Project Manual for:

TUBA CITY REGIONAL HEALTH CARE CORPORATION DIABETES PREVENTION PROGRAM FITNESS

TAMARAX STREET

TUBA CITY, AZ 86045

Project No. 1641B

REGISTERED ARCHITECT
CERTIFICATE NO.
15244
ROBERT L. PIAN
Date Signed 11/07/17
ARIZONA, U.S.A.

EXPIRES 12/31/2018

NOVEMBER 07, 2017

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EXPIRES 12/31/2018

PROJECT MANUAL DIABETES PREVENTION PROGRAM FITNESS

TUBA CITY REGIONAL HEALTH CARE CORPORATION
TUBA CITY, AZ

(SPS+ Project No. 1641B)
Dated: November 07, 2017

Pursuant to the Tuba City Regional Health Care Corporation and Job Order Contractor Agreement

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PART 1 GENERAL

1.01 DEFINITIONS

A. General Contractor is to be henceforth known as Job Order Contractor or JOC.

1.02 PROJECT SCHEDULE

A. Schedule
   1. Final Completion is due on 90 days from notice to proceed.

B. Liquidated Damages
   1. $250 per day for each calendar day substantial completion and or final completion is not achieved.

1.03 STATEMENT OF WORK

A. New approximately 8,000 square foot modular building to include lobby, reception, screening room, workout rooms, office areas, kitchen training, restrooms and support services. General site will include utilities, parking and hardscaping to support building function.
   1. JOC to verify water and sewer location, depth, capacity, volume and pressure before construction.
   2. JOC to provide construction documents with current registered Architect/Engineer seals for building plan review and permits. JOC to coordinate and submit plans for review and subsequent permitting.
   3. JOC to provide Navajo Nation Fire and Rescue sanctioned review and approval (permitting) by Brown and Associates.
      i. If a sprinkler system is required by the authority having jurisdiction, JOC to provide and install sprinkler system to meet current required building codes. Refer to Quote Form Alternate #2.
   4. Note that the design development drawings and engineering details are for general information only. JOC registered Architect and Engineers may utilize alternative detailing and construction that meets or exceeds the performance of the proposed detailing.

1.04 SUBSURFACE INVESTIGATION

A. A copy of a geotechnical report with respect to the building’s site is included with this document:
   1. Geotechnical Report entitled: Geotechnical Engineering Report, Diabetes Prevention Program Fitness, dated June 23, 2017.
   2. Prepared by: Ricker, Atkinson, McBee, Morman & Associates, Inc., RAMM Project No. G24105B.
   3. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
   4. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.
   5. This report, by its nature cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

1.05 TECHNICAL SPECIFICATIONS

A. Refer to General Technical Specifications on Sheet A200 for manufacturer and product data.

END OF STATEMENT OF WORK

TO: Tuba City Regional Health Care Corporation
Attention: Julius Young II
Director of Facilities Management
167 Main Street
Tuba City, Arizona 86045

1. Pursuant to and in compliance with the Design Development Documents and Soils Investigation Report relating to the construction of:

TUBA CITY REGIONAL HEALTH CARE CORPORATION

DIABETES PREVENTION PROGRAM FITNESS

NEW MODULAR BUILDING

as prepared by SPS+ ARCHITECTS, LLP. This is to certify that the above Documents, as well as the sites upon which the work is to be constructed and any and all conditions affecting the work, have been carefully examined, the amount and nature of the work to be accomplished is thoroughly understood, and at no time, will misunderstanding of the Project Manual, Drawings, Specifications or conditions be contested.

- CONTINUTED -

2. **BASE QUOTE** to include the following items:

JOC to attach detailed itemized quote cost information for each category in CSI format.

a. Subcontractor and supplier cost:
_______________ DOLLARS ($__________).

b. JOC and General Conditions:
_______________ DOLLARS ($__________).

c. Owner's Contingency:
Twenty-five thousand and no/100 --------------------- DOLLARS ($25,000.00______).

d. JOC Profit:
_______________ DOLLARS ($__________).

e. Performance and Payment Bonds:
_______________ DOLLARS ($__________).

f. Insurance:
_______________ DOLLARS ($__________).

g. Navajo Nation Tax:
_______________ DOLLARS ($__________).

h. State and County Tax:
_______________ DOLLARS ($__________).

i. JOC to provide Construction Documents with Architectural and Engineering registered seals for authority having jurisdiction review submittal:
_______________ DOLLARS ($__________).

j. Building Permit Review Fee:
_______________ DOLLARS ($__________).

k. Building Permit Fee:
_______________ DOLLARS ($__________).

l. Allowance for underground utilities unforeseen conditions:
Ten thousand and no/100 ------------------------------ DOLLARS ($10,000.00______).

m. Other: _______________
____
_______________ DOLLARS ($__________).

n. Other: _______________
____
_______________ DOLLARS ($__________).

TOTAL BASE QUOTE: ("a through l" plus others as occurs)
_______________ DOLLARS ($__________).

- CONTINUTED -

3. **ALTERNATE ITEMS** (includes subcontractor and supplier costs, JOC and General Conditions, Owners Contingency, General Contractor Profit, Performance and Payment Bonds, Insurance, Navajo Nation Tax, State and County Tax):

a. Alternate #1 – Base Quote Low Slope Roof to be TPO or PVC with 10 year full system guarantee. Alternate to be Derbigum roof with 10 year full system guarantee.

____ DOLLARS ($__________).

b. Alternate #2 – Base Quote does not include a sprinkler system. If authority having jurisdiction requires a sprinkler system, Alternate #2 to provide and install a current code compliant sprinkler system. Bid to include shop drawing creation and submittal/approval by Navajo Nation Fire and Rescue, Brown and Associates, and/or other required entities

____ DOLLARS ($__________).

- CONTINUTED -

4. **VOLUNTARY ALTERNATES** JOC is invited to provide voluntary alternates to reduce the overall cost of the project.

a. Voluntary Alternate #1: ____

____

____

Cost: ____ DOLLARS ($__________).

b. Voluntary Alternate #2: ____

____

____

Cost: ____ DOLLARS ($__________).

c. Voluntary Alternate #3: ____

____

____

Cost: ____ DOLLARS ($__________).

d. Voluntary Alternate #3: ____

____

____

Cost: ____ DOLLARS ($__________).

- CONTINUTED -

5. In submitting this Quote, I (we) the undersigned agree:

   a. To hold my (our) Quote open for sixty (60) calendar days.

   b. Date of Substantial Completion: As noted in Statement of Work.

   c. Date of Final Completion: As noted in Statement of Work.

   d. The Owner reserves the right to reject any and all Quotes, or to waive or decline to waive any informality in any Quote.

   e. To enter into and execute an Agreement, if awarded on basis of this Quote, and to furnish Performance and Payment Bonds in the amount of one hundred (100%) percent of the total amount of Agreement.

JOC Company Name: ____

JOC Representative: ____

Signed ________________________________ Date: ______________

END OF QUOTE FORM

Geotechnical Engineering Report
Fitness Building – TCRHCC
306 North Main Street – North Building
Tuba City, Arizona
RAMM Project No. G24105B
Revised 6-23-17

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10971
KENNETH L.
RICKER
Date Signed 6-23-17
ARIZONA U.S.A.

Expires 3/31/2019

For:
SPS + Architects
8681 East Via De Negocio
Scottsdale, Arizona 85258

◆◆◆

By:
Ricker • Atkinson • McBee • Morman & Associates, Inc.
2105 South Hardy Drive, Suite 13
Tempe, Arizona 85282

RICKER • ATKINSON • McBEE • MORMAN & ASSOCIATES, INC.
Geotechnical Engineering • Construction Materials Testing

R·A·M·M

SPS + Architects
8681 East Via De Negocio
Scottsdale, Arizona 85258

June 19, 2017
Revised 6-23-17

Attention: Robert L. Pian, Partner, AIA, NCARB

Subject: Geotechnical Engineering Report
Fitness Building – TCRHCC
306 North Main Street – North Building
Tuba City, Arizona

RAMM Project No. G24105B

Attached to this letter is the Geotechnical Engineering Report for the proposed Fitness Building at TCRHCC at 306 North Main Street – North Building located in Tuba City, Arizona.

The proposed Fitness Building will consist of an 8000 square-foot, one-story modular structure with a suspended floor, adjacent exterior slabs, ramps and stairs and at-grade paved parking and drives. The results of our field explorations; laboratory testing; and engineering analysis, evaluation and recommendations are presented in this report.

The following is a brief summary of selected recommendations.

A. Foundations:
   - Support on undisturbed site soils.
   - Where pier footings are not subjected to frost, design for allowable bearing pressure of 1500 psf for footings founded at least 2.0 feet below Elevation 4947.0 feet and 2500 psf, for footings founded below frost elevation. The suspended modular floor will be founded at Elevation 4950.5 feet.

B. Site Soils:
   - Use as fill and backfill in pavement and landscaped areas of the site.
   - All fill placed below the bottom of the pier footing and exterior slabs, ramps and stairs should be low expansive potential imported fill.

C. Pavement Sections:
   - Auto Parking and Drives – 2.5 inches of asphalt concrete on 7 inches of base material.
   - Truck Drives – 3.5 inches of asphalt concrete on 8 inches of base material.

The attached report was prepared based on project and site data available at this time and was prepared in a manner and to the standards of the local geotechnical engineering practice. Our services did not include evaluations for the presence of hazardous materials; for concrete durability and corrosion potential with respect to on-site soils and site use water sources; for area subsidence resulting from groundwater withdrawal; or for other geologic hazards.

If you have any questions, please do not hesitate to call.

Respectfully submitted,

RICKER • ATKINSON • McBEE • MORMAN & ASSOCIATES, INC.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10971
KENNETH L.
RICKER
Date Signed 6-23-17
ARIZONA U.S.A.

Expires – 3/31/2019

By: Kenneth L. Ricker, P.E.

/dh
Copies to: Addressee (4 + pian@spsplusarchitects.com)

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Registered Professional Engineer (Civil) Certificate No. 10971 KENNETH L. RICKER Date Signed 6-23-17 ARIZONA U.S.A.

Expires 3/31/2019

APPENDIX B - LABORATORY ANALYSIS

REPORT

R·A·M·M

INTRODUCTION

This report presents the results of our geotechnical engineering services for the proposed Fitness Building at TCRHCC at 306 North Main Street – North Building located in Tuba City, Arizona. The scope of our services included performing a field exploration program, laboratory analysis and geotechnical engineering evaluation, analysis and recommendations. The geotechnical recommendations presented herein consist of foundation design, site development, pavement design, material suitability and requirements, and site preparation and grading procedures. We would be pleased to discuss with you any additional recommendations you may require. In addition, we are available to review project specifications and plans for conformance with our recommendations at no charge to you.

This firm should be notified for additional evaluation and recommendations should the building design parameters (location, type, size, structural loads), site use or conditions encountered during construction differ from those presented herein.

PROPOSED CONSTRUCTION

The proposed Fitness Building will consist of an 8000 square-foot, one-story modular structure with a suspended floor, adjacent exterior slabs, ramps and stairs and at-grade paved parking and drives. It is anticipated that maximum structural loads for the building will be on the order of 0.5 to 2.0 kips per linear foot for bearing walls and 2.0 to 5.0 kips for column loads. The suspended modular floor will be founded at Elevation 4950.5 feet.

SITE CONDITIONS

The proposed Fitness Building (North Building) will be located at 306 North Main Street in the east part of TCRHCC complex, in Tuba City, Arizona. At the time of our field explorations, the proposed site had been filled and was being used as a gravel covered parking lot. The site sloped downward to the east/southeast.

FIELD EXPLORATIONS

Subsurface conditions at the site were explored by drilling one test boring to a depth of 12.5 feet in the proposed building area, as shown on the Site Plan in Appendix A. The test boring was drilled with a CME 55 drill rig using 7-inch diameter, hollow-stem augers. The drilling equipment and crew were provided by Wildcat Drilling, Inc. The test boring location was determined in the field by a field technician from our firm who also directed the drill crew. During the field explorations, representative disturbed and undisturbed samples were obtained, the test borings logged and soils field classified by our field technician. The relatively undisturbed samples were obtained by driving a 3-inch diameter, ring-lined, open-end sampler into the soil. A disturbed sample was obtained by driving a standard split-spoon sampler 18 inches into the ground. Both samplers were driven with a 140-pound hammer dropping 30 inches. The results of the field explorations are presented on the Test Boring Log in Appendix A.

LABORATORY ANALYSIS

Representative samples obtained during the field exploration were subjected to the following tests in our laboratory.

Type of Test	Type of Sample	Number of Samples Tested
Compression	Undisturbed	1
Swell	Remolded	1
Percent Passing No. 200 Sieve and Atterberg Limits	Representative	1
Moisture Content/Dry Density *	Undisturbed	3
Moisture Content	Split-Spoon	1

* Reported in the Test Boring Logs

The results of the laboratory tests are presented in Appendix B.

SUBSURFACE CONDITIONS

The results of the test boring are presented in Appendix A in the Test Boring Log. In general, the near surface soils encountered at Test Boring 1B and extending to a depth of 0.5 feet, consisted of medium dense clayey sand fill with some gravel and medium plasticity fines. The deposit was underlain by firm to very stiff sandy clay with a trace of gravel and medium plasticity which extended to a depth of 6 feet and was underlain by a somewhat loose to medium dense, non-plastic fine sand. Refusal to auger penetration occurred at a depth of 12.5 feet on hard clay. Soil moisture contents in the fill was slightly damp, damp to slightly damp in the clay and as damp to wet in the fine sand. Groundwater was observed in the test boring at a depth of 12 feet.

DISCUSSION OF TEST RESULTS

A remolded sample of the surface soils from the site exhibited a moderate to high swell potential following wetting when tested in the laboratory. An undisturbed sample from anticipated foundation grade underwent slight compression during loading to approximate foundation loads.

Upon wetting at approximate foundation loads, the near surface soils underwent slight additional compression.

FOUNDATION DESIGN RECOMMENDATIONS

Pier Footings:

The proposed Fitness Building can be supported on shallow Pier footings. The footings should be founded on undisturbed site soil. Footings thus founded may be designed using an allowable bearing pressure of 1500 psf, provided the bottom of the footings are at least 2.0 feet below Elevation 4947.0 feet and 2500 psf, for footings founded below frost elevation. The suspended modular floor will be founded at Elevation 4950.5 feet. Finished grade is defined as the lowest adjacent finished grade around the building perimeter. Structural loads should not exceed 6 kips per linear foot for walls and 85 kips for column footings. All footing excavations should be reviewed by a representative of the geotechnical engineer prior to placing reinforcing steel or concrete. Any fill, loose, disturbed or unstable soils should be removed from the bearing surface and replaced with MAG cement/AB slurry or as otherwise directed by the geotechnical engineer.

The allowable bearing capacity should be applied to maximum, design dead plus live loads and may be increased by one-third when considering temporary loads such as transient wind or seismic loads. A one-third increase may also be used for toe pressures due to eccentric or lateral loadings, assuming the entire footing bearing surface remains in compression. The weight of the footing concrete below grade may be neglected in dead load computations. The recommended minimum footing widths are 2.0 and 1.33 feet for isolated columns and continuous wall footings, respectively. A Site Class designation of C should be used for the site per the 2006, 2009 and 2012 International Building Code (IBC). The soil profile and site class designations are based on site conditions and a review of available well holes within a one mile radius of the site. This data was available on ADWR's website and indicated that dense material exists to depths over 100 feet in the immediate vicinity of the site or shallower bedrock.

The estimated total and differential footing settlements for the loading conditions described above are less than ½ inch if soils below footing level remain at or below the construction moisture content. Additional post-construction, differential movements of equal magnitude could occur if bearing soils become wet after construction. Therefore, continuous footings and stem walls should be reinforced and masonry walls constructed with properly designed reinforcement and with frequent expansion/contraction joints. Positive drainage away from the perimeter of the building is essential to minimize the potential for moisture infiltration into bearing soils.

Lateral Earth Pressures:

The following tabulation presents the recommended lateral earth pressures and base friction values which should be used in the lateral design of footings and retaining walls. The lateral pressures are equivalent fluid pressures for average anticipated conditions.

Backfill Pressures:	
Unrestrained walls	40 psf/ft
Restrained walls	55 psf/ft
Passive Pressures:	
Continuous	250 psf/ft
Isolated column footings	350 psf/ft
Coefficient of Base Friction:	
Concrete to soil	0.40
Plastic membrane to soil	0.25

The above equivalent fluid pressures are for vertical walls with horizontal backfills and do not include temporary loads imposed by compaction equipment or permanent loads resulting from backfill swell pressures, hydrostatic pressures or surcharge loads. All retaining walls should contain weep holes to reduce the potential for the buildup of hydrostatic pressures.

SITE DEVELOPMENT RECOMMENDATIONS

Concrete Slab-On-Grade Support:

The near surface clay soils are of medium plasticity, and when compacted and wetted, these soils exhibit a moderate to high swell potential. These soils may be used as fill in pavement and landscaped areas. All fill placed in the building and exterior slabs, ramps and stairs should be low expansive potential imported fill as presented later in this report. All unreinforced slabs-on-grade should be jointed in accordance with ACI (American Concrete Institute) or PCA (Portland Cement Association) guidelines.

Surface Drainage:

Most soils will undergo some degree of volume change as the result of wetting. The degree of volume change will depend on the type of soil, swell potential, natural soils structure or degree of compaction (if a fill). These volume changes could result in movements in overlying building and non-structure elements including sidewalks, planters, retaining walls, floor slabs, etc. Therefore, good site and surface drainage away from these elements is required. In addition, water should not be allowed to pond within 10 feet of the building or other elements which are sensitive to movements. The exterior footing excavation backfill must be well compacted to minimize the possibility of moisture infiltration through this zone. All joints in the concrete floor slabs and at walls of the building must be sealed with flexible waterproof joint sealer.

Excavatability:

The excavatability of site materials is difficult to evaluate based only on the exploration equipment used during this project report. Therefore, we recommend that the contractor evaluate the excavatability of site materials by performing test excavations with the size and type of equipment the contractor plans on using at the site. For design purposes the following paragraph presents our best analysis as to the excavatability of site soils.

The near surface and underlying soils to depths of at least 12 feet can probably be removed with conventional excavating equipment. Excavations penetrating the underlying hard clay and groundwater will be very slow and difficult to accomplish and may need dewatering during and after excavation. OSHA requires all excavations over five feet in depth, in which personnel are to enter, be either braced or sloped in accordance with OSHA regulations.

Workability:

Wetting site soils such that moisture contents are at or above optimum could result in moderate to extensive soil pumping under dynamic loadings such as heavy construction equipment driving over the area. In building areas, some pumping is not detrimental to foundation or floor slabs provided the specified percent compaction is achieved. However, in flexible pavement areas where pumping has occurred, and in building areas where severe pumping has damaged subgrade conditions, the area should be allowed to dry until soils are workable without pumping or the wetted areas removed and replaced with drier site soils.

PAVEMENT DESIGN RECOMMENDATIONS

Asphalt Concrete:

The following asphalt concrete pavement sections are based on anticipated traffic types and frequencies and site soil conditions. Therefore, any material imported to the site and placed in pavement areas should have support characteristics the same as or better than the site soils.

	Pavement Section	
Use	Asphalt Concrete	Base Material
Auto Parking and Drives	2.5 inches	7.0 inches
Truck Drives	3.5 inches	8.0 inches

These sections are minimal and will require periodic maintenance where proper drainage is provided and maintained. Should moisture penetrate to the subgrade soils or ponding occur on or adjacent to the asphalt concrete section, a significant reduction in asphalt concrete life could occur along with increased maintenance. Therefore, good surface drainage on and adjacent to the paved areas is essential to achieving the desired pavement life.

MATERIALS SUITABILITY AND REQUIREMENTS

Site Soils:

The near surface soils exhibit medium plasticity and a moderate to high swell potential when compacted and wetted. These soils may be used as fill in pavement and landscaped areas. All fill placed in the building and exterior slabs, ramps and stairs should be low expansive potential imported fill as presented later in this report. All materials should be free of organics, debris and material greater than 6 inches in size.

Imported Soils:

Imported soils required to raise the building above footing level or in exterior slab areas, or for use as retaining wall backfills, should meet the following requirements:

Maximum Particle Size------------------------ 6 inches
Maximum Swell Potential----------------------- 1.5%*

* Based on a sample which is remolded to 95% of the ASTM D698 maximum dry density at a moisture content of 2 percent below optimum, placed under a surcharge load of 100 psf and wetted.

Imported soils should have a low corrosion potential as determined by a corrosion expert and/or material supplier and should meet ACI 318 negligible sulfate exposure durability requirements for concrete.

Base Material:

Base material used below concrete slabs and pavements should conform to the requirements of Maricopa Association of Governments (MAG) Specifications for Aggregate Base (Section 702) or ADOT equivalent.

Asphalt Concrete Pavement:

Asphalt concrete pavement materials should conform to the requirement of Maricopa Association of Governments MAG Specifications for Asphalt Concrete (Section 710) or ADOT equivalent.

SITE PREPARATION AND GRADING PROCEDURES

Building and Pavement Areas:

Recommendations presented in the previous sections of this report are based upon the following site preparation and grading procedures. Therefore, all earthwork should be accomplished with observation and testing by a qualified technician under the direction of a registered geotechnical/ materials engineer. The following apply to the areas within and extending 5 feet beyond the footprint of the building and in exterior slab and pavement areas.

1. Clear and grub the site by removing and disposing of all vegetation, debris, rubble and remnants of any former developments.

2. Strip the site of any existing fill zones, loose backfill zones and unstable soils. During stripping observe the surface for evidence of buried debris, vegetation or disturbed materials which will require additional removal. Areas steeper than 5H to 1V should be benched and any depressions widened to accommodate compaction equipment.

3. Prepare the ground surface in at-grade areas, in fill areas and in areas cut to grade by scarifying, moisture conditioning and compacting the exposed surface soils to a depth of 8 inches.

4. Moisture condition and place all imported fill and backfill materials required to achieve specified grades. Fill materials should be moisture conditioned, placed and compacted in horizontal lifts of thicknesses compatible with the compaction equipment being used.

5. Compact subgrade, fill, backfill, subbase fill or base material to the following minimum percent compaction of the ASTM D698 maximum dry density for each lift.

Material	Minimum Percent Compaction
Soil:	
Below pavement sections	95
Imported Fill:	
Below concrete floor slabs and exterior slabs, ramps and stairs	90

Material	Minimum Percent Compaction
Base Material:	
Below flexible pavement	100
Backfill: *	90

* Outside of building, exterior slab and pavement areas.

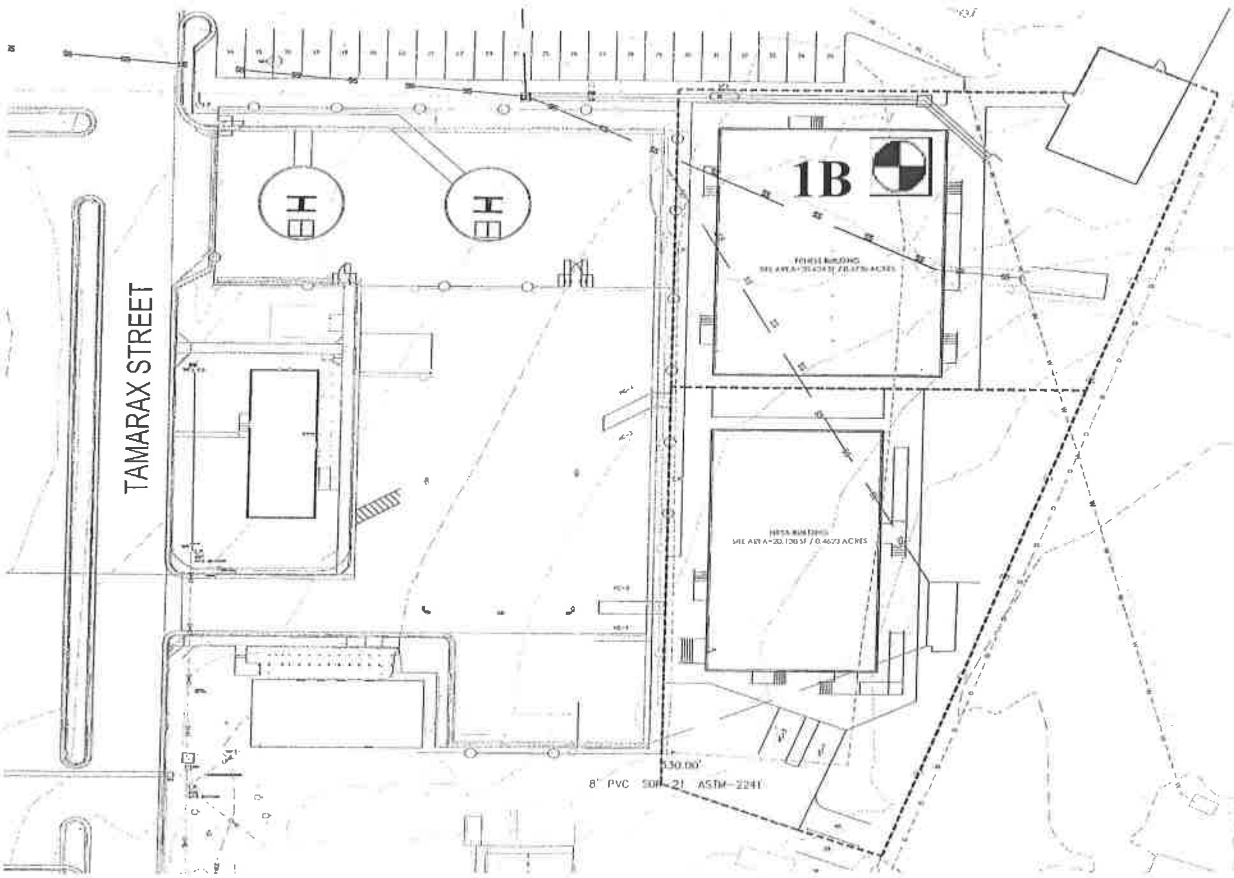
6. The moisture content of soil and base materials at the time of compaction should be:

Type	Area of Use	Moisture Content
On-site	Buildings, Exterior Slabs	Not recommended for use in these areas
On-site	Pavements	2% below optimum or lower
Imported	Buildings, Exterior Slabs	Optimum plus or minus 3%
Imported	Pavements	2% below optimum or lower
Base Material	Buildings and Pavements	Optimum plus or minus 3%

7. Any soils which are disturbed or overexcavated by the contractor outside the limits of the plans or specifications should be replaced with materials compacted as specified above. The above compaction requirements will also apply to any disturbance occurring within the construction limits, including but not limited to backfilling of trenches inside and outside of the building pad.

APPENDIX A
FIELD EXPLORATIONS

R·A·M·M



Test Boring Location

NOT TO SCALE

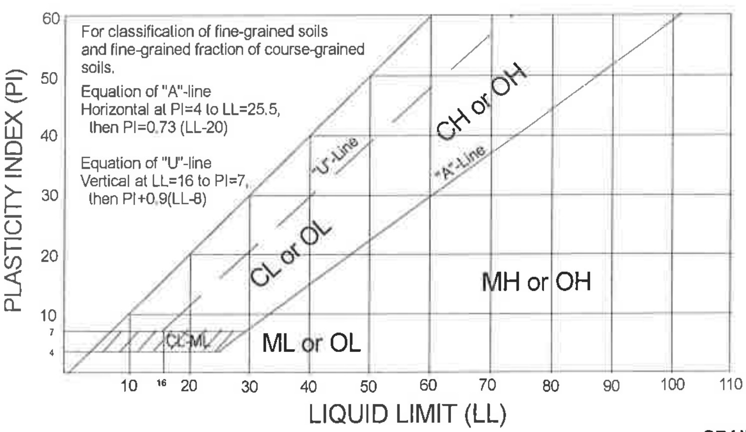
SITE PLAN

LEGEND

ASTM Designation: D2487-11
(Based on Unified Soil Classification System)

CLASSIFICATION OF SOILS

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests				Soil Classification: Group Symbol	Soil Classification: Name
COARSE-GRAINED SOILS More than 50% retained on No. 200 Sieve	Gravels More than 50% coarse fraction retained on No. 4 Sieve	Clean Gravels Less than 5% fines	Cu >4 and 1 <Cc <3	GW	Well graded gravel
			Cu<4 and/or 1>Cc>3	GP	Poorly graded gravel
		Gravels with Fines More than 12% fines	Fines classify as ML or MH	GM	Silty gravel
			Fines classify as CL or CH	GC	Clayey gravel
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	Cu >6 and 1 <Cc <3	SW	Well-graded sand
			Cu<6 and/or 1>Cc>3	SP	Poorly graded sand
		Sands with Fines More than 12% fines	Fines classify as ML or MH	SM	Silty sand
			Fines classify as CL or CH	SC	Clayey sand
FINE-GRAINED SOILS 50% or more passes the No. 200 Sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI>7 and plots on or above "A" line	CL	Lean clay
			PI<4 or plots below "A" line	ML	Silt
		Organic	Liquid Limit - oven dried / Liquid limit - not dried <0.75	OL	Organic clay / Organic silt
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay
			PI plots below "A" line	MH	Elastic silt
		Organic	Liquid limit - oven dried / Liquid limit - not dried <0.75	OH	Organic clay / Organic silt
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat



TEST BORING LOG DEFINITIONS

Blows per foot using 140 pound hammer with 30 inch free-fall.

Depth, feet	Blows/Foot: C	Blows/Foot: N/R	Sample Type	Dry Density pcf	Water Content, %	Unified Classification	Description

C = Continuous Penetration Resistance (2 inch diameter rod)
N = Standard Penetration Resistance (ASTM D1586)
R = Penetration Resistance (3 inch diameter ring line sampler)

GRAIN SIZES

	U.S. STANDARD SERIES SIEVE 200	40	10	4 CLEAR SQUARE SIEVE OPENINGS	3/4"	3"	12"
SILTS & CLAYS DISTINGUISHED ON BASIS OF PLASTICITY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

MOISTURE CONDITION (INCREASING MOISTURE ——▶)

DRY	SLIGHