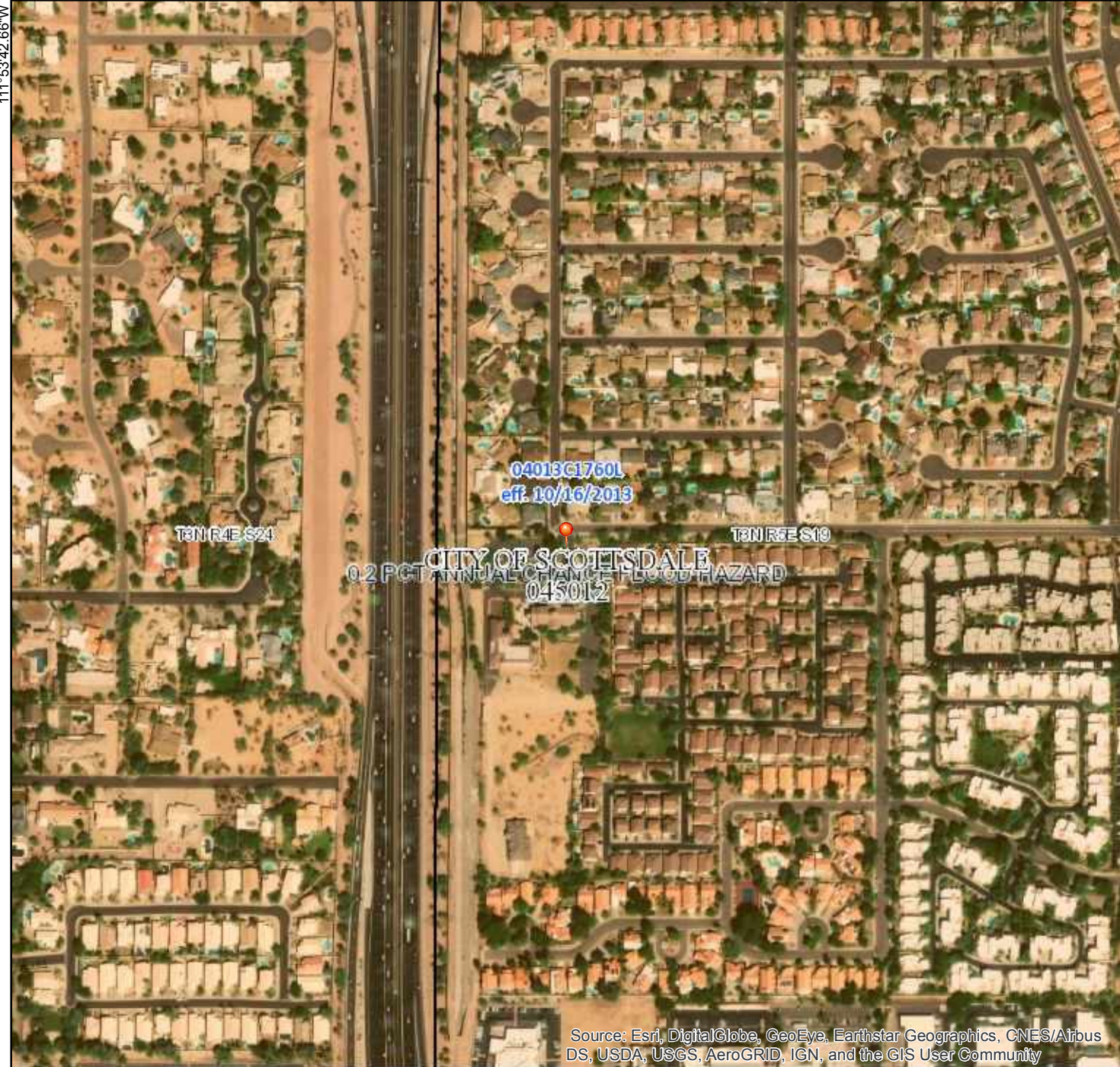
# APPENDIX A

## FEMA Exhibit

# National Flood Hazard Layer FIRMMette



33°35'38.18"N



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

|                             |  |   |
|-----------------------------|--|---|
| SPECIAL FLOOD HAZARD AREAS  |  | Without Base Flood Elevation (BFE)<br>Zone A, V, A99  |
|                             |  | With BFE or Depth   |
|                             |  | Regulatory Floodway Zone AE, AO, AH, VE, AR   |
| OTHER AREAS OF FLOOD HAZARD |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
|                             |  | Future Conditions 1% Annual Chance Flood Hazard Zone X  |
|                             |  | Area with Reduced Flood Risk due to Levee. See Notes. Zone X  |
|                             |  | Area with Flood Risk due to Levee Zone D  |
| OTHER AREAS                 |  | Area of Minimal Flood Hazard Zone X   |
|                             |  | Effective LOMRs   |
| GENERAL STRUCTURES          |  | Area of Undetermined Flood Hazard Zone D  |
|                             |  | Channel, Culvert, or Storm Sewer  |
|                             |  | Levee, Dike, or Floodwall   |
| OTHER FEATURES              |  | Cross Sections with 1% Annual Chance Water Surface Elevation  |
|                             |  | Coastal Transect  |
|                             |  | Base Flood Elevation Line (BFE)   |
|                             |  | Limit of Study  |
| MAP PANELS                  |  | Jurisdiction Boundary   |
|                             |  | Coastal Transect Baseline   |
|                             |  | Profile Baseline  |
|                             |  | Hydrographic Feature  |
|                             |  | Digital Data Available  |
|                             |  | No Digital Data Available   |
|                             |  | Unmapped  |



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **6/28/2018 at 6:54:57 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

0 250 500 1,000 1,500 2,000 Feet 1:6,000 33°35'8.21"N

# APPENDIX B

## Drainage Calculations



**NOAA Atlas 14, Volume 1, Version 5**  
**Location name: Scottsdale, Arizona, USA\***  
**Latitude: 33.5885°, Longitude: -111.8902°**  
**Elevation: 1384.44 ft\*\***



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

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

**PF tabular**

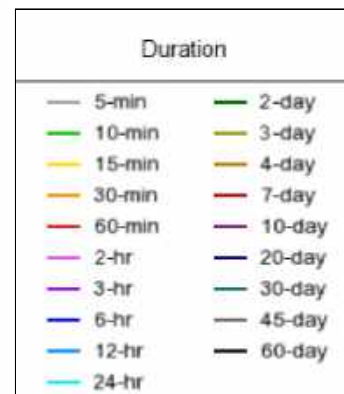
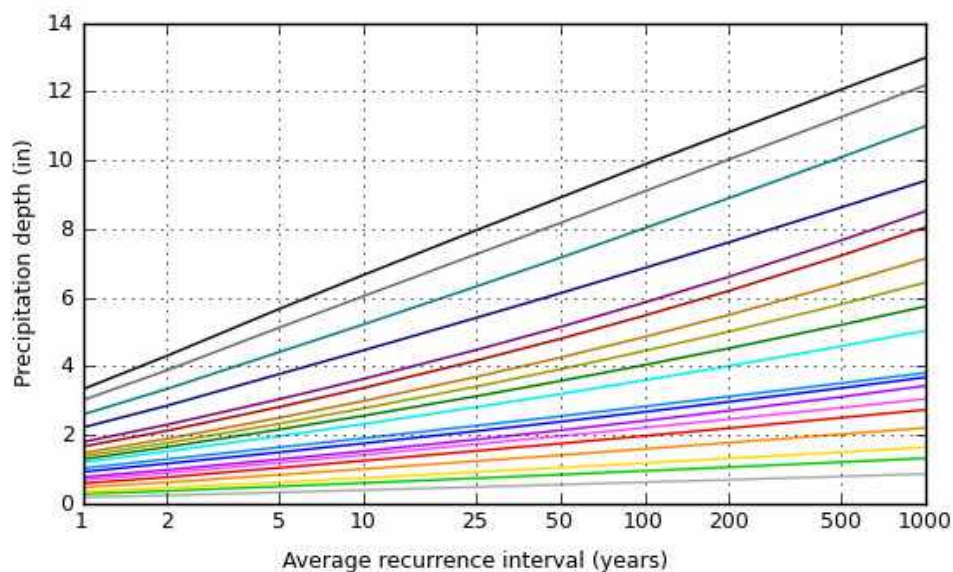
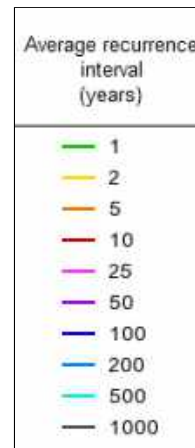
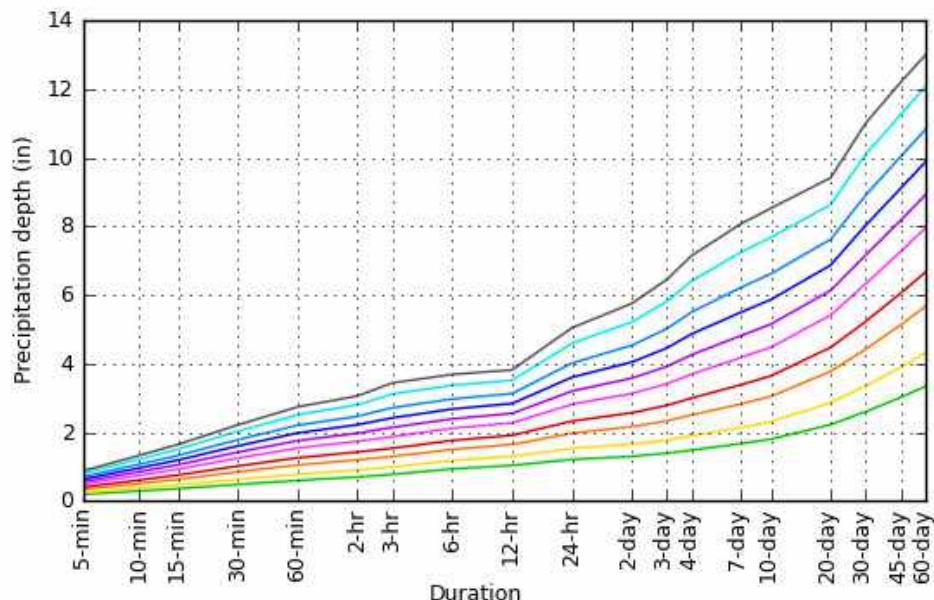
| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b> |  |                               |                               |                               |                               |                               |                               |                               |                               |                              |
|--|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|------------------------------|
| <b>Duration</b>  | <b>Average recurrence interval (years)</b> |                               |                               |                               |                               |                               |                               |                               |                               |                              |
|  | <b>1</b>                                   | <b>2</b>                      | <b>5</b>                      | <b>10</b>                     | <b>25</b>                     | <b>50</b>                     | <b>100</b>                    | <b>200</b>                    | <b>500</b>                    | <b>1000</b>                  |
| <b>5-min</b>   | <b>0.189</b><br>(0.157-0.231)              | <b>0.246</b><br>(0.206-0.302) | <b>0.332</b><br>(0.275-0.406) | <b>0.399</b><br>(0.329-0.486) | <b>0.489</b><br>(0.396-0.593) | <b>0.558</b><br>(0.447-0.672) | <b>0.629</b><br>(0.495-0.756) | <b>0.700</b><br>(0.542-0.840) | <b>0.797</b><br>(0.601-0.957) | <b>0.870</b><br>(0.643-1.05) |
| <b>10-min</b>  | <b>0.287</b><br>(0.238-0.351)              | <b>0.375</b><br>(0.313-0.459) | <b>0.506</b><br>(0.419-0.618) | <b>0.607</b><br>(0.501-0.739) | <b>0.744</b><br>(0.603-0.903) | <b>0.849</b><br>(0.681-1.02)  | <b>0.957</b><br>(0.754-1.15)  | <b>1.07</b><br>(0.825-1.28)   | <b>1.21</b><br>(0.915-1.46)   | <b>1.33</b><br>(0.979-1.59)  |
| <b>15-min</b>  | <b>0.356</b><br>(0.295-0.436)              | <b>0.464</b><br>(0.388-0.569) | <b>0.627</b><br>(0.519-0.766) | <b>0.753</b><br>(0.621-0.917) | <b>0.922</b><br>(0.748-1.12)  | <b>1.05</b><br>(0.844-1.27)   | <b>1.19</b><br>(0.935-1.43)   | <b>1.32</b><br>(1.02-1.59)    | <b>1.50</b><br>(1.13-1.81)    | <b>1.64</b><br>(1.21-1.97)   |
| <b>30-min</b>  | <b>0.479</b><br>(0.397-0.587)              | <b>0.625</b><br>(0.523-0.767) | <b>0.844</b><br>(0.699-1.03)  | <b>1.01</b><br>(0.836-1.23)   | <b>1.24</b><br>(1.01-1.51)    | <b>1.42</b><br>(1.14-1.71)    | <b>1.60</b><br>(1.26-1.92)    | <b>1.78</b><br>(1.38-2.13)    | <b>2.03</b><br>(1.53-2.43)    | <b>2.21</b><br>(1.64-2.66)   |
| <b>60-min</b>  | <b>0.593</b><br>(0.492-0.726)              | <b>0.774</b><br>(0.647-0.949) | <b>1.05</b><br>(0.865-1.28)   | <b>1.25</b><br>(1.03-1.53)    | <b>1.54</b><br>(1.25-1.87)    | <b>1.75</b><br>(1.41-2.11)    | <b>1.98</b><br>(1.56-2.38)    | <b>2.20</b><br>(1.70-2.64)    | <b>2.51</b><br>(1.89-3.01)    | <b>2.74</b><br>(2.02-3.29)   |
| <b>2-hr</b>  | <b>0.694</b><br>(0.584-0.830)              | <b>0.897</b><br>(0.759-1.08)  | <b>1.20</b><br>(1.00-1.43)    | <b>1.42</b><br>(1.18-1.70)    | <b>1.74</b><br>(1.43-2.06)    | <b>1.97</b><br>(1.60-2.33)    | <b>2.22</b><br>(1.77-2.61)    | <b>2.46</b><br>(1.94-2.90)    | <b>2.80</b><br>(2.15-3.30)    | <b>3.06</b><br>(2.29-3.62)   |
| <b>3-hr</b>  | <b>0.772</b><br>(0.650-0.945)              | <b>0.989</b><br>(0.836-1.22)  | <b>1.29</b><br>(1.09-1.58)    | <b>1.53</b><br>(1.27-1.86)    | <b>1.87</b><br>(1.53-2.26)    | <b>2.14</b><br>(1.73-2.57)    | <b>2.42</b><br>(1.92-2.90)    | <b>2.71</b><br>(2.11-3.24)    | <b>3.11</b><br>(2.36-3.72)    | <b>3.44</b><br>(2.54-4.12)   |
| <b>6-hr</b>  | <b>0.930</b><br>(0.798-1.11)               | <b>1.17</b><br>(1.01-1.40)    | <b>1.50</b><br>(1.28-1.77)    | <b>1.76</b><br>(1.49-2.07)    | <b>2.11</b><br>(1.76-2.48)    | <b>2.39</b><br>(1.96-2.79)    | <b>2.68</b><br>(2.17-3.12)    | <b>2.97</b><br>(2.36-3.47)    | <b>3.37</b><br>(2.61-3.93)    | <b>3.68</b><br>(2.79-4.31)   |
| <b>12-hr</b>   | <b>1.03</b><br>(0.891-1.22)                | <b>1.30</b><br>(1.12-1.53)    | <b>1.64</b><br>(1.41-1.93)    | <b>1.91</b><br>(1.63-2.23)    | <b>2.27</b><br>(1.92-2.65)    | <b>2.55</b><br>(2.13-2.97)    | <b>2.84</b><br>(2.33-3.30)    | <b>3.13</b><br>(2.54-3.63)    | <b>3.51</b><br>(2.78-4.10)    | <b>3.81</b><br>(2.96-4.48)   |
| <b>24-hr</b>   | <b>1.21</b><br>(1.06-1.39)                 | <b>1.53</b><br>(1.35-1.77)    | <b>1.97</b><br>(1.73-2.28)    | <b>2.32</b><br>(2.03-2.68)    | <b>2.81</b><br>(2.44-3.23)    | <b>3.20</b><br>(2.75-3.67)    | <b>3.60</b><br>(3.07-4.13)    | <b>4.01</b><br>(3.39-4.60)    | <b>4.59</b><br>(3.82-5.26)    | <b>5.04</b><br>(4.15-5.80)   |
| <b>2-day</b>   | <b>1.30</b><br>(1.13-1.49)                 | <b>1.65</b><br>(1.45-1.91)    | <b>2.16</b><br>(1.89-2.49)    | <b>2.57</b><br>(2.23-2.95)    | <b>3.13</b><br>(2.70-3.59)    | <b>3.57</b><br>(3.06-4.10)    | <b>4.04</b><br>(3.44-4.64)    | <b>4.53</b><br>(3.82-5.21)    | <b>5.21</b><br>(4.33-6.00)    | <b>5.75</b><br>(4.71-6.64)   |
| <b>3-day</b>   | <b>1.39</b><br>(1.22-1.59)                 | <b>1.77</b><br>(1.56-2.04)    | <b>2.33</b><br>(2.04-2.67)    | <b>2.78</b><br>(2.43-3.18)    | <b>3.41</b><br>(2.96-3.90)    | <b>3.92</b><br>(3.37-4.47)    | <b>4.45</b><br>(3.81-5.09)    | <b>5.01</b><br>(4.25-5.74)    | <b>5.81</b><br>(4.85-6.65)    | <b>6.45</b><br>(5.33-7.41)   |
| <b>4-day</b>   | <b>1.48</b><br>(1.31-1.69)                 | <b>1.89</b><br>(1.67-2.17)    | <b>2.50</b><br>(2.20-2.85)    | <b>2.99</b><br>(2.62-3.41)    | <b>3.69</b><br>(3.22-4.20)    | <b>4.26</b><br>(3.68-4.84)    | <b>4.86</b><br>(4.18-5.53)    | <b>5.50</b><br>(4.68-6.27)    | <b>6.41</b><br>(5.38-7.30)    | <b>7.15</b><br>(5.94-8.17)   |
| <b>7-day</b>   | <b>1.66</b><br>(1.46-1.91)                 | <b>2.13</b><br>(1.86-2.44)    | <b>2.82</b><br>(2.46-3.23)    | <b>3.37</b><br>(2.94-3.87)    | <b>4.16</b><br>(3.60-4.76)    | <b>4.80</b><br>(4.13-5.48)    | <b>5.48</b><br>(4.68-6.26)    | <b>6.20</b><br>(5.25-7.11)    | <b>7.23</b><br>(6.04-8.28)    | <b>8.05</b><br>(6.66-9.25)   |
| <b>10-day</b>  | <b>1.80</b><br>(1.58-2.06)                 | <b>2.30</b><br>(2.02-2.63)    | <b>3.04</b><br>(2.67-3.47)    | <b>3.64</b><br>(3.18-4.15)    | <b>4.47</b><br>(3.89-5.09)    | <b>5.15</b><br>(4.45-5.84)    | <b>5.86</b><br>(5.03-6.66)    | <b>6.61</b><br>(5.63-7.53)    | <b>7.67</b><br>(6.45-8.73)    | <b>8.52</b><br>(7.09-9.72)   |
| <b>20-day</b>  | <b>2.22</b><br>(1.96-2.53)                 | <b>2.86</b><br>(2.52-3.25)    | <b>3.78</b><br>(3.32-4.29)    | <b>4.47</b><br>(3.92-5.07)    | <b>5.41</b><br>(4.73-6.13)    | <b>6.13</b><br>(5.34-6.95)    | <b>6.87</b><br>(5.95-7.80)    | <b>7.62</b><br>(6.56-8.66)    | <b>8.63</b><br>(7.37-9.84)    | <b>9.41</b><br>(7.97-10.7)   |
| <b>30-day</b>  | <b>2.60</b><br>(2.29-2.96)                 | <b>3.35</b><br>(2.95-3.80)    | <b>4.42</b><br>(3.89-5.01)    | <b>5.23</b><br>(4.59-5.92)    | <b>6.32</b><br>(5.53-7.15)    | <b>7.16</b><br>(6.24-8.10)    | <b>8.03</b><br>(6.96-9.07)    | <b>8.91</b><br>(7.67-10.1)    | <b>10.1</b><br>(8.62-11.4)    | <b>11.0</b><br>(9.33-12.5)   |
| <b>45-day</b>  | <b>3.02</b><br>(2.67-3.42)                 | <b>3.89</b><br>(3.44-4.40)    | <b>5.13</b><br>(4.53-5.80)    | <b>6.05</b><br>(5.33-6.84)    | <b>7.26</b><br>(6.38-8.21)    | <b>8.18</b><br>(7.16-9.24)    | <b>9.10</b><br>(7.93-10.3)    | <b>10.0</b><br>(8.69-11.4)    | <b>11.3</b><br>(9.68-12.8)    | <b>12.2</b><br>(10.4-13.9)   |
| <b>60-day</b>  | <b>3.33</b><br>(2.97-3.76)                 | <b>4.31</b><br>(3.83-4.87)    | <b>5.67</b><br>(5.03-6.39)    | <b>6.67</b><br>(5.90-7.51)    | <b>7.96</b><br>(7.02-8.97)    | <b>8.92</b><br>(7.84-10.1)    | <b>9.88</b><br>(8.64-11.1)    | <b>10.8</b><br>(9.43-12.2)    | <b>12.1</b><br>(10.4-13.7)    | <b>13.0</b><br>(11.2-14.8)   |

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

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### PF graphical

PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 33.5885°, Longitude: -111.8902°



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### Maps & aerials

Small scale terrain



**NOAA Atlas 14, Volume 1, Version 5**  
**Location name: Scottsdale, Arizona, USA\***  
**Latitude: 33.5885°, Longitude: -111.8902°**  
**Elevation: 1384.44 ft\*\***



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

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

**PF tabular**

| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)<sup>1</sup></b> |  |                               |                               |                               |                               |                               |                               |                               |                               |                               |
|---|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <b>Duration</b>   | <b>Average recurrence interval (years)</b> |                               |                               |                               |                               |                               |                               |                               |                               |                               |
|   | <b>1</b>                                   | <b>2</b>                      | <b>5</b>                      | <b>10</b>                     | <b>25</b>                     | <b>50</b>                     | <b>100</b>                    | <b>200</b>                    | <b>500</b>                    | <b>1000</b>                   |
| <b>5-min</b>  | <b>2.27</b><br>(1.88-2.77)                 | <b>2.95</b><br>(2.47-3.62)    | <b>3.98</b><br>(3.30-4.87)    | <b>4.79</b><br>(3.95-5.83)    | <b>5.87</b><br>(4.75-7.12)    | <b>6.70</b><br>(5.36-8.06)    | <b>7.55</b><br>(5.94-9.07)    | <b>8.40</b><br>(6.50-10.1)    | <b>9.56</b><br>(7.21-11.5)    | <b>10.4</b><br>(7.72-12.6)    |
| <b>10-min</b>   | <b>1.72</b><br>(1.43-2.11)                 | <b>2.25</b><br>(1.88-2.75)    | <b>3.04</b><br>(2.51-3.71)    | <b>3.64</b><br>(3.01-4.43)    | <b>4.46</b><br>(3.62-5.42)    | <b>5.09</b><br>(4.09-6.13)    | <b>5.74</b><br>(4.52-6.91)    | <b>6.40</b><br>(4.95-7.67)    | <b>7.28</b><br>(5.49-8.74)    | <b>7.95</b><br>(5.87-9.56)    |
| <b>15-min</b>   | <b>1.42</b><br>(1.18-1.74)                 | <b>1.86</b><br>(1.55-2.28)    | <b>2.51</b><br>(2.08-3.06)    | <b>3.01</b><br>(2.48-3.67)    | <b>3.69</b><br>(2.99-4.48)    | <b>4.21</b><br>(3.38-5.07)    | <b>4.75</b><br>(3.74-5.71)    | <b>5.28</b><br>(4.09-6.34)    | <b>6.02</b><br>(4.54-7.22)    | <b>6.57</b><br>(4.86-7.90)    |
| <b>30-min</b>   | <b>0.958</b><br>(0.794-1.17)               | <b>1.25</b><br>(1.05-1.53)    | <b>1.69</b><br>(1.40-2.06)    | <b>2.03</b><br>(1.67-2.47)    | <b>2.48</b><br>(2.01-3.01)    | <b>2.83</b><br>(2.27-3.41)    | <b>3.20</b><br>(2.52-3.84)    | <b>3.56</b><br>(2.75-4.27)    | <b>4.05</b><br>(3.05-4.86)    | <b>4.42</b><br>(3.27-5.32)    |
| <b>60-min</b>   | <b>0.593</b><br>(0.492-0.726)              | <b>0.774</b><br>(0.647-0.949) | <b>1.05</b><br>(0.865-1.28)   | <b>1.25</b><br>(1.03-1.53)    | <b>1.54</b><br>(1.25-1.87)    | <b>1.75</b><br>(1.41-2.11)    | <b>1.98</b><br>(1.56-2.38)    | <b>2.20</b><br>(1.70-2.64)    | <b>2.51</b><br>(1.89-3.01)    | <b>2.74</b><br>(2.02-3.29)    |
| <b>2-hr</b>   | <b>0.347</b><br>(0.292-0.415)              | <b>0.448</b><br>(0.380-0.538) | <b>0.598</b><br>(0.502-0.713) | <b>0.712</b><br>(0.592-0.848) | <b>0.868</b><br>(0.716-1.03)  | <b>0.986</b><br>(0.802-1.17)  | <b>1.11</b><br>(0.886-1.31)   | <b>1.23</b><br>(0.968-1.45)   | <b>1.40</b><br>(1.07-1.65)    | <b>1.53</b><br>(1.15-1.81)    |
| <b>3-hr</b>   | <b>0.257</b><br>(0.216-0.315)              | <b>0.329</b><br>(0.278-0.405) | <b>0.430</b><br>(0.362-0.526) | <b>0.510</b><br>(0.425-0.620) | <b>0.623</b><br>(0.510-0.752) | <b>0.712</b><br>(0.576-0.855) | <b>0.805</b><br>(0.639-0.966) | <b>0.903</b><br>(0.704-1.08)  | <b>1.04</b><br>(0.784-1.24)   | <b>1.14</b><br>(0.845-1.37)   |
| <b>6-hr</b>   | <b>0.155</b><br>(0.133-0.185)              | <b>0.196</b><br>(0.168-0.233) | <b>0.250</b><br>(0.213-0.296) | <b>0.294</b><br>(0.248-0.346) | <b>0.353</b><br>(0.294-0.414) | <b>0.399</b><br>(0.327-0.466) | <b>0.447</b><br>(0.362-0.520) | <b>0.496</b><br>(0.394-0.579) | <b>0.563</b><br>(0.435-0.656) | <b>0.615</b><br>(0.465-0.719) |
| <b>12-hr</b>  | <b>0.086</b><br>(0.074-0.101)              | <b>0.108</b><br>(0.093-0.127) | <b>0.136</b><br>(0.117-0.160) | <b>0.159</b><br>(0.135-0.185) | <b>0.189</b><br>(0.159-0.220) | <b>0.212</b><br>(0.176-0.246) | <b>0.235</b><br>(0.193-0.273) | <b>0.259</b><br>(0.210-0.301) | <b>0.291</b><br>(0.230-0.340) | <b>0.317</b><br>(0.246-0.372) |
| <b>24-hr</b>  | <b>0.050</b><br>(0.044-0.058)              | <b>0.064</b><br>(0.056-0.074) | <b>0.082</b><br>(0.072-0.095) | <b>0.097</b><br>(0.085-0.112) | <b>0.117</b><br>(0.102-0.135) | <b>0.133</b><br>(0.115-0.153) | <b>0.150</b><br>(0.128-0.172) | <b>0.167</b><br>(0.141-0.192) | <b>0.191</b><br>(0.159-0.219) | <b>0.210</b><br>(0.173-0.242) |
| <b>2-day</b>  | <b>0.027</b><br>(0.024-0.031)              | <b>0.034</b><br>(0.030-0.040) | <b>0.045</b><br>(0.039-0.052) | <b>0.053</b><br>(0.046-0.061) | <b>0.065</b><br>(0.056-0.075) | <b>0.074</b><br>(0.064-0.085) | <b>0.084</b><br>(0.072-0.097) | <b>0.094</b><br>(0.080-0.109) | <b>0.109</b><br>(0.090-0.125) | <b>0.120</b><br>(0.098-0.138) |
| <b>3-day</b>  | <b>0.019</b><br>(0.017-0.022)              | <b>0.025</b><br>(0.022-0.028) | <b>0.032</b><br>(0.028-0.037) | <b>0.039</b><br>(0.034-0.044) | <b>0.047</b><br>(0.041-0.054) | <b>0.054</b><br>(0.047-0.062) | <b>0.062</b><br>(0.053-0.071) | <b>0.070</b><br>(0.059-0.080) | <b>0.081</b><br>(0.067-0.092) | <b>0.090</b><br>(0.074-0.103) |
| <b>4-day</b>  | <b>0.015</b><br>(0.014-0.018)              | <b>0.020</b><br>(0.017-0.023) | <b>0.026</b><br>(0.023-0.030) | <b>0.031</b><br>(0.027-0.036) | <b>0.038</b><br>(0.033-0.044) | <b>0.044</b><br>(0.038-0.050) | <b>0.051</b><br>(0.043-0.058) | <b>0.057</b><br>(0.049-0.065) | <b>0.067</b><br>(0.056-0.076) | <b>0.074</b><br>(0.062-0.085) |
| <b>7-day</b>  | <b>0.010</b><br>(0.009-0.011)              | <b>0.013</b><br>(0.011-0.015) | <b>0.017</b><br>(0.015-0.019) | <b>0.020</b><br>(0.017-0.023) | <b>0.025</b><br>(0.021-0.028) | <b>0.029</b><br>(0.025-0.033) | <b>0.033</b><br>(0.028-0.037) | <b>0.037</b><br>(0.031-0.042) | <b>0.043</b><br>(0.036-0.049) | <b>0.048</b><br>(0.040-0.055) |
| <b>10-day</b>   | <b>0.007</b><br>(0.007-0.009)              | <b>0.010</b><br>(0.008-0.011) | <b>0.013</b><br>(0.011-0.014) | <b>0.015</b><br>(0.013-0.017) | <b>0.019</b><br>(0.016-0.021) | <b>0.021</b><br>(0.019-0.024) | <b>0.024</b><br>(0.021-0.028) | <b>0.028</b><br>(0.023-0.031) | <b>0.032</b><br>(0.027-0.036) | <b>0.036</b><br>(0.030-0.041) |
| <b>20-day</b>   | <b>0.005</b><br>(0.004-0.005)              | <b>0.006</b><br>(0.005-0.007) | <b>0.008</b><br>(0.007-0.009) | <b>0.009</b><br>(0.008-0.011) | <b>0.011</b><br>(0.010-0.013) | <b>0.013</b><br>(0.011-0.014) | <b>0.014</b><br>(0.012-0.016) | <b>0.016</b><br>(0.014-0.018) | <b>0.018</b><br>(0.015-0.020) | <b>0.020</b><br>(0.017-0.022) |
| <b>30-day</b>   | <b>0.004</b><br>(0.003-0.004)              | <b>0.005</b><br>(0.004-0.005) | <b>0.006</b><br>(0.005-0.007) | <b>0.007</b><br>(0.006-0.008) | <b>0.009</b><br>(0.008-0.010) | <b>0.010</b><br>(0.009-0.011) | <b>0.011</b><br>(0.010-0.013) | <b>0.012</b><br>(0.011-0.014) | <b>0.014</b><br>(0.012-0.016) | <b>0.015</b><br>(0.013-0.017) |
| <b>45-day</b>   | <b>0.003</b><br>(0.002-0.003)              | <b>0.004</b><br>(0.003-0.004) | <b>0.005</b><br>(0.004-0.005) | <b>0.006</b><br>(0.005-0.006) | <b>0.007</b><br>(0.006-0.008) | <b>0.008</b><br>(0.007-0.009) | <b>0.008</b><br>(0.007-0.010) | <b>0.009</b><br>(0.008-0.011) | <b>0.010</b><br>(0.009-0.012) | <b>0.011</b><br>(0.010-0.013) |
| <b>60-day</b>   | <b>0.002</b><br>(0.002-0.003)              | <b>0.003</b><br>(0.003-0.003) | <b>0.004</b><br>(0.003-0.004) | <b>0.005</b><br>(0.004-0.005) | <b>0.006</b><br>(0.005-0.006) | <b>0.006</b><br>(0.005-0.007) | <b>0.007</b><br>(0.006-0.008) | <b>0.008</b><br>(0.007-0.008) | <b>0.008</b><br>(0.007-0.010) | <b>0.009</b><br>(0.008-0.010) |

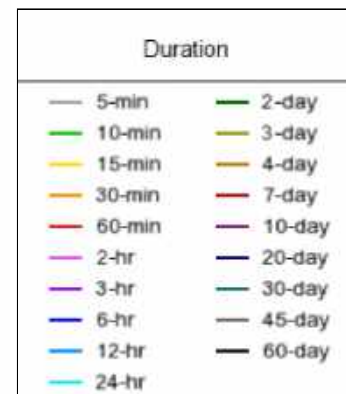
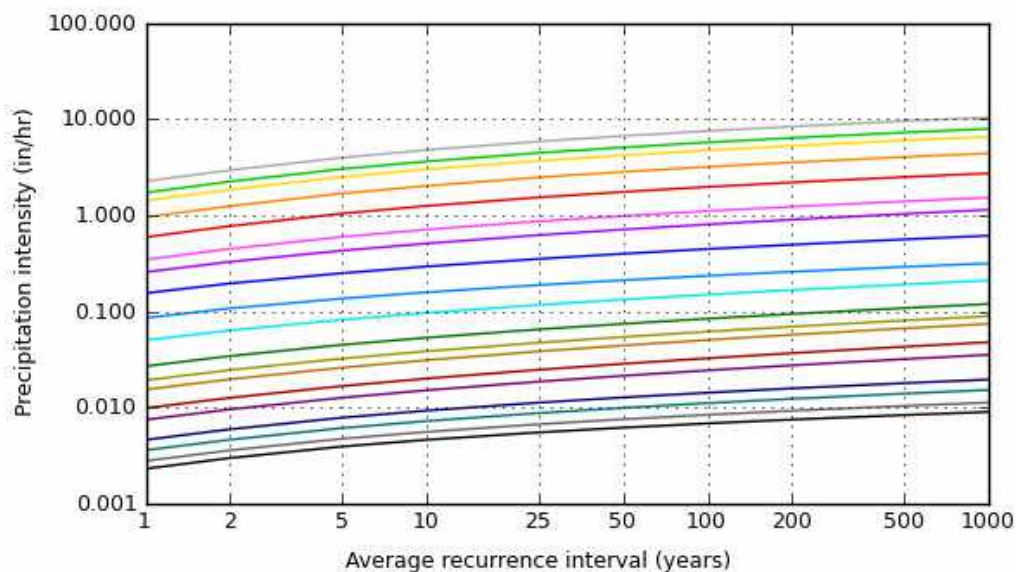
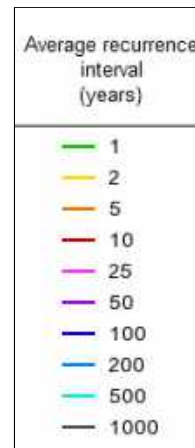
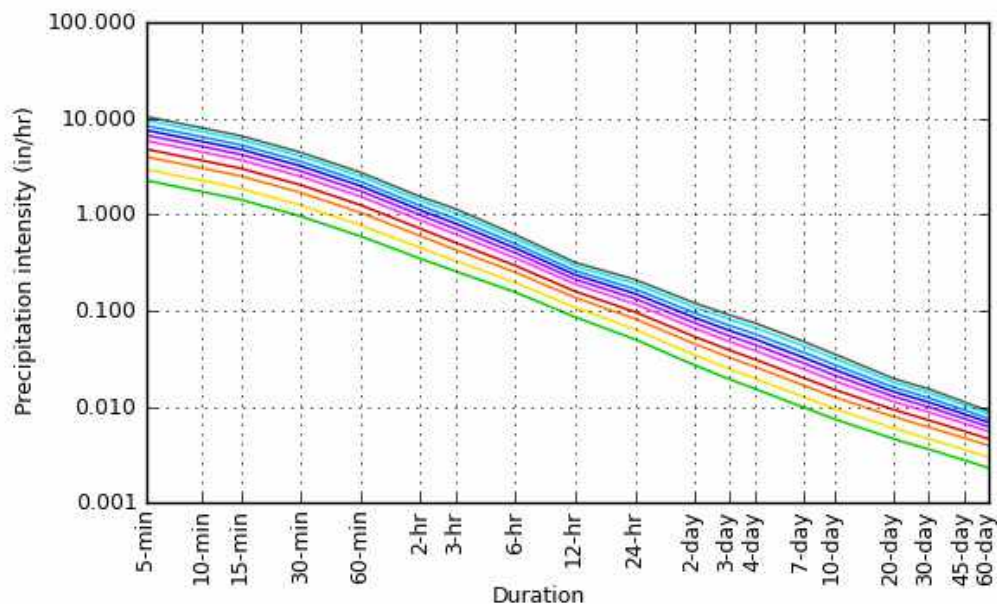
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration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

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### PF graphical

#### PDS-based intensity-duration-frequency (IDF) curves

Latitude: 33.5885°, Longitude: -111.8902°



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### Maps & aerials

Small scale terrain

| <b>WEIGHTED C FACTOR BASED ON SURFACE TYPE FOR AREA C</b> |          |            |
|---|----------|------------|
| Surface Type  | C Factor | Area (sft) |
| Impervious  | 0.95     | 2150       |
| pervious  | 0.5      | 13626      |
| C Weighted  | 0.56     |            |

| <b>WEIGHTED C FACTOR BASED ON SURFACE TYPE FOR AREA A</b> |          |            |
|---|----------|------------|
| Surface Type  | C Factor | Area (sft) |
| Impervious  | 0.95     | 3153       |
| pervious  | 0.5      | 4643       |
| C Weighted  | 0.68     |            |

| <b>WEIGHTED C FACTOR BASED ON SURFACE TYPE FOR AREA B</b> |          |            |
|---|----------|------------|
| Surface Type  | C Factor | Area (sft) |
| Impervious  | 0.95     | 115532     |
| pervious  | 0.5      | 35397      |
| C Weighted  | 0.84     |            |

| <b>WEIGHTED C FACTOR BASED ON SURFACE TYPE FOR AREA D</b> |          |            |
|---|----------|------------|
| Surface Type  | C Factor | Area (sft) |
| Impervious  | 0.95     | 95582      |
| pervious  | 0.5      | 52353      |
| C Weighted  | 0.78     |            |

We have determined most critical inlets per engineering judgment and calculated Q100 for each sub-area.

| <b>RATIONAL METHOD- MOST CRITICAL INLETS</b> |        |        |            |       |                  |                  |
|--|--------|--------|------------|-------|------------------|------------------|
| INLET LABEL                                  | Area   | Area   | C          | Tc    | i <sub>100</sub> | Q <sub>100</sub> |
|  | (sf)   | (acre) | (weighted) | (min) | (in/hr)          | (cfs)            |
| A1   | 7,796  | 0.18   | 0.95       | 5     | 7.55             | 1.28             |
| B1   | 14,712 | 0.34   | 0.95       | 5     | 7.55             | 2.42             |
| B2   | 14,153 | 0.32   | 0.95       | 5     | 7.55             | 2.33             |
| B3   | 18,213 | 0.42   | 0.95       | 5     | 7.55             | 3.00             |
| B4   | 14,596 | 0.34   | 0.95       | 5     | 7.55             | 2.40             |
| B5   | 11,496 | 0.26   | 0.95       | 5     | 7.55             | 1.89             |
| B6   | 9,650  | 0.22   | 0.95       | 5     | 7.55             | 1.59             |
| B7   | 28,434 | 0.65   | 0.95       | 5     | 7.55             | 4.68             |
| B8   | 32,102 | 0.74   | 0.95       | 5     | 7.55             | 5.29             |
| B9   | 7,560  | 0.17   | 0.95       | 5     | 7.55             | 1.24             |
| C1   | 2,273  | 0.05   | 0.95       | 5     | 7.55             | 0.37             |

Q<sub>100</sub> = CIA

C = Runoff Coefficient

I = Rainfall Intensity for 10-minute time-of-concentration

A = Area in acres



Below is a summary of tributary areas that sum to the total site area. Also shown is the retention volume required for each area and volume provided in surface or underground retention basins.

| <b>RETENTION BASIN CALCULATIONS</b> |           |             |      |                    |                |                         |                                 |                             |                       |                   |          |
|-------------------------------------|-----------|-------------|------|--------------------|----------------|-------------------------|---------------------------------|-----------------------------|-----------------------|-------------------|----------|
| Sub-Area (onsite)                   | Area (sf) | Area (acre) | C100 | P100 YR, 2 HR (in) | Vol. Req. (cf) | Surface Vol. Prov. (cf) | Total Tank Length Provided (LF) | Underground Vol. Prov. (cf) | Total Vol. Prov. (cf) | Excess Volume (%) | DRYWELLS |
| A                                   | 7,796.00  | 0.18        | 0.68 | 2.22               | 980.74         | 1,442.0                 | 0.0                             | 0.0                         | 1,442.0               | 47.0              | 0        |
| B                                   | 150,929   | 3.465       | 0.84 | 2.22               | 23,454.4       | 0.0                     | 300.0                           | 23,561.9                    | 23,561.9              | 0.5               | 2        |
| C                                   | 15,776    | 0.362       | 0.56 | 2.22               | 1,634.4        | 1,757.0                 | 0.0                             | 0.0                         | 1,757.0               | 7.5               | 0        |
| D                                   | 147,935   | 3.396       | 0.78 | 2.22               | 21,347.0       | 37,078.0                | 0.0                             | 0.0                         | 37,078.0              | 73.7              | 3        |
| Total                               | 314,640.0 | 7.4         | -    | -                  | 47,416.5       | 40,277.0                | 300.0                           | 23,561.9                    | 63,838.9              | 34.6              | 5        |

**PROPOSED SURFACE BASINS INFORMATION**

| BASIN | HWE  | BOT  | VOL (P) | VOL (R) | TOTAL VOL (P) | DRYWELL* |
|-------|------|------|---------|---------|---------------|----------|
| A     | 80.6 | 79.6 | 1,442   | 1,139   | 1,442         | 0        |
| C1    | 81.4 | 81.0 | 803     | 1,634   | 1,757         | 0        |
| C2    | 82.5 | 82.0 | 106     |         |               | 0        |
| C3    | 82.6 | 82.1 | 848     |         |               | 0        |
| D     | 82.3 | 79.3 | 37,078  | 21,620  | 37,078        | 3        |

\* DRYWELL CALCULATIONS IS BASED ON 0.1 CFS PERCOLATION RATE.

FOR BASINS WITHOUT A DRYWELL, FINAL PERCOLATION RATE AND NUMBER OF DRYWELLS WILL BE DETERMINE AT THE TIME OF CONSTRUCTION.

**EXISTING SURFACE BASIN INFORMATION**

| BASIN | HWE  | BOT  | VOL (P) | VOL (R) | TOTAL VOL (P) |
|-------|------|------|---------|---------|---------------|
| D     | 82.3 | 80.2 | 17,602  | 30,400  | 17,602        |

# APPENDIX C

## Drainage Channel Report and ADOT Plans

0015070

001508

**SPEZDIE**  
**AND ASSOCIATES**  
 GEOTECHNICAL AND SITE ENGINEERS  
 11500 N 54th AVENUE, SUITE 204 • PHOENIX, ARIZONA 85028 • (602) 997-0261

DRAINAGE REPORT

DESIGNATION: Armenian Apostolic Church  
 LOCATION: Pima Road & Cholla Avenue  
 CLIENT: Armenian Apostolic Church  
 PROJECT NO: 880199CA  
 DATE: October 27, 1989



001509

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| EXHIBIT B - Topographic Map .....               | 4           |
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| EXHIBIT E - Retention Volume Calculations ..... | 7           |

**SPEEDIE  
AND ASSOCIATES**  
GEOTECHNICAL AND SITE ENGINEERS  
11029 N. 24th AVE., SUITE 105 - PHOENIX, ARIZONA 85028

**PROJECT LOCATION & DESCRIPTION OF SITE:**

The proposed church site is located in the Northwest 1/4 of the Southwest 1/4 of Section 19, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is located within the city limits of Scottsdale, Arizona, south and east of where the Cholla Drive alignment intersects Pima Road from the east. The area of the site is approximately 3.0 acres (see Exhibit A).

The subject site slopes generally towards the southwest and contains, as a main drainage feature, a natural wash approximately 18 inches deep, and 20 feet wide which runs across the site from the northeast corner to the southwest corner and continues to the south.

There are no existing structures on the site. Vegetation on the site is at present desert brush with 15 percent density. The soil type is class "B", based upon the SCS map provided in the City of Scottsdale Publication "Drainage Report Preparation", Figure 2-14.

**OFFSITE DRAINAGE:**

Runoff flows into the wash at the northeast corner of the site where the south end of 88th Place intersects Cholla Drive. The northern limits of the contributing drainage area is considered to be Jenan Drive, approximately 2,100 feet north of the subject property.

Based on the drainage report for the Ricco Villas #2 subdivision which is to the north of the subject site, the drainage area contributing runoff to the wash was to be 21 acres with a drainage length of 1,700 feet (sub area 1b, Ricco Villas #2 Drainage Report). However, the subdivision as constructed varies somewhat from the original preliminary plat which was the basis for design. The drainage area is now considered to be 26 acres with a drainage length of 2,100 feet. The rational method was used for hydrology calculations for a 100-year and 10-year design frequency (see Exhibits B & C).

001501

001502

**SPEEDIE  
AND ASSOCIATES**  
GEOTECHNICAL / MATERIALS / SITE ENGINEERS  
11229 N. 24th Ave. SUITE 805 - PHOENIX, ARIZONA 85029

PROJECT NO: 880199CA

PAGE 2 OF 2

Present plans for the church site call for the construction of a drainage ditch along the north 16.5 feet of the site which will channel runoff now entering the site from the north towards the west where it will flow into the existing drainage ditch along the east side of Pima Road (see Exhibit D). The west 40 feet of the site is reserved for a drainageway to be installed with the future highway improvements along the Pima Road alignment.

ONSITE DRAINAGE:

A detention basin is to be constructed on the site to retain runoff generated from the proposed development. Total retention volume required for the site is 17,719 cubic feet (see Calculation - Exhibit E). This volume is provided in the proposed basin at a depth of less than two feet. The retained runoff is to be metered into the drainage ditch along Pima Road through a 12-inch pipe (see Grading & Drainage Plan). The maximum level to which water can pond is one foot below the building finish floor.

10.29-A



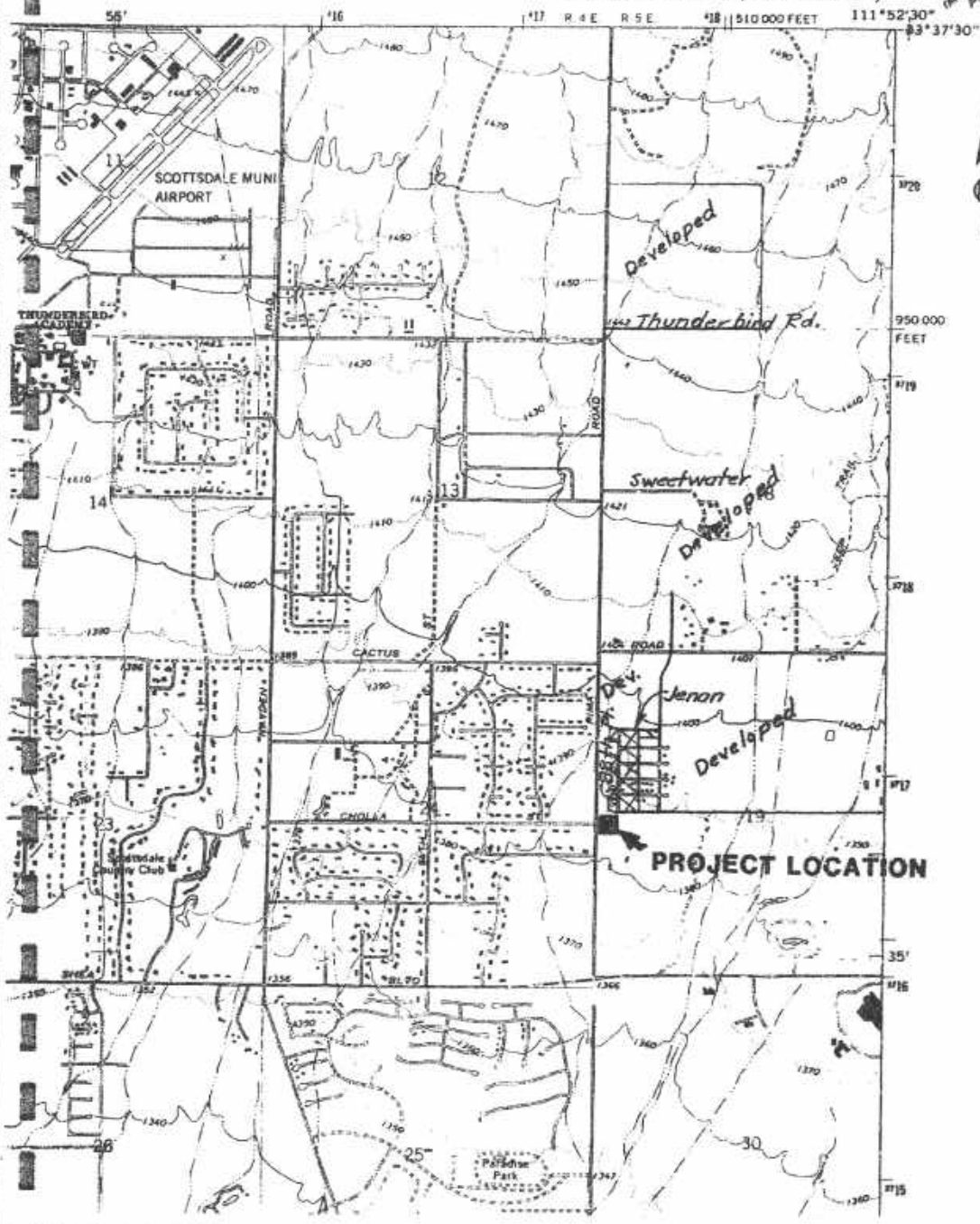
EXHIBIT B

PARADISE VALLEY QUADRANGLE

ARIZONA—MARICOPA CO.

7.5 MINUTE SERIES (TOPOGRAPHIC)

MSL IN THE  
MC DOWELL  
PEAK



001503

001504

EXHIBIT C

ARIZONA HIGHWAY DEPARTMENT  
BRIDGE DIVISION

HYDROLOGIC DESIGN DATA SHEET  
RATIONAL METHOD

LOCATION DATA

Highway Pima Road County Maricopa  
Location N.E. corner Pima Road & Cholla Drive  
Project No. \_\_\_\_\_ Station \_\_\_\_\_  
Name of Stream Street Runoff - Ricco Villas #2 Subdivision

DESIGN DATA

Design Frequency 100 10 years  
Drainage Area A<sub>1</sub> 25 acres  
A<sub>2</sub> acres  
Drainage Length 2,100 feet  
Elevation  
Top of Drainage Area \_\_\_\_\_ feet  
At Structure \_\_\_\_\_ feet  
Drainage Area Slope 0.76 %  
Precipitation  
P = 6-hour \_\_\_\_\_ inches  
P = 24-hour \_\_\_\_\_ inches

DESIGN COMPUTATIONS

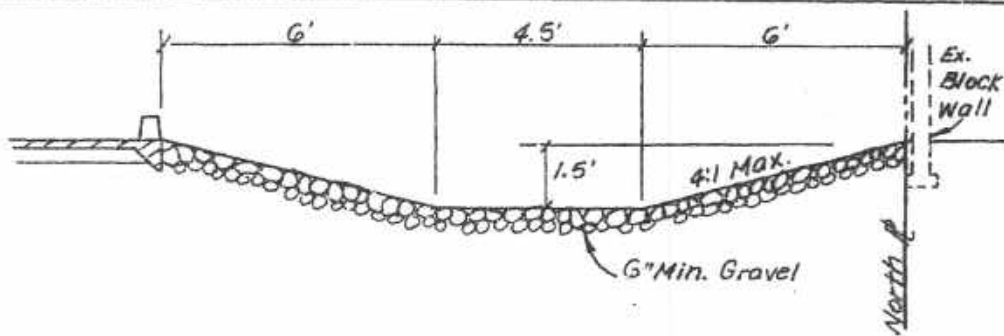
Precipitation  $P_1 = 1\text{-hour}$  2.41 1.61 inches  
Time of Concentration  $T_c$  18 minutes  
Rainfall Intensity  $i$  5.0 3.4 inches/hour  
Curve Numbers  
 $CN_1$  \_\_\_\_\_  
 $CN_2$  \_\_\_\_\_  
Weighted Curve Number  $CN_w$  89 89  
Runoff Coefficient  $C$  0.57 0.44  
Peak Discharge  $Q_p = CiA =$  74 39 cfs

Computed by P. E. Truders Date 10-25-89

**EXHIBIT D**

JOB ARMENIAN APOSTOLIC CHURCH  
 PROJECT NO. 880199CA  
 CALCULATED BY P.E.T. DATE 10-25-89  
 CHECKED BY G.E.S. DATE \_\_\_\_\_  
 SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

**DRAINAGE DITCH CAPACITY**



$$Q = \frac{1.49}{n} A R^{2/3} S_o^{1/2} = \text{cfs}$$

$$n = 0.025 \text{ (gravel)}$$

$$A = (6 \times 1.5) + (4.5 \times 1.5) = 15.75 \text{ s.f.}$$

$$R = \frac{A}{P} = \frac{15.75}{16.87} = 0.934$$

$$S_o = \frac{2}{250} = 0.008 \text{ ft./ft.}$$

$$Q = \frac{1.49}{0.025} (15.75) (0.934)^{2/3} (0.008)^{1/2}$$

$$Q = 80.22 \text{ cfs}$$

10.35-A

001-508

001506

001507

**SPEEDIE AND ASSOCIATES**  
 GEOTECHNICAL AND SITE ENGINEERS  
 1099 N 24th AVE. SUITE 205 - PHOENIX, ARIZONA 85025  
 1401 W IRON AVE. SUITE 108 - MESA, ARIZONA 85207

**EXHIBIT E**

JOB ARMENIAN APOSTOLIC CHURCH

PROJECT NO. 880199CA

CALCULATED BY P.E.T. DATE 10-25-89

CHECKED BY G.E.S. DATE \_\_\_\_\_

SHEET NO. \_\_\_\_\_ OF \_\_\_\_\_

Detention Basin Calculations: 10' ear, 2-hour storm

$$v = \frac{DXA}{12} C_w \quad D = 2.82$$

Area: (excluding drainage ditch along north side and drainage easement east side of Pima Road.)

Total Area = 3 Ac = 130,680 s.f.

A = 130,680 - (17,480 + 3,927) = 109,273 s.f.

C<sub>w</sub>:

|            | A                   | C      |               |
|------------|---------------------|--------|---------------|
| Buildings: | 19,675 s.f.         | = 0.95 | 18,691        |
| Concrete:  | 7,884 s.f.          | = 0.90 | 7,096         |
| Asphalt:   | 31,980 s.f.         | = 0.85 | 27,183        |
| Landscape: | 49,734 s.f.         | = 0.45 | 22,380        |
|            | <u>109,273 s.f.</u> |        | <u>75,350</u> |

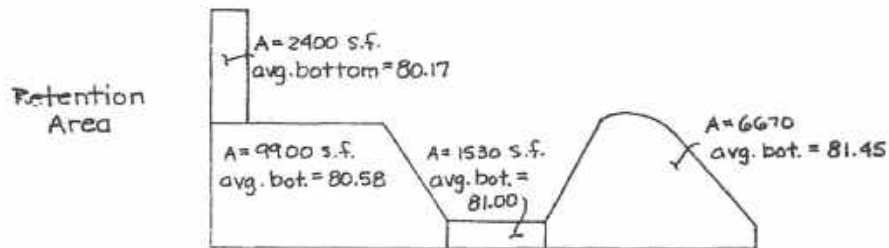
$$C_w = \frac{75,350}{109,273} = \underline{0.69}$$

Volume Required:

$$V_r = \frac{2.82 \times 109,273}{12} \times 0.69$$

$$V_r = \underline{17,719 \text{ cu. ft.}}$$

Volume Provided:



Total A = 20,500 s.f. H.W. = 81.80

$$V_p = (0.35 \times 6670) + (0.8 \times 1530) + (1.22 \times 9900) + (1.63 \times 2400)$$

$$V_p = \underline{19,549 \text{ cu. ft.}}$$

10.35-A

# SPEEDIE AND ASSOCIATES

GEOTECHNICAL AND SITE ENGINEERS

11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029 • (602) 997-8301

JAMES A. SPEEDIE, P.E.  
GREGG A. CREASER, P.E.  
GARY E. STOCKER, P.E.  
STEVEN A. GRIESS, P.E.

## REPORT ON SOIL INVESTIGATION



DESIGNATION: Armenian Apostolic Church  
LOCATION: Pima Road & Cholla Road  
Scottsdale, Arizona  
CLIENT: Armenian Apostolic Church  
of Maricopa County  
PROJECT NO: 880199SA  
DATE: August 15, 1988

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| Soil Conditions . . . . .                  | 1           |
| ANALYSIS AND RECOMMENDATIONS . . . . .     | 2           |
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| Site Preparation . . . . .                 | 2           |
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## INTRODUCTION

This report presents the results of a subsoil investigation carried out at the site of the proposed Armenian Apostolic Church. The site is located on the southeast corner of Cholla and Pima Roads in Scottsdale, Arizona.

Preliminary information calls for the construction of a one or two-story sanctuary, cultural center and gavit (covered outdoor meeting area) to be located generally as shown on the Soil Boring Location Plan, Plate 1. The structures will be slab-on-grade with masonry or wood-frame bearing walls. Structural loads will be light to moderate and no special considerations regarding settlement tolerance are known. Adjacent areas will be landscaped or paved to support moderate passenger and light commercial traffic. Landscaped areas will be utilized for storm water retention and disposal.

## GENERAL SITE AND SOIL CONDITIONS

Site Conditions - The rectangularly shaped site is approximately 3.9 acres in size and is bounded on the west by Pima Road, on the north by Cholla Road, and on the south and east by undeveloped desert. At the time of the investigation the site was covered with moderately thick desert vegetation. Several ephemeral drainage channels intersect the site in a generally northeast to southwest direction. Several moderately graded dirt roads pass through the site. There was no evidence of any previous structural fills or foundations.

Soil Conditions - Subsoil conditions at the site are relatively uniform throughout. The upper 3.0 to 8.0 feet consists of firm to very stiff, brown to red-brown silt, sandy silt and clayey silt. Variable trace gravel and cementation is also present in this stratum. Moisture contents range from 3 to 5 percent and plastic limits range from non-plastic to 17 percent. In-place dry densities are on the order of 93 to 102 PCF. These soils exhibit a Standard Penetration Resistance (SPT) of 7 to 18 blows per foot. Swell tests indicate that the surface soils have a low potential for volume increase due to wetting when compacted to moistures and densities expected during construction.

The upper 3.0 to 8.0 feet is underlain by medium dense to very dense, brown to red-brown clayey sand and gravelly sand and hard, brown to red-brown sandy clay. Moisture contents are on the order of 3 percent and in-place densities are on the order of 108 PCF. This stratum exhibits a Standard Penetration Resistance of 15 to 50-plus blows per foot.

All borings were dry upon completion and groundwater is not reported to be shallow in this area. Therefore, groundwater should not be a factor in the design or construction of shallow foundations.

#### ANALYSIS AND RECOMMENDATIONS

Analysis - Analysis of the field and laboratory data indicates that subsoils at the site are favorable for the support of the proposed structures, provided that the upper foundation soils are stabilized by overexcavation and recompaction.

Site Preparation - The entire area to be occupied by the proposed construction should be stripped of all vegetation, debris, rubble and obviously loose surface soils. In addition, the native soils should be overexcavated to a depth of 18 inches below proposed footing elevation and extending at least 2.0 feet beyond the footing edges. The native soils may be saved for replacement in these excavations.

Prior to placing structural fill below footing bottom elevation, the exposed subgrade should be scarified to a depth of 8 inches, moisture conditioned to optimum ( $\pm 2$  percent) and compacted to at least 95 percent of maximum dry density as determined by ASTM D-698. Pavement areas should be treated in a similar manner.

All cut areas and areas above footing bottom elevation that are to receive floor slab fill should be scarified 8 inches, moisture conditioned to optimum ( $\pm 2$  percent) and uniformly compacted to 95 percent of maximum dry density.

Foundation Design - It is recommended that the structure be founded on shallow spread footings bearing on properly compacted fill at a minimum depth of 18 inches below finished exterior grade. If site preparation is carried out as set forth herein, a recommended safe allowable bearing capacity of 2,500 psf can be utilized for design. This bearing capacity refers to the total of all loads, dead and live, and is a net pressure. It may be increased one-third for wind, seismic or other loads of short duration. All footing excavations should be level and cleaned of all loose or disturbed materials. Positive drainage away from the proposed buildings must be maintained at all times.

Continuous wall footings and isolated rectangular footings should be designed with minimum widths of 16 and 24 inches respectively, regardless of the resultant bearing pressure. Lightly loaded interior partitions (less than 800 plf) may be supported on reinforced thickened slab sections (minimum 12 inches of bearing width).

Estimated settlements under design loads are on the order of 1/2-inch, virtually all of which will occur during construction. Post-construction differential settlements will be negligible, under existing and compacted moisture contents. Additional localized settlements of the same magnitude could occur if native supporting soils were to experience a significant increase in moisture content. Positive drainage away from structures, and controlled routing of roof runoff should be provided to prevent ponding adjacent to perimeter walls. Planters requiring heavy watering should be considered in this regard. Care should be taken in design and construction to insure that domestic and interior storm drain water is contained to prevent seepage.

Continuous footings and stem walls should be reinforced to distribute stresses arising from small differential movements, and long walls should be provided with control joints to accommodate these movements. Reinforcement and control joints are suggested to allow slight movement and prevent minor floor slab cracking.

Lateral Pressures - The following lateral pressure values may be utilized for the proposed construction:

Active Pressure

|                    |        |
|--------------------|--------|
| Unrestrained Walls | 35 PCF |
| Restrained Walls   | 60 PCF |

Passive Pressure

|                     |         |
|---------------------|---------|
| Continuous Footings | 350 PCF |
| Spread Footings     | 400 PCF |

Coefficient of Friction

|                          |      |
|--------------------------|------|
| With Passive Pressure    | 0.35 |
| Without Passive Pressure | 0.45 |

All backfill must be compacted to not less than 95 percent (ASTM D-698) to mobilize these passive values at low strain.

Fill and Backfill - Native soils are suitable for use in grading fills. If imported common fill for use in site grading is required, it should be examined by a Soils Engineer to ensure that it is of low swell potential and free of organic or otherwise deleterious material. In general, the fill should have 100 percent passing the 3-inch sieve and no more than 60 percent passing the 200 sieve. For the fine fraction (passing the 40 sieve), the liquid limit and plasticity index should not exceed 30 percent and 10 percent, respectively. It should exhibit less than 1.5 percent swell potential when compacted to 95 percent of maximum dry density (ASTM D-698) at a moisture content of 2 percent below optimum, confined under a 100 psf surcharge, and inundated.

Fill should be placed on subgrade which has been properly prepared and approved by a Soils Engineer. Fill must be wetted and thoroughly mixed to achieve optimum moisture content,  $\pm 2$  percent (optimum to  $+3$  percent for underslab fill). Fill should be placed in horizontal lifts of 8-inch thickness (or as dictated by compaction equipment) and compacted to the percent of maximum dry density per ASTM D-698 set forth as follows:

|    |  |     |
|----|--|-----|
| A. | Building Areas                             |     |
| 1. | Below footing level                        | 95  |
| 2. | Below slabs-on-grade (non-expansive soils) | 95  |
| B. | Pavement Subgrade or Fill                  | 95  |
| C. | Utility Trench Backfill                    |     |
| 1. | More than 1.5' below finish S/G            | 90  |
| 2. | Within 1.5' of finish S/G                  | 95  |
| D. | Aggregate Base Course                      |     |
| 1. | Below floor slabs                          | 95  |
| 2. | Below asphalt paving                       | 100 |
| E. | Landscape Areas                            |     |
| 1. | Miscellaneous fill                         | 90  |
| 2. | Utility trench - more than 1.0' below F/G  | 85  |
| 3. | Utility trench - within 1.0' of F/G        | 90  |

Utilities Installation - Trench excavations for utilities can be accomplished by conventional trenching equipment. Trench walls will stand near-vertically for the short periods of time required to install utilities. If trenches are greater than shoulder-height, precautions must be taken to protect workmen.

Backfill of trenches may be carried out with native excavated material. This material should be moisture-conditioned, placed in 8 inch lifts and mechanically compacted. Water settling is not recommended. Compaction requirements are summarized in the "Fill And Backfill" section of this report.

Although backfilling in compacted lifts is preferred to minimize pavement settlements, it is seldom achieved by local contractors. A less desirable, but more expedient process would involve backfill of trenches to 18 inches below finish subgrade, jetting as set forth in Section 601 of the M.A.G. Specification, and allowing time for moisture stabilization. The surface should then be thoroughly wheel-rolled to provide stable conditions. The upper 18 inches should then be placed in two moisture-conditioned lifts and compacted to not less than 95 percent of maximum dry density.

Slabs-On-Grade - To facilitate fine grading operations and aid in concrete curing, a 4-inch thick layer of granular material conforming to the gradation for Aggregate Base Course (A.B.C.) as per M.A.G. Specification Section 702 should be utilized beneath the slab. Dried subgrade soils should be moistened prior to placing the A.B.C.

Asphalt Pavement - If earthwork in paved areas is carried out to finish subgrade elevation as set forth herein, the subgrade will provide adequate support for pavements.

For pavement areas to be used primarily for passenger traffic and parking, our experience in the area indicates that a minimum of 2.0 inches of asphalt over 4.0 inches of aggregate base course will provide satisfactory service; heavy duty areas should be 2.5 inches of asphalt over 5.0 inches of base. This assumes that all subgrades are prepared in accordance with the recommendations contained in the "Site Preparation" and "Fill and Backfill" sections of this report, and paving operations carried out in a proper manner. If pavement subgrade preparation is not carried out immediately prior to paving, the entire area should be proof-rolled at that time with a heavy pneumatic-tired roller to identify locally unstable areas for repair.

Pavement base course material should be A.B.C. per M.A.G. Section 702 Specifications. Asphalt concrete materials and mix design should conform to M.A.G. 710. It is recommended that mix designation C-3/4 be used for the pavements. While this mix has a somewhat rougher texture, it offers more stability. Pavement installation should be carried out under applicable portions of M.A.G. Section 321.

#### GENERAL

The scope of this investigation and report does not include regional considerations such as seismic activity and ground fissures resulting from subsidence due to groundwater withdrawal, nor any considerations of hazardous releases or toxic contamination of any type.

Our analysis of data and the recommendations presented herein are based on the assumption that soil conditions do not vary significantly from those found at specific sample locations. Our work has been

performed in accordance with generally accepted engineering principles and practice; this warranty is in lieu of all other warranties expressed or implied.

We recommend that a Soils Engineer monitor the earthwork and foundation portions of this project to ensure compliance to project specifications and the field applicability of subsurface conditions which are the basis of the recommendations presented in this report. If any significant changes are made in the scope of work or type of construction that was assumed in this report, we must review such revised conditions to confirm our findings if the conclusions and recommendations presented herein are to apply.

Respectfully submitted,



Stephen J. Smelser, Geologist



James A. Speedie, P.E.

August 15, 1988

APPENDIX

FIELD AND LABORATORY INVESTIGATION . . . . . Page 1 of 1

SOIL BORING LOCATION PLAN . . . . . Plate 1

SOIL LOG LEGEND . . . . . Plate 2

LOG OF TEST BORING: Boring No. B-1 . . . . . Figure No. 1  
                          Boring No. B-2 . . . . . Figure No. 2  
                          Boring No. B-3 . . . . . Figure No. 3  
                          Boring No. B-4 . . . . . Figure No. 4  
                          Boring No. B-5 . . . . . Figure No. 5

TABULATION OF TEST DATA . . . . . Figure No. 6

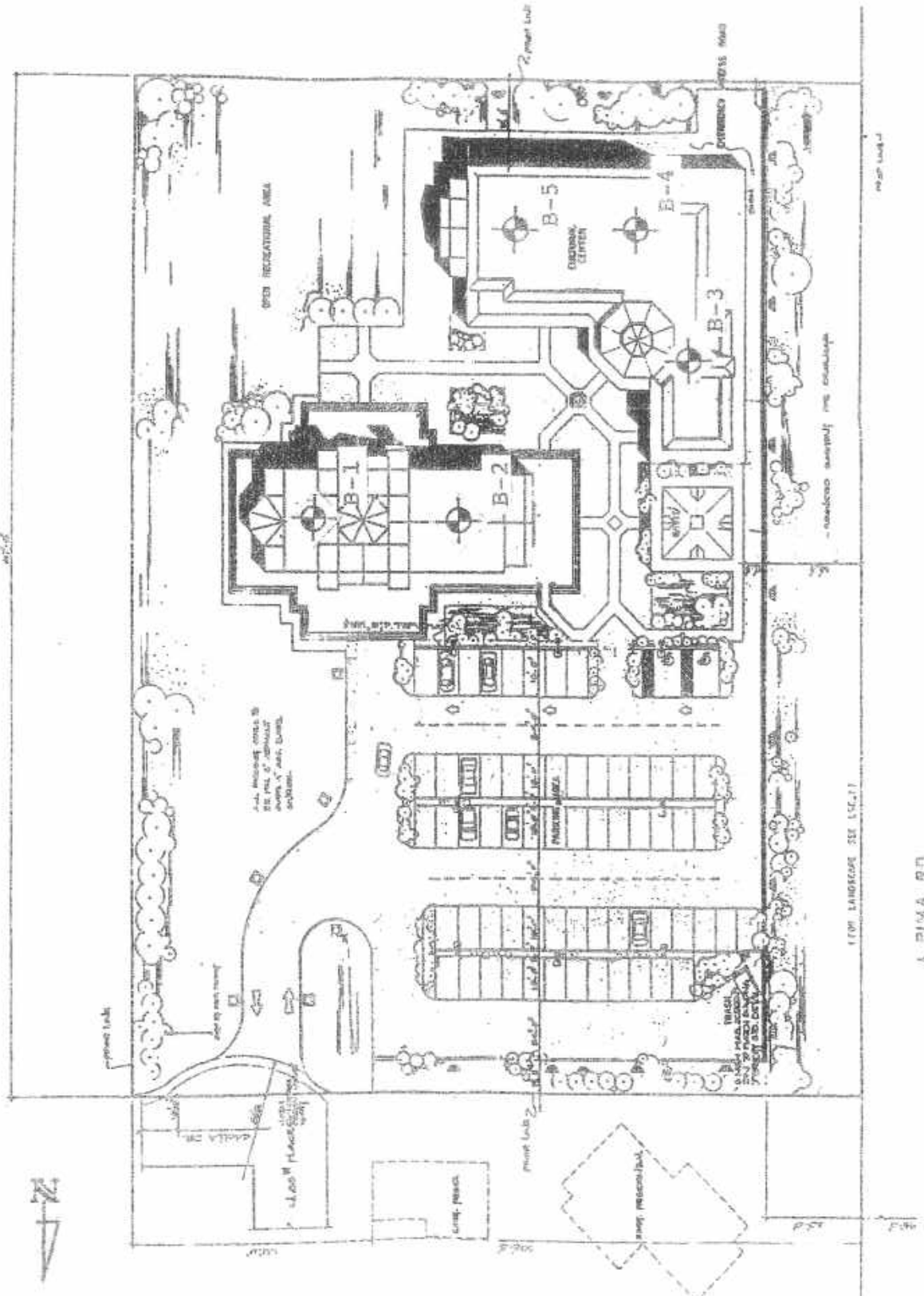
CONSOLIDATION DATA . . . . . Figure No. 7

SWELL TEST DATA . . . . . Figure No. 8

FIELD AND LABORATORY INVESTIGATION

On July 21, 1988, five soil test borings were drilled at the approximate locations shown on the attached Soil Boring Location Plan, Plate 1. All exploration work was carried out under the full-time supervision of our engineer, who recorded subsurface conditions and obtained samples for laboratory testing. The soil borings were advanced with a truck-mounted Mobile B-61 drill rig utilizing 7.0 inch diameter hollow stem flight augers. Detailed information regarding the borings and samples obtained can be found on an individual Log of Test Boring prepared for each drilling location.

Laboratory testing consisted of moisture content, dry density, grain-size distribution and plasticity (Atterberg Limits) tests for classification and pavement design parameters. Compression tests were performed on a selected ring sample in order to estimate settlements and determine effects of inundation. Remolded swell tests were performed on samples compacted to densities and moisture contents expected during construction. All field and laboratory data is presented in this Appendix as Figures No. 1 through 8.



**SPEEDIES AND ASSOCIATES**  
 GEOTECHNICAL AND SITE ENGINEERS  
 PROJECT NO. 880199SA

SOIL BORING LOCATION PLAN  
 ARMENIAN APOSTOLIC CHURCH  
 PIMA RD. & CHOLLA RD.  
 SCOTTSDALE, ARIZONA

Soil Boring Location

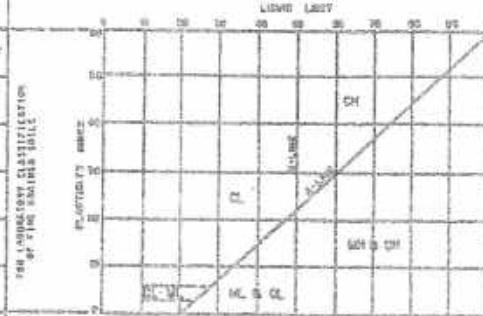
# SOILS CLASSIFICATION CHART

| MAJOR DIVISIONS      |  | GRAPH SYMBOL                                    | LETTER SYMBOLS   | TYPICAL DESCRIPTIONS   |
|----------------------|--|---|--|--|
| COARSE GRAINED SOILS | MORE THAN 50% OF GRAIN SIZE IS LARGER THAN NO. 20 (75 μm)  | GRAVEL WITH OR WITHOUT FINE SAND                | GW   | WELL-SORTED GRAVEL, SAND, SILT AND CLAY, LITTLE OR NO FINE                   |
|                      |  |   | GP   | POORLY-SORTED GRAVEL, SAND, SILT AND CLAY, LITTLE OR NO FINE                 |
|                      | MORE THAN 50% OF GRAIN SIZE IS LARGER THAN NO. 40 (425 μm) | GRAVEL WITH SAND                                | GM   | SILT GRAVEL, SAND, SILT AND CLAY, LITTLE OR NO FINE                          |
|                      |  |   | GC   | STONY GRAVEL, SAND, SILT AND CLAY, LITTLE OR NO FINE                         |
| FINE GRAINED SOILS   | MORE THAN 50% OF GRAIN SIZE IS LARGER THAN NO. 20 (75 μm)  | CLEAN SAND (LITTLE OR NO FINE)                  | SM   | WELL-SORTED SAND, GRAVELLY SAND, LITTLE OR NO FINE                           |
|                      |  |   | SP   | POORLY-SORTED SAND, GRAVELLY SAND, LITTLE OR NO FINE                         |
|                      | MORE THAN 50% OF GRAIN SIZE IS LARGER THAN NO. 40 (425 μm) | SAND WITH FINE SAND (APPROXIMATE RATIO OF FINE) | SM   | SILTY SAND, SAND-SILT MIXTURES   |
|                      |  |   | SC   | CLAYEY SAND, SAND-CLAY MIXTURES  |
| FINE GRAINED SOILS   | MORE THAN 50% OF GRAIN SIZE IS LARGER THAN NO. 20 (75 μm)  | SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)     | ML   | INORGANIC SILTS AND CLAYS, FINE SAND, SILT, SILT AND CLAY, SLIGHT PLASTICITY |
|                      |  |   | CL   | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, SILTY CLAY, SILT AND CLAY       |
|                      | MORE THAN 50% OF GRAIN SIZE IS LARGER THAN NO. 20 (75 μm)  | SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)  | OL   | ORGANIC SILTS AND CLAYS, SILTY CLAY OF LOW PLASTICITY                        |
|                      |  |   | OH   | ORGANIC SILTS, RECENTLY DEPOSITED, WITH SOME SILTY FINE SAND                 |
| FINE GRAINED SOILS   | SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)             | CH  | ORGANIC CLAYS OF HIGH PLASTICITY, ASH CLAY                   |  |
|                      |  | OH  | ORGANIC CLAYS OF HIGH TO VERY HIGH PLASTICITY, ORGANIC SILTS |  |
| HEAVY BULKED SOILS   |  |   | PT   | PEAT, MARL, SWAMP SOILS WITH HIGH ORGANIC CONTENTS                           |

## GRADATION CHART

| MATERIAL SIZE   | PARTICLE SIZE   |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|-----------------|
|                 | LOWER LIMIT     |                 | UPPER LIMIT     |                 |
|                 | PERCENT PASSING | PERCENT PASSING | PERCENT PASSING | PERCENT PASSING |
| SAND            | 75 μm           | 5-15            | 40-60           | 5-15            |
|                 | 425 μm          | 25-75           | 85-100          | 5-15            |
| GRAVEL          | 75 μm           | 100             | 100             | 100             |
|                 | 4.75 mm         | 100             | 100             | 100             |
| COARSELY GRADED | 75 μm           | 100             | 100             | 100             |
|                 | 4.75 mm         | 100             | 100             | 100             |

## PLASTICITY CHART



|            | CONSISTENCY   |           | RELATIVE DENSITY |                 |
|------------|---------------|-----------|------------------|-----------------|
|            | CLAYS & SILTS | BLWS/FOOT | STANDARD         | SANDS & GRAVELS |
| VERY SOFT  | 0-2           | 0-1       | 0-1              | VERY LOOSE      |
| SOFT       | 2-4           | 1-3       | 1-3              | LOOSE           |
| FIRM       | 4-8           | 3-6       | 3-6              | MEDIUM DENSE    |
| STIFF      | 8-15          | 6-10      | 6-10             | DENSE           |
| VERY STIFF | 15-30         | 10-20     | 10-20            | VERY DENSE      |
| HARD       | 30-50         | 20-40     | 20-40            |                 |

\* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch I.D. (1-3/8 inch O.D.) split spoon (ASTM D-1586).  
 † Unconfined compressive strength in tons/sq. ft. Read from penetrometer.

| SAMPLE DESIGNATION | PENETRATION RESISTANCE SYMBOL | DESCRIPTION  |
|--------------------|-------------------------------|--|
| Bg                 | -                             | Large Bulk Sample  |
| BS                 | -                             | Misc. Grab Sample - Bottle or Bag  |
| AS                 | -                             | Auger Sample - A grab sample taken directly from auger flights   |
| S                  | ⊙                             | Spoon Sample - Standard Penetration Test (ASTM D-1586)-Driving a 2.0-inch outside diameter, 1 3/8-inch inside diameter split spoon sampler into undisturbed soil for three successive 6-inch increments of penetration by means of a 140-pound weight falling freely through a distance of 30 inches. The cumulative number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N). |
| LS                 | ⊙                             | Liner Sample - Standard Penetration Test-Driving a 2.0-inch outside diameter split spoon, equipped with two, 3-inch long by 1 3/8-inch inside diameter brass liners, separated by a 1-inch long spacer, into undisturbed soil as above.  |
| RS                 | ⊙                             | Ring Sample - Driving a 3.0-inch outside diameter spoon, equipped with a series of 2.42-inch inside diameter, 1-inch long brass rings, into undisturbed soil for one 12-inch increment by means of a 140-pound weight falling freely through a distance of 30 inches. The blows required for the 12 inches of penetration are recorded.  |
| ST                 | -                             | Shelby Tube - A 3.0-inch outside diameter thin-walled tube continuously pushed into undisturbed soil by a rapid motion, without impact or twisting. (ASTM D-1587)  |
| -                  | ⊞                             | Continuous Penetration Resistance (Bulldoze) - Driving a 2.0-inch outside diameter "Bulldoze penetrometer" continuously into undisturbed soil by means of a 140-pound weight falling freely through a distance of 30 inches. The blows for each successive 12-inch increment are recorded.   |

NOTE: The classification lines shown on the top of test borings and/or Test Pit represent the approximate boundary between soil types, and the transition may be gradual.

SOIL LOG  
LOGNO

SPEEDE & ASSOCIATES  
ENGINEERS AND SURVEYORS  
1400 WEST 24TH AVENUE, SUITE 200  
DENVER, COLORADO 80202

| SOIL DESCRIPTION   | SAMPLE NUMBER | ELEVATION OF SAMPLE TIP | NATURAL WATER CONTENT (%) | IN-PLACE DRY DENSITY (P.C.F.) | STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT |    |    |
|--|---------------|-------------------------|---------------------------|-------------------------------|--|----|----|
|  |               |                         |                           |                               | 0  | 25 | 50 |
| GROUND SURFACE ELEVATION: <u>N/A</u>   |               |                         |                           |                               |  |    |    |
| Stiff Brown SANDY SILT (ML - Dry) With A Trace Of Gravel.<br>3.0'  | RS-1          | 2.0                     | 4.3                       | 93.9                          |  |    |    |
| Medium Dense Brown SAND (SM - Dry) With A Trace Of Silt And Gravel.<br>8.5'  | S-2           | 5.5                     | 4.6                       | -                             |  |    |    |
| Dense Brown CLAYEY SAND (SC - Dry) With A Trace Of Gravel, Air Voids And Weak Cementation.<br>12.5'                | S-3           | 10.5                    | -                         | -                             |  |    |    |
| Dense Light Brown And White Mottled SAND (SP - Dry) With A Trace Of Clay And Gravel And Weak Cementation.<br>18.5' | S-4           | 15.5                    | -                         | -                             |  |    |    |
| Very Dense Light Brown CLAYEY SAND (SC - Dry) With A Trace Of Gravel And Strong Cementation.<br>19.8'              | S-5           | 19.8                    | -                         | -                             | 95   | 10 |    |
| END OF BORING  |               |                         |                           |                               |  |    |    |

\* Sample Depth

BORING STARTED: 07-21-88  
 BORING COMPLETED: 07-21-88  
 FIELD ENGINEER/TECHNICIAN: S. Smalser  
 DRILLER: D. Ulises  
 CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry  
 NUMBERS OF HOURS AFTER COMPLETION:

|   |                |
|---|----------------|
| <b>SPEEDIE AND ASSOCIATES</b>   |                |
| LOG OF TEST BORING NUMBER B-1   |                |
| ARMENIAN APOSTOLIC CHURCH<br>PIMA ROAD & CHOLLA ROAD<br>SCOTTSDALE, ARIZONA |                |
| APPROVED: <u>SSS</u>  | DATE: 08-12-88 |
| PROJECT NO: 880199SA  | FIGURE NO: 2   |

ELEVATION (FEET)

| GROUND SURFACE ELEVATION: <u>N/A</u>  |  | *             |                         |                           |                               |  |
|---|--|---------------|-------------------------|---------------------------|-------------------------------|--|
| SOIL DESCRIPTION  |  | SAMPLE NUMBER | ELEVATION OF SAMPLE TIP | NATURAL WATER CONTENT (%) | IN-PLACE DRY DENSITY (P.C.F.) | STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT |
|   |  |               |                         |                           |                               | 0      25      50                              |
| Stiff Brown SANDY SILT (ML - Dry) With A Trace Of Gravel.<br><span style="float: right;">3.0'</span>  |  | S-1           | 2.5                     | 3.7                       | -                             |  |
| Medium Dense Red-Brown GRAVELLY SAND (SP - Dry).<br><span style="float: right;">8.0'</span>   |  | RS-2          | 5.0                     | 2.8                       | 107.8                         |  |
| Very Dense Brown And White Mottled CLAYEY SAND (SC - Dry) With A Trace Of Air Voids And Weak Cementation.<br><span style="float: right;">10.5'</span> |  | S-3           | 10.5                    | -                         | -                             |  |
| END OF BORING   |  |               |                         |                           |                               |  |

\* Sample Depth

BORING STARTED: 07-21-88  
 BORING COMPLETED: 07-21-88  
 FIELD ENGINEER/TECHNICIAN: S. Smelser  
 DRILLER: D. Ulsee  
 CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry

NUMBERS OF HOURS AFTER COMPLETION:

|   |                |
|---|----------------|
| <b>SPEEDIE AND ASSOCIATES</b>   |                |
| LOG OF TEST BORING NUMBER B-2   |                |
| ARMENIAN APOSTOLIC CHURCH<br>PIMA ROAD & CHOLLA ROAD<br>SCOTTSDALE, ARIZONA |                |
| APPROVED: <u>SSS</u>  | DATE: 08-12-88 |
| PROJECT NO: 880199SA  | FIGURE NO: 2   |

GROUND SURFACE ELEVATION: N/A  
 SOIL DESCRIPTION

| SAMPLE NUMBER | ELEVATION OF SAMPLE TIP | NATURAL WATER CONTENT (%) | IN-PLACE DRY DENSITY (P.C.F.) | STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT |       |
|---------------|-------------------------|---------------------------|-------------------------------|--|-------|
|               |                         |                           |                               | 0  | 25 50 |
| RS-1          | 2.0                     | 4.3                       | 92.9                          |  |       |
| S-2           | 5.5                     | -                         | -                             |  |       |
| S-3           | 10.5                    | -                         | -                             | 59   | 12"   |

Stiff Brown SILT (ML - Dry) With A Trace Of Sand And Gravel.  
 3.0'

Very Stiff Red-Brown SANDY SILT (ML - Dry) With A Trace Of Air Voids And Weak Cementation.  
 8.0'

Hard Red-Brown SANDY CLAY (CL - Dry) With Moderate Cementation.  
 10.5'

END OF BORING

ELEVATION (FEET)

\* Sample Depth

BORING STARTED: 07-21-88  
 BORING COMPLETED: 07-21-88  
 FIELD ENGINEER/TECHNICIAN: S. Smelser  
 DRILLER: D. Ulser  
 CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry  
 NUMBERS OF HOURS AFTER COMPLETION:

**SPEEDIE AND ASSOCIATES**

LOG OF TEST BORING NUMBER B-3

ARMENIAN APOSTOLIC CHURCH  
 PIMA ROAD & CHOLLA ROAD  
 SCOTTSDALE, ARIZONA

|                             |                     |
|-----------------------------|---------------------|
| APPROVED: <u>SSS</u>        | DATE: 08-12-88      |
| PROJECT NO: <u>880199SA</u> | FIGURE NO: <u>3</u> |

ELEVATION (FEET)

| GROUND SURFACE ELEVATION: <u>N/A</u>   |  | SAMPLE NUMBER | ELEVATION OF SAMPLE TIP | NATURAL WATER CONTENT (%) | IN-PLACE DRY DENSITY (P.C.F.) | STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT |          |
|--|--|---------------|-------------------------|---------------------------|-------------------------------|--|----------|
| SOIL DESCRIPTION   |  |               |                         |                           |                               | 0 25 50  |          |
| Firm Brown SILT (ML - Dry) With A Trace Of Sand And Gravel.<br>3.5'  |  | S-1           | 2.5                     | -                         | -                             |  |          |
|  |  | BS-2          | 3.0                     | -                         | -                             |  |          |
| Very Stiff Brown CLAYEY SILT (ML - Dry) With A Trace Of Sand And Gravel.<br>8.0'   |  | S-3           | 5.5                     | -                         | -                             |  |          |
|  |  | S-4           | 10.5                    | -                         | -                             |  |          |
| Dense Light Brown SILTY SAND (SM - Dry).<br>13.0'  |  | S-5           | 15.5                    | -                         | -                             |  | 59/12" → |
|  |  | S-6           | 19.5                    | -                         | -                             |  | 50/6" →  |
| Very Dense Light Brown CLAYEY SAND (SC - Dry) With A Trace Of Gravel And Caliche.<br>16.0'                                 |  |               |                         |                           |                               |  |          |
| Hard Light Brown And White Mottled CLAY (CL - Dry) With A Trace Of Gravel And Air Voids And Moderate Cementation.<br>19.5' |  |               |                         |                           |                               |  |          |
| END OF BORING  |  |               |                         |                           |                               |  |          |

\* Sample Depth

BORING STARTED: 07-21-88  
 BORING COMPLETED: 07-21-88  
 FIELD ENGINEER/TECHNICIAN: S. Smelser  
 DRILLER: D. Ulser  
 CONTRACTOR: Heber Mining

☐ WATER LEVEL IN HOLE AT Dry  
 NUMBERS OF HOURS AFTER COMPLETION:

|   |                |
|---|----------------|
| <b>SPEEDIE AND ASSOCIATES</b>   |                |
| LOG OF TEST BORING NUMBER B-4   |                |
| ARMENIAN APOSTOLIC CHURCH<br>PIMA ROAD & CHOLLA ROAD<br>SCOTTSDALE, ARIZONA |                |
| APPROVED: <u>SSS</u>  | DATE: 08-12-88 |
| PROJECT NO: 880199SA  | FIGURE NO: 4   |

| GROUND SURFACE ELEVATION: <u>N/A</u> |   | SAMPLE NUMBER | ELEVATION OF SAMPLE TIP | NATURAL WATER CONTENT (%) | IN-PLACE DRY DENSITY (P.C.F.) | STANDARD PENETRATION NUMBER (N) BLOWS PER FOOT |
|--------------------------------------|---|---------------|-------------------------|---------------------------|-------------------------------|--|
| SOIL DESCRIPTION                     |   |               |                         |                           |                               | 0 25 50  |
|                                      | Firm Light Brown SILT (ML - Dry) With A Trace Of Gravel.<br>3.5'                                | RS-1          | 2.0                     | 5.1                       | 101.7                         |  |
|                                      | Very Stiff Red-Brown CLAYEY SILT (ML - Dry) With A Trace Of Sand, Gravel And Air Voids.<br>8.0' | S-2           | 5.5                     | -                         | -                             |  |
|                                      | Medium Dense Red-Brown GRAVELLY SAND (SP - Dry).<br>13.0'                                       | S-3           | 10.5                    | -                         | -                             |  |
|                                      | Dense Light Brown GRAVELLY SAND (SP - Dry) With A Trace Of Caliche.<br>15.5'                    | S-4           | 15.5                    | -                         | -                             |  |
|                                      | END OF BORING   |               |                         |                           |                               |  |

ELEVATION (FEET)

\* Sample Depth

BORING STARTED: 07-21-88  
 BORING COMPLETED: 07-21-88  
 FIELD ENGINEER/TECHNICIAN: S. Smelser  
 DRILLER: D. Ulises  
 CONTRACTOR: Heber Mining

WATER LEVEL IN HOLE AT Dry  
 NUMBERS OF HOURS AFTER COMPLETION:

**SPEEDIE AND ASSOCIATES**

LOG OF TEST BORING NUMBER B-5

ARMENIAN APOSTOLIC CHURCH  
 PIMA ROAD & CHOLLA ROAD  
 SCOTTSDALE, ARIZONA

|                      |                |
|----------------------|----------------|
| APPROVED: <u>SSS</u> | DATE: 08-12-88 |
| PROJECT NO: 880199SA | FIGURE NO: 5   |

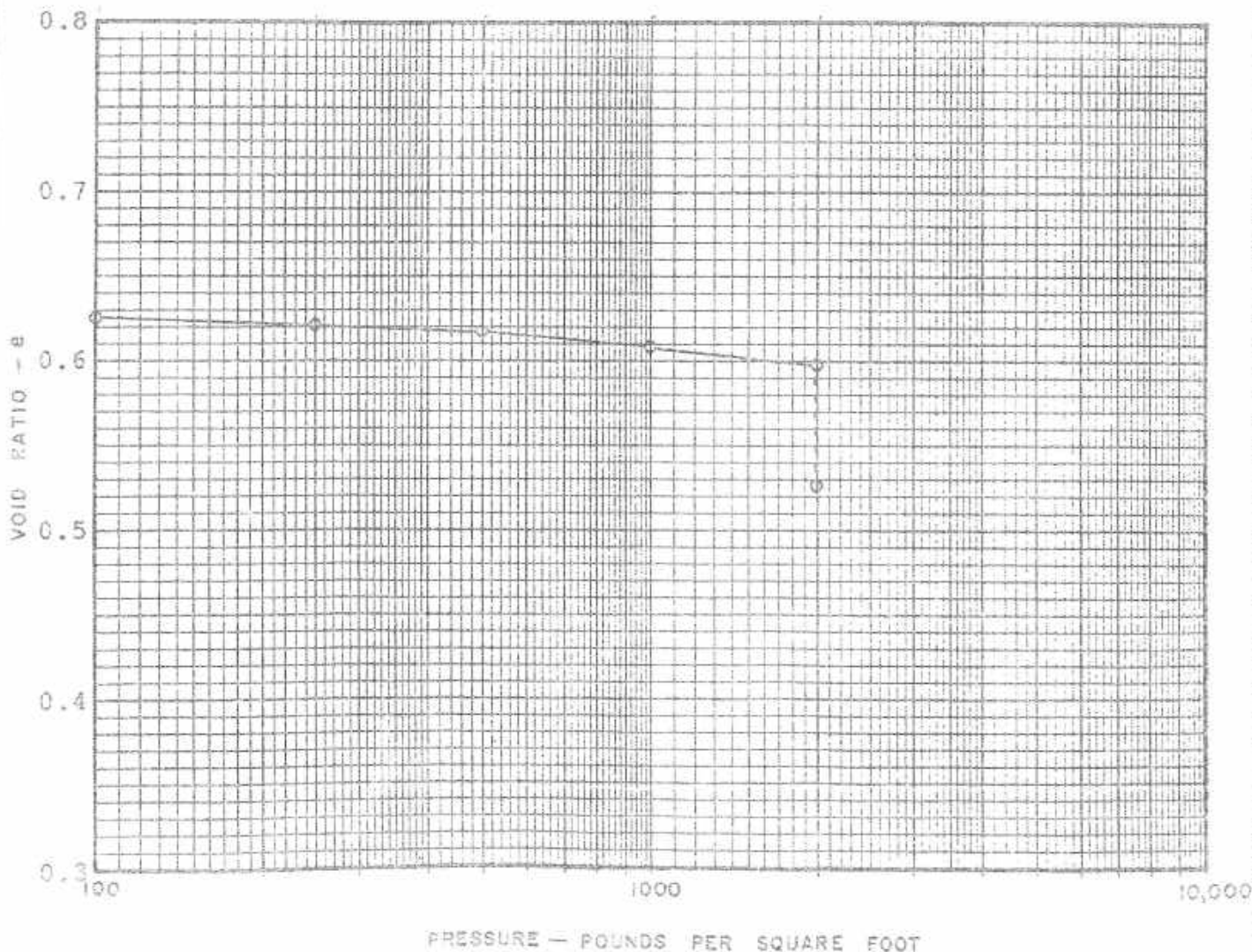
# SPEEDIE AND ASSOCIATES

GEOTECHNICAL AND SITE ENGINEERS  
1109 N. 24th Ave. • Suite 202 • Phoenix, Arizona • 85016 • (602) 997-0707

## CONSOLIDATION TEST

PROJECT: Armenian Apostolic Church PROJECT NO: 880199SA DATE: 07-27-88  
 LOCATION: Pima Road & Cholla Road - Scottsdale, Arizona  
 CLIENT: Armenian Apostolic Church LAB. SAMPLE NO: 8656  
 BORING NO: B-5 FIELD SAMPLE NO: RS-1 SAMPLE DEPTH: 2.0' SAMPLE ELEV. (TIP): -  
 TESTED BY: JH DATE: 07-22-88 CHECKED BY: SJS DATE: 07-27-88  
 REMARKS: Sample inundated at end of test at 2,000 PSF.

\_\_\_\_\_ In-situ  
 - - - - - Inundated



SWELL TEST DATA

| BORING/<br>PIT NO. | SAMPLE<br>DEPTH (FT.) | REMOLEDDED<br>DRY DENSITY<br>(PCF) | INITIAL<br>MOISTURE<br>CONTENT<br>PERCENT | PERCENT *<br>COMPACTION | INITIAL DEGREE<br>OF SATURATION<br>PERCENT | FINAL DEGREE<br>OF SATURATION<br>PERCENT | TOTAL<br>SWELL<br>PERCENT |
|--------------------|-----------------------|------------------------------------|---|-------------------------|--|--|---------------------------|
| B-4/BS-2           | 3.0                   | 110.1                              | 15.3                                      | 94.3                    | 81.0                                       | 92.6                                     | 0.3                       |
| B-4/BS-2           | 3.0                   | 109.2                              | 12.2                                      | 93.8                    | 62.9                                       | 95.4                                     | 1.9                       |

\* Based on a maximum dry density of 116.4 PCF at 12.3 percent moisture.

ARMENIAN APOSTOLIC CHURCH  
PIMA ROAD & CHOLLA ROAD  
SCOTTSDALE, ARIZONA

**SPEEDIE  
AND ASSOCIATES**  
GEOTECHNICAL AND SOIL ENGINEERS

PROJECT NO. 880199SA

| P.A.M.L. NUMBER | STATE | PROJECT NO. | SHEET NO. | TOTAL SHEETS | AS BUILT |
|-----------------|-------|-------------|-----------|--------------|----------|
| 9               | ARZ.  | 600-1-544   | 497       | 1950         | 03/11/08 |
| IDIL WA 036     |       |             |           |              |          |



Site

Install Access Ramp  
See Detail D12

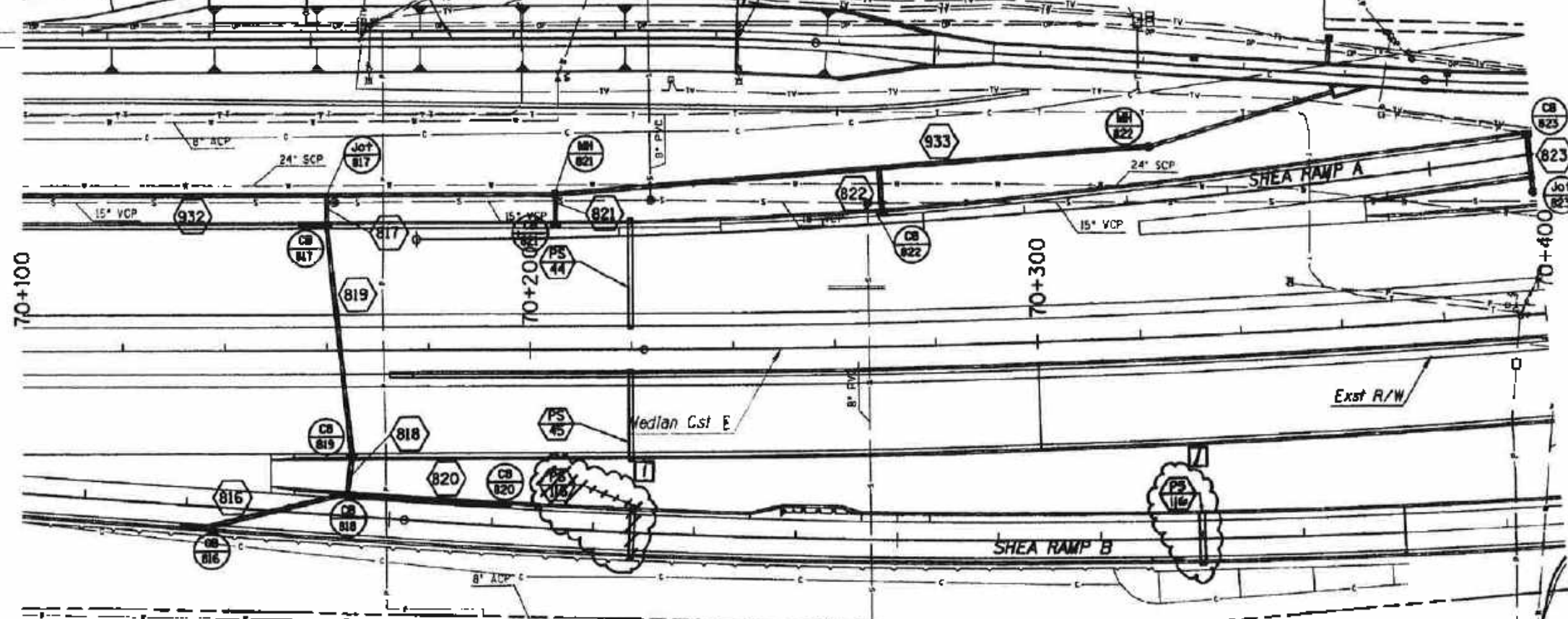
Access Road  
See Detail D16

Sta 4+963.984  
End Project  
Match Downstream  
Channel

Ext R/W

3.000 m

Drainage Channel Cst E



70+100

70+200

70+300

70+400

Ext R/W

Median Cst E

SHEA RAMP B

SHEA RAMP A

|      |    |          |
|------|----|----------|
| DATE | BY | REVISION |
|      |    |          |
|      |    |          |
|      |    |          |
|      |    |          |
|      |    |          |
|      |    |          |
|      |    |          |
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|      |    |          |

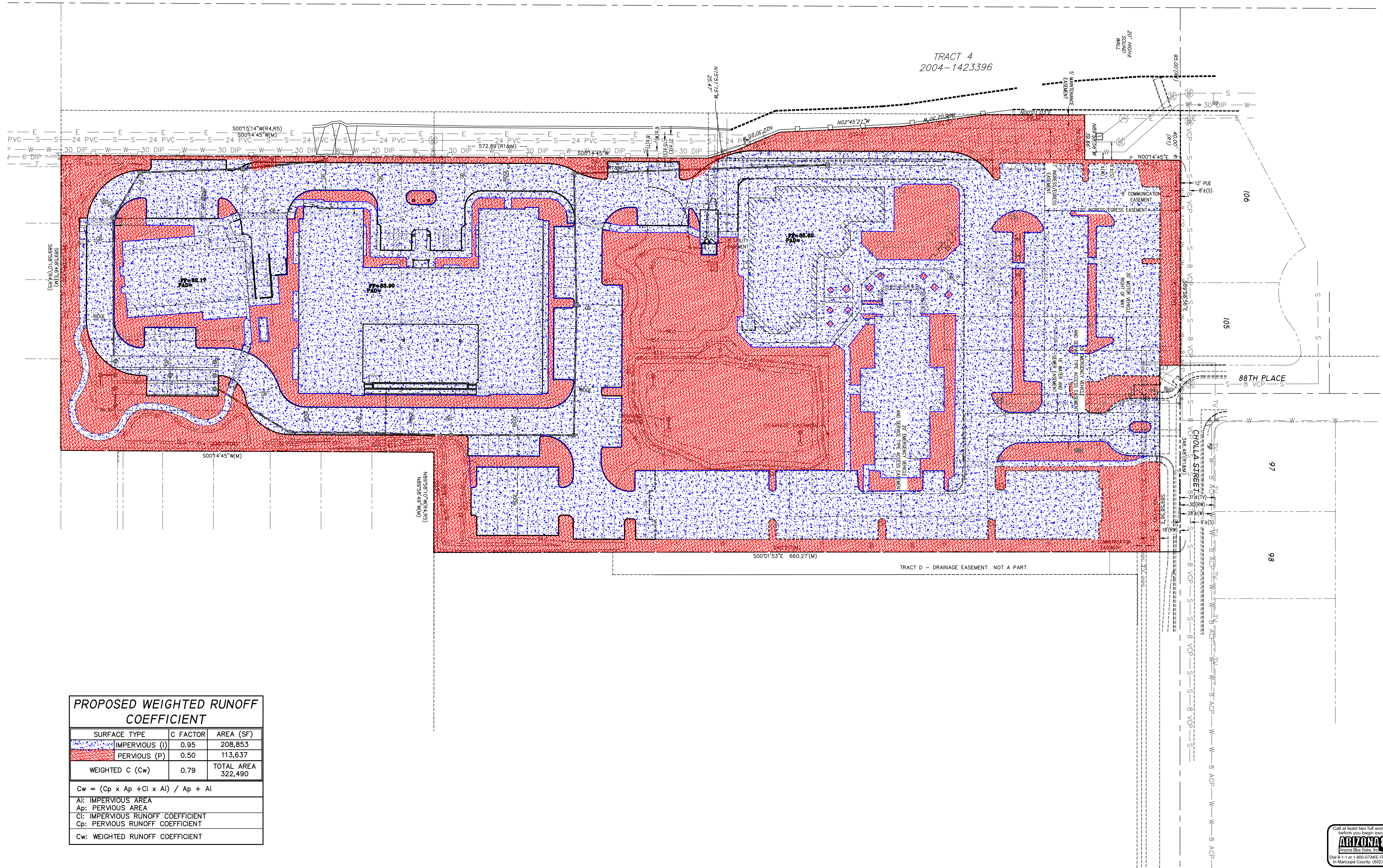
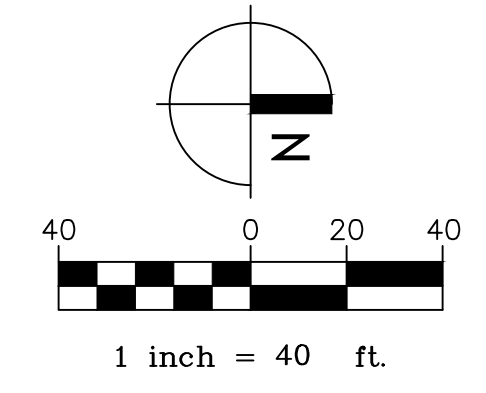


|   |                             |           |  |  |
|---|-----------------------------|-----------|--|--|
| DESIGN  | RSR, RLH                    | 4/98      | ARIZONA DEPARTMENT OF TRANSPORTATION<br>INTERMODAL TRANSPORTATION DIVISION |  |
| DRAWN   | AEI                         | 4/98      |  |  |
| CHECKED   | JPM, ACP                    | 4/98      |  |  |
| WOOD, PATEL & ASSOCIATES, INC.<br>1550 EAST MISSOURI, SUITE 203<br>PHOENIX, ARIZONA 85021-2341-4344 |                             |           | DRAINAGE PLAN<br>Sta 70+100 to 70+400                                      |  |
| ROUTE   | PIMA FREEWAY - PIMA TO SHEA |           |  |  |
| TRACS NO. H 4083 01C  |                             | 600-1-544 | DWG NO. D-1.23   |  |
|   |                             |           | 437 OF 1350  |  |

FILE: V:\960711\95SUB\DRPLAN17.DGN  
DATE: 04/23/08

# APPENDIX D

## Weighted 'C' Exhibit



**PROPOSED WEIGHTED RUNOFF COEFFICIENT**

| SURFACE TYPE           | C FACTOR    | AREA (SF)                 |
|------------------------|-------------|---------------------------|
| IMPERVIOUS (I)         | 0.95        | 208,853                   |
| PERVIOUS (P)           | 0.50        | 113,637                   |
| <b>WEIGHTED C (Cw)</b> | <b>0.79</b> | <b>TOTAL AREA 322,490</b> |

$C_w = (C_p \times A_p + C_i \times A_i) / A_p + A_i$   
 Ai: IMPERVIOUS AREA  
 Ap: PERVIOUS AREA  
 Ci: IMPERVIOUS RUNOFF COEFFICIENT  
 Cp: PERVIOUS RUNOFF COEFFICIENT  
 Cw: WEIGHTED RUNOFF COEFFICIENT

**aaikai** architecture + interiors  
 7956 E. WILSON AVENUE, SUITE 100  
 SCOTTSDALE, ARIZONA 85260  
 480.888.8852  
 aaikai.com

**MEGERDICHIAN SENIOR CENTER**  
 8849 E. CHOLLA ST.  
 SCOTTSDALE, AZ 85260

**PRE-CONSTRUCTION PHASE**

| NO. | ISSUED FOR:                  | DATE       |
|-----|------------------------------|------------|
| 1   | REZONING & C.U.P.            | 12-13-2018 |
| 2   | REZONING & C.U.P. 2nd Review | 08-03-2020 |
| 3   | REZONING & C.U.P. 3rd Review | 12-08-2020 |

**CONSTRUCTION PHASE**

| REV. | BULLETIN # | DATE |
|------|------------|------|
|      |            |      |



**KLAND CIVIL ENGINEERS**  
 CIVIL ENGINEERING  
 LAND DEVELOPMENT SERVICES  
 LAND SURVEYING  
 7227 N. 16th St., Suite 217  
 Phoenix, Arizona 85020  
 PHONE: (480) 344-0480  
 www.klandeng.com

**WEIGHTED 'C' EXHIBIT**

DATE: 12/08/2020  
 JOB NUMBER: 1727-00  
 KLAND PROJECT NUMBER: K15153

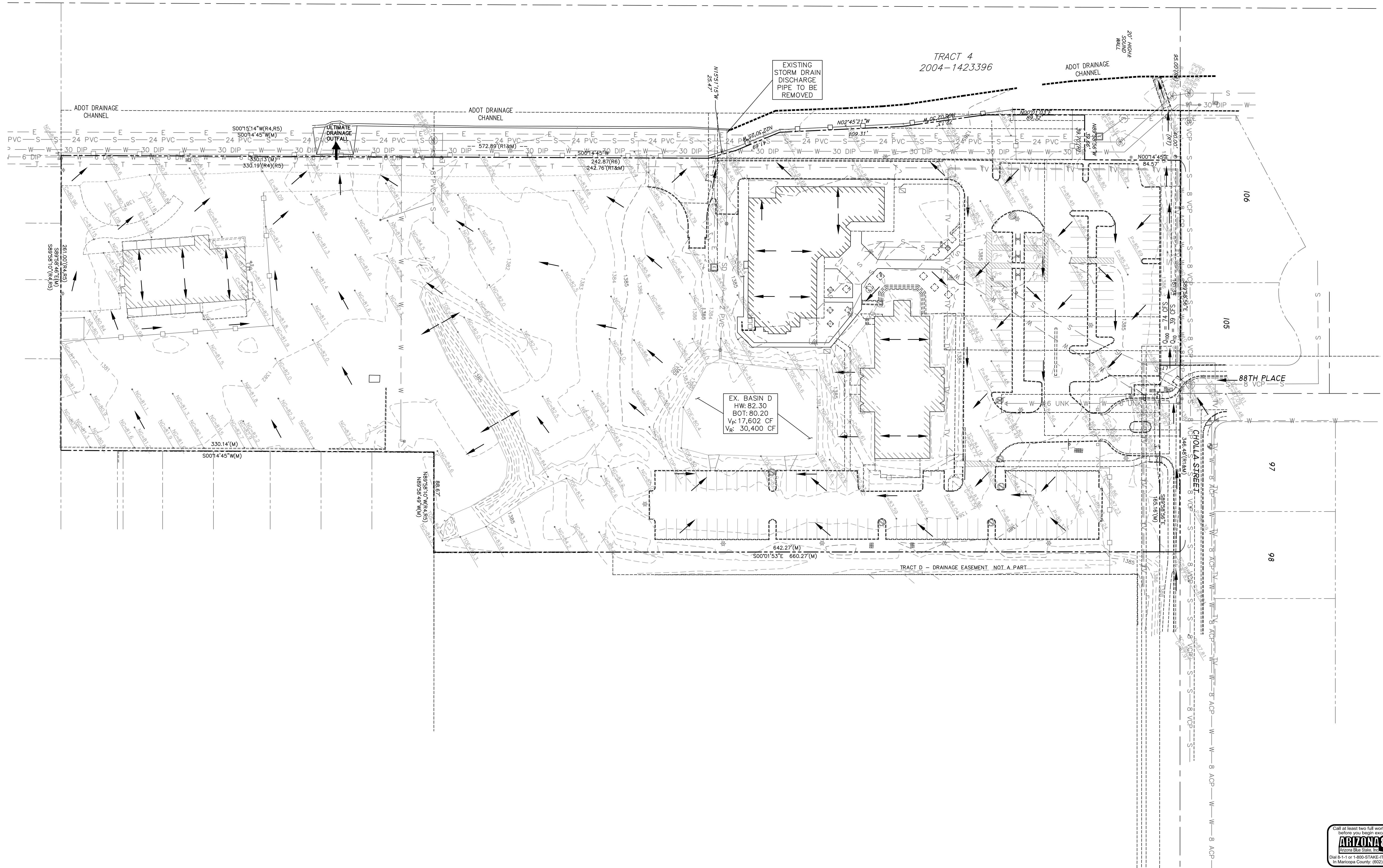
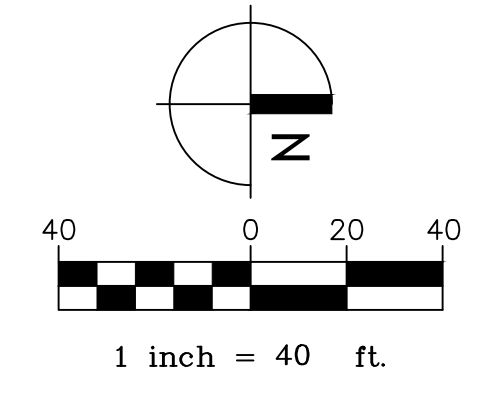
**WCI OF 1**



K:\2019\K15153 Megerdichian Senior Center\DWG\CONCEPT\105-Heighted\_C.dwg

# APPENDIX E

## Existing Drainage Map



aaakai architecture + interiors  
7866 E. Camelback Rd., Suite 100, Phoenix, AZ 85018  
480.988.8822  
aaakai.com

**MEGERDICHIAN  
SENIOR CENTER**  
8849 E. CHOLLA ST.  
SCOTTSDALE, AZ 85260

PRE-CONSTRUCTION PHASE

| NO. | ISSUED FOR:                     | DATE       |
|-----|---------------------------------|------------|
| 1   | REZONING & C.U.P.               | 12-13-2018 |
| 2   | REZONING & C.U.P.<br>2nd Review | 08-03-2020 |
| 3   | REZONING & C.U.P.<br>3rd Review | 12-08-2020 |

CONSTRUCTION PHASE

| REV. | BULLETIN # | DATE |
|------|------------|------|
|      |            |      |
|      |            |      |



**KLAND  
CIVIL ENGINEERS**  
CIVIL ENGINEERING  
LAND DEVELOPMENT  
SERVICES  
LAND SURVEYING  
7227 N. 16th St., Suite 217  
Phoenix, Arizona 85002  
PHONE: (480) 344-0480  
www.klandeng.com

SHEET TITLE  
**EXISTING DRAINAGE  
MAP**

DATE: 12/08/2020  
JOB NUMBER: 1727-00  
KLAND PROJECT NUMBER: K15153

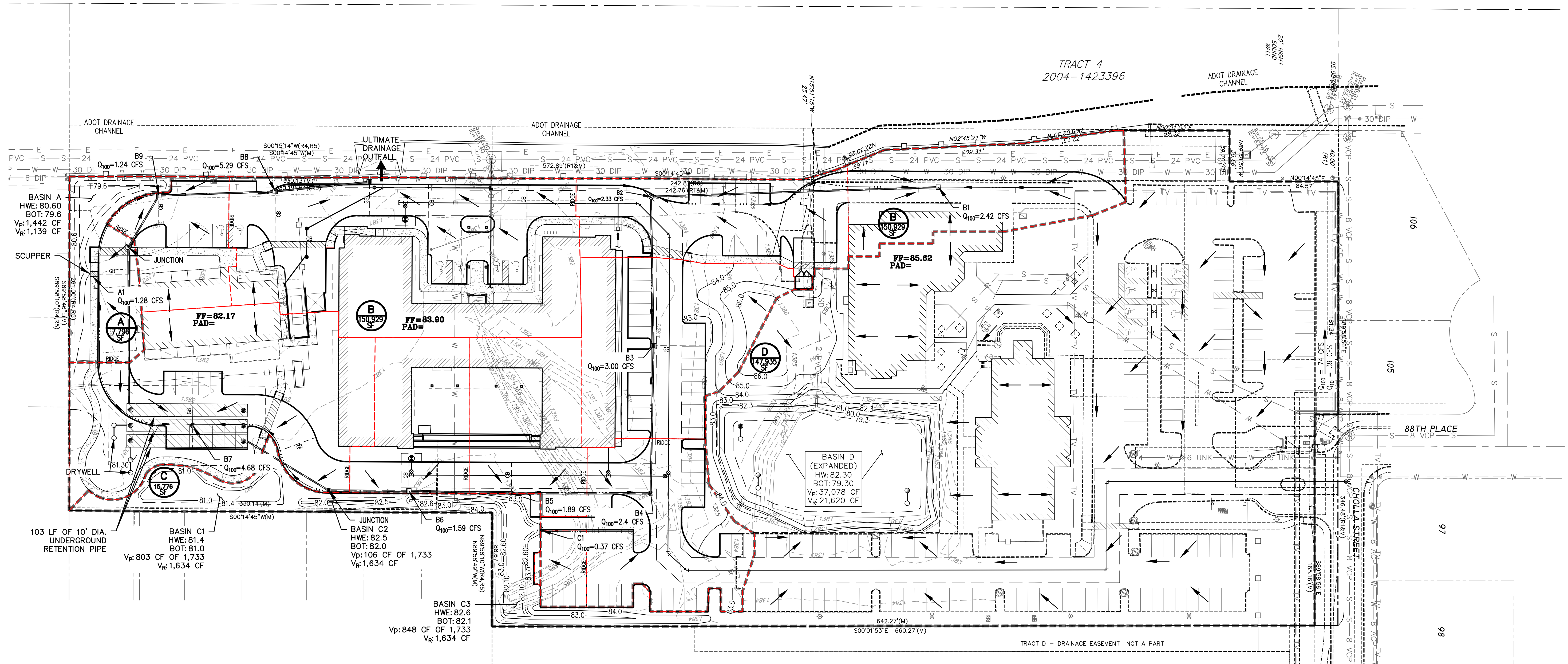
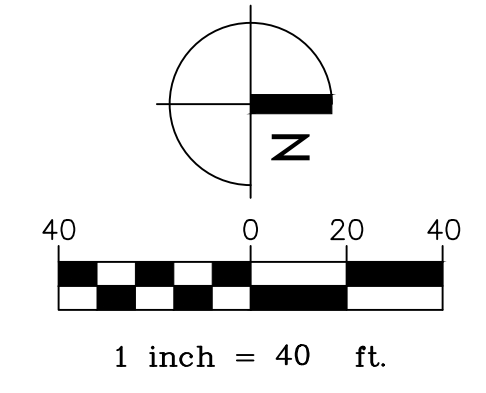


**EX DM  
OF 1**

**25-ZN-2018**

# APPENDIX F

## Proposed Drainage Map



| SURFACE BASINS INFORMATION |      |      |         |         |               |
|----------------------------|------|------|---------|---------|---------------|
| BASIN                      | HWE  | BOT  | VOL (P) | VOL (R) | TOTAL VOL (P) |
| A                          | 80.6 | 79.6 | 1,442   | 1,139   | 1,442         |
| C1                         | 81.4 | 81.0 | 803     |         |               |
| C2                         | 82.5 | 82.0 | 106     | 1,634   | 1,757         |
| C3                         | 82.6 | 82.1 | 848     |         |               |
| D                          | 82.3 | 79.3 | 37,078  | 21,620  | 37,078        |

| RETENTION BASIN CALCULATIONS |           |             |      |                   |               |                         |                                 |                             |                       |                   |          |
|------------------------------|-----------|-------------|------|-------------------|---------------|-------------------------|---------------------------------|-----------------------------|-----------------------|-------------------|----------|
| Sub-Area (onsite)            | Area (sf) | Area (acre) | C100 | P100YR, 2 HR (in) | Vol Req. (cf) | Surface Vol. Prov. (cf) | Total Tank Length Provided (LF) | Underground Vol. Prov. (cf) | Total Vol. Prov. (cf) | Excess Volume (%) | DRYWELLS |
| A                            | 7,796.00  | 0.18        | 0.79 | 2.22              | 1,139.39      | 1,442.0                 | 0.0                             | 0.0                         | 1,442.0               | 26.6              | 0        |
| B                            | 150,929   | 3.465       | 0.79 | 2.22              | 22,058.3      | 0.0                     | 282.0                           | 22,148.2                    | 22,148.2              | 0.4               | 2        |
| C                            | 15,776    | 0.362       | 0.56 | 2.22              | 1,634.4       | 1,757.0                 | 0.0                             | 0.0                         | 1,757.0               | 7.5               | 0        |
| D                            | 147,935   | 3.396       | 0.79 | 2.22              | 21,620.7      | 37,078.0                | 0.0                             | 0.0                         | 37,078.0              | 71.5              | 3        |
| Total                        | 314,640.0 | 7.4         | -    | -                 | 46,452.8      | 40,277.0                | 282.0                           | 22,148.2                    | 62,425.2              | 34.4              | 5        |

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480.888.8882

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8849 E. CHOLLA ST.  
SCOTTSDALE, AZ 85260

| PRE-CONSTRUCTION PHASE |                              |            |
|------------------------|------------------------------|------------|
| NO.                    | ISSUED FOR:                  | DATE       |
| 1                      | REZONING & C.U.P.            | 12-13-2018 |
| 2                      | REZONING & C.U.P. 2nd Review | 08-03-2020 |
| 3                      | REZONING & C.U.P. 3rd Review | 12-08-2020 |

| CONSTRUCTION PHASE |            |      |
|--------------------|------------|------|
| REV.               | BULLETIN # | DATE |
|                    |            |      |



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www.klandeng.com

**PROPOSED DRAINAGE MAP**

DATE: 12/08/2020  
JOB NUMBER: 1727-00  
KLAND PROJECT NUMBER: K15153



DMI OF 1

25-ZN-2018

# APPENDIX G

## Master Plan

**BENCHMARK**

FOUND BRASS CAP IN HANDHOLE AT THE INTERSECTION OF 92ND STREET AND CHOLLA STREET. CITY OF SCOTTSDALE. GPS POINT 8194. ELEV = 1388.480 (NAVD '88, CITY OF SCOTTSDALE DATUM)

FOUND BRASS CAP IN HANDHOLE AT THE INTERSECTION OF 92ND STREET AND SHEA BOULEVARD. CITY OF SCOTTSDALE. GPS POINT 8301. ELEV = 1372.195 (NAVD '88, CITY OF SCOTTSDALE DATUM)

FOUND BRASS CAP IN HANDHOLE AT THE INTERSECTION OF 84TH STREET AND SHEA BOULEVARD. CITY OF SCOTTSDALE. GPS POINT 3251. ELEV = 1364.811 (NAVD '88, CITY OF SCOTTSDALE DATUM)

**LEGAL DESCRIPTION**

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF MARICOPA, STATE OF ARIZONA AND IS DESCRIBED AS FOLLOWS: LOT 1, A PROPERTY ASSEMBLAGE IN THE CITY OF SCOTTSDALE, ARIZONA ARMENIAN APOSTOLIC CHURCH OF ARIZONA, ACCORDING TO BOOK 971 OF MAPS, PAGE 46, AND THEREAFTER AFFIDAVIT OF CORRECTION IN RECORDING NO. 2008-0228799, RECORDS OF MARICOPA COUNTY, ARIZONA.

**BASIS OF BEARING**

THE MONUMENT LINE OF 92ND STREET. SAID LINE BEARS SOUTH 00 DEGREES 01 MINUTES 20 SECONDS EAST.

**ARCHITECT**

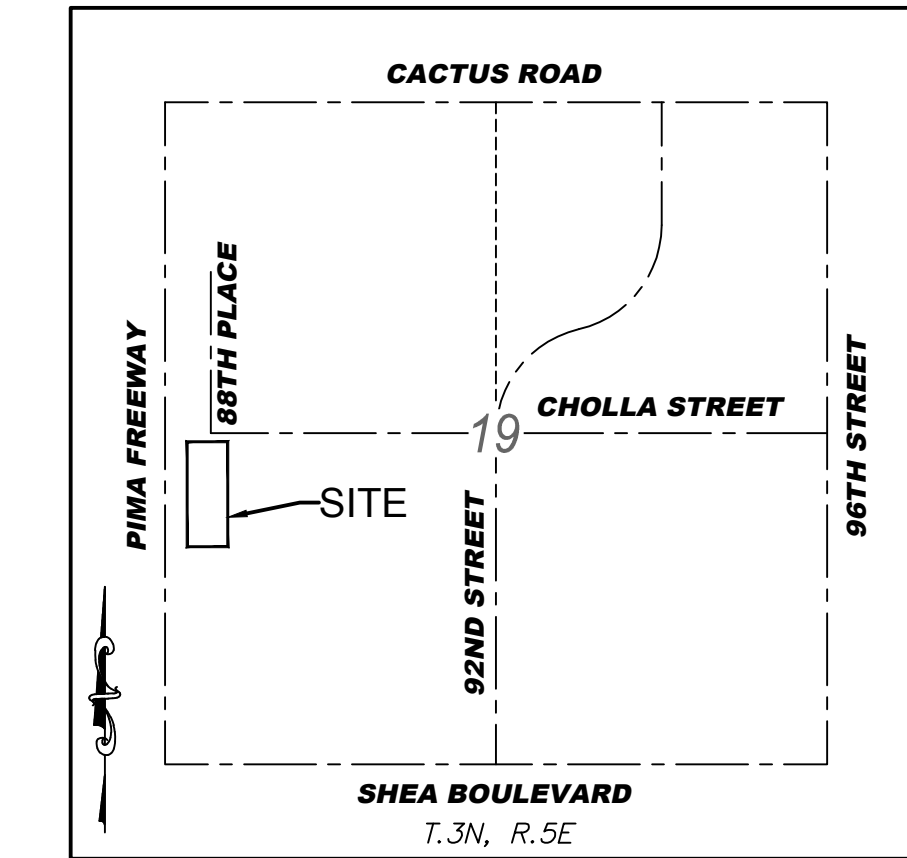
AAKAI ARCHITECTURE AND INTERIORS  
7585 E. REDFIELD RD., STE 106  
SCOTTSDALE, AZ 85260  
PH: (480) 588-5852  
CONTACT:

**ENGINEER**

KLAND CIVIL ENGINEERS  
7227 N. 16TH ST., STE 217  
PHOENIX, AZ 85020  
PH: (480) 344-0480  
CONTACT: LESLIE KLAND, PE

**MASTER GRADING AND DRAINAGE PLAN**  
**MEGERDICHIAN SENIOR CENTER**

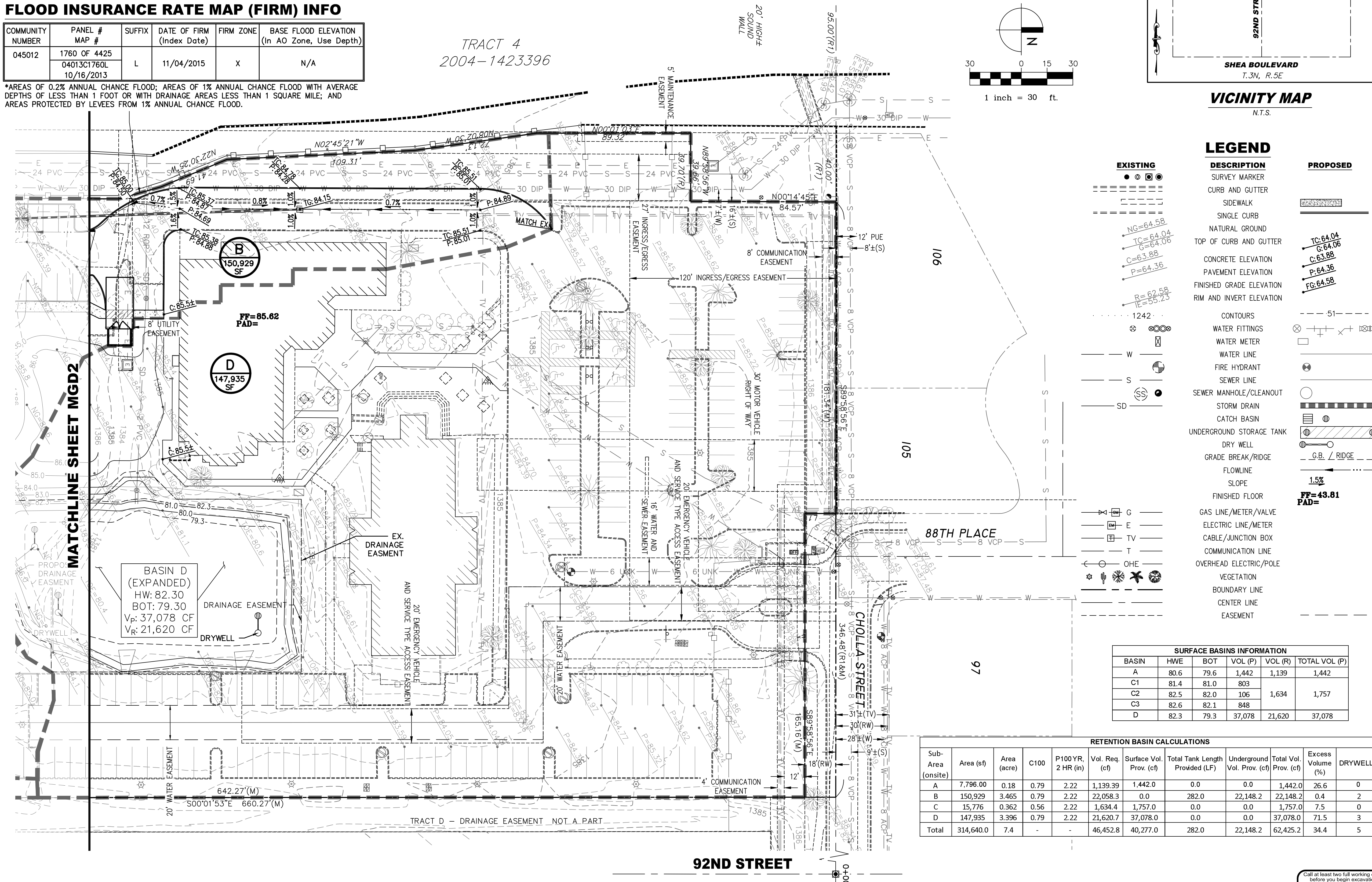
8849 EAST CHOLLA STREET, SCOTTSDALE, ARIZONA 85260  
A PORTION OF LOT 3 IN THE SOUTHWEST QUARTER OF SECTION 19, TOWNSHIP 3 NORTH, RANGE 5 EAST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.



**FLOOD INSURANCE RATE MAP (FIRM) INFO**

| COMMUNITY NUMBER | PANEL # MAP #                             | SUFFIX | DATE OF FIRM (Index Date) | FIRM ZONE | BASE FLOOD ELEVATION (In AO Zone, Use Depth) |
|------------------|---|--------|---------------------------|-----------|--|
| 045012           | 1760 OF 4425<br>04013C1760L<br>10/16/2013 | L      | 11/04/2015                | X         | N/A  |

\*AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD.



**LEGEND**

| EXISTING | DESCRIPTION              | PROPOSED |
|----------|--------------------------|----------|
| ●        | SURVEY MARKER            | ○        |
| ---      | CURB AND GUTTER          | ---      |
| ---      | SIDEWALK                 | ---      |
| ---      | SINGLE CURB              | ---      |
| ---      | NATURAL GROUND           | ---      |
| ---      | TOP OF CURB AND GUTTER   | ---      |
| ---      | CONCRETE ELEVATION       | ---      |
| ---      | PAVEMENT ELEVATION       | ---      |
| ---      | FINISHED GRADE ELEVATION | ---      |
| ---      | RIM AND INVERT ELEVATION | ---      |
| ---      | CONTOURS                 | ---      |
| ---      | WATER FITTINGS           | ---      |
| ---      | WATER METER              | ---      |
| ---      | WATER LINE               | ---      |
| ---      | FIRE HYDRANT             | ---      |
| ---      | SEWER LINE               | ---      |
| ---      | SEWER MANHOLE/CLEANOUT   | ---      |
| ---      | STORM DRAIN              | ---      |
| ---      | CATCH BASIN              | ---      |
| ---      | UNDERGROUND STORAGE TANK | ---      |
| ---      | DRY WELL                 | ---      |
| ---      | GRADE BREAK/RIDGE        | ---      |
| ---      | FLOWLINE                 | ---      |
| ---      | SLOPE                    | ---      |
| ---      | FINISHED FLOOR           | ---      |
| ---      | GAS LINE/METER/VALVE     | ---      |
| ---      | ELECTRIC LINE/METER      | ---      |
| ---      | CABLE/JUNCTION BOX       | ---      |
| ---      | COMMUNICATION LINE       | ---      |
| ---      | OVERHEAD ELECTRIC/POLE   | ---      |
| ---      | VEGETATION               | ---      |
| ---      | BOUNDARY LINE            | ---      |
| ---      | CENTER LINE              | ---      |
| ---      | EASEMENT                 | ---      |

**SURFACE BASINS INFORMATION**

| BASIN | HWE  | BOT  | VOL (P) | VOL (R) | TOTAL VOL (P) |
|-------|------|------|---------|---------|---------------|
| A     | 80.6 | 79.6 | 1,442   | 1,139   | 1,442         |
| C1    | 81.4 | 81.0 | 803     |         |               |
| C2    | 82.5 | 82.0 | 106     | 1,634   | 1,757         |
| C3    | 82.6 | 82.1 | 848     |         |               |
| D     | 82.3 | 79.3 | 37,078  | 21,620  | 37,078        |

**RETENTION BASIN CALCULATIONS**

| Sub-Area (onsite) | Area (sf) | Area (acre) | C100 | P100 YR. 2 HR (in) | Vol. Req. (cf) | Surface Vol. Prov. (cf) | Total Tank Length Provided (LF) | Underground Vol. Prov. (cf) | Total Vol. Prov. (cf) | Excess Volume (%) | DRYWELLS |
|-------------------|-----------|-------------|------|--------------------|----------------|-------------------------|---------------------------------|-----------------------------|-----------------------|-------------------|----------|
| A                 | 7,796.00  | 0.18        | 0.79 | 2.22               | 1,139.39       | 1,442.0                 | 0.0                             | 0.0                         | 1,442.0               | 26.6              | 0        |
| B                 | 150,929   | 3.465       | 0.79 | 2.22               | 22,058.3       | 0.0                     | 282.0                           | 22,148.2                    | 22,148.2              | 0.4               | 2        |
| C                 | 15,776    | 0.362       | 0.56 | 2.22               | 1,634.4        | 1,757.0                 | 0.0                             | 0.0                         | 1,757.0               | 7.5               | 0        |
| D                 | 147,935   | 3.396       | 0.79 | 2.22               | 21,620.7       | 37,078.0                | 0.0                             | 0.0                         | 37,078.0              | 71.5              | 3        |
| Total             | 314,640.0 | 7.4         | -    | -                  | 46,452.8       | 40,277.0                | 282.0                           | 22,148.2                    | 62,425.2              | 34.4              | 5        |

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| 3   | REZONING & C.U.P. 3rd Review | 12-08-2020 |

**CONSTRUCTION PHASE**

| REV. | BULLETIN # | DATE |
|------|------------|------|
|      |            |      |



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**MASTER GRADING AND DRAINAGE PLAN**

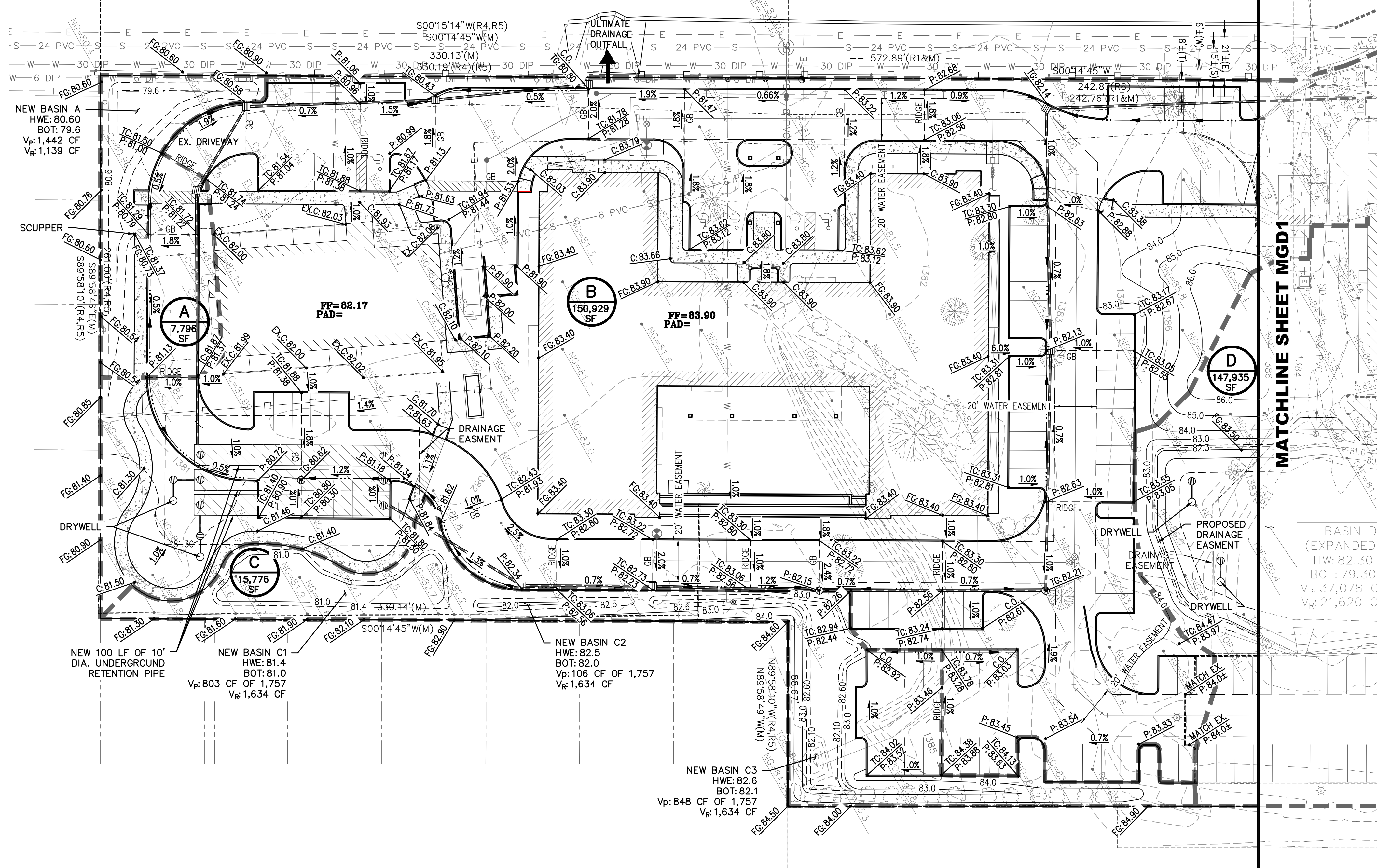
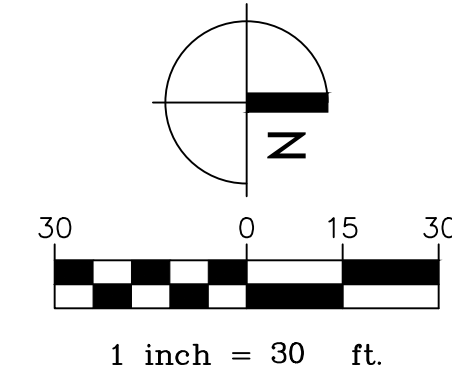
DATE: 12/08/2020  
JOB NUMBER: 1727-00  
KLAND PROJECT NUMBER: K15153

**MGD1 OF 2**



**FINAL CONSTRUCTION DOCUMENT NOTES:**

1. THE FINAL DRAINAGE REPORT SHOULD NOTE THAT THE PROPOSED UNDERGROUND STORMWATER STORAGE TANKS (USSTS) MUST MEET THE CITY'S USST POLICY IN SECTION 4-1.202 OF THE CITY'S DESIGN STANDARDS & POLICIES MANUAL (DSPM), WHICH INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
  - (PLEASE REVIEW THE REFERENCED SECTION COMPLETELY TO ADDRESS ANY OUTSTANDING APPLICABLE ITEMS. DISCUSS AND INCORPORATE IN THE DRAINAGE REPORT AS APPLICABLE).
  - A. THE OWNER MUST DEDICATE A PUBLIC DRAINAGE EASEMENT OVER THE USST, WITH NO MAJOR VEGETATION SUCH AS TREES WITHIN THE EASEMENT. AT A MINIMUM, THE EASEMENT SHOULD EXTEND AT A PROJECTED SLOPE OF 1:1 FROM THE BOTTOM OF THE PIPE.
  - B. THE USST MUST HAVE AT LEAST A 75-YEAR LIFE, INCLUDING THE LINING AND COATING.
  - C. THE USST MUST DRAIN BY GRAVITY.
  - D. SPECIFY MAG SUPPLEMENTAL STANDARD DETAIL 2554 FOR CORRUGATED METAL PIPES.
  - E. A MINIMUM OF TWO ACCESS POINTS MUST BE PROVIDED FOR EACH USST.
  - F. AN OPERATIONS AND MAINTENANCE (O&M) MANUAL MUST BE PREPARED FOR THE SYSTEM PRIOR TO APPROVAL OF FINAL PLANS.
  - G. FINAL PLANS MUST INCLUDE SIGNS AT EACH END OF THE USST.
  - H. A SIGNED AND NOTARIZED OWNERSHIP AND RESPONSIBILITY STATEMENT MUST BE PROVIDED PRIOR TO APPROVAL OF FINAL PLANS.
  - I. ADD THE REQUIRED WARNING SIGNS



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SHEET TITLE  
**MASTER GRADING AND  
DRAINAGE PLAN**

DATE: 12/08/2020  
JOB NUMBER: 1727-00  
KLAND PROJECT NUMBER: K15153



**MGD2  
OF 2**

**25-ZN-2018**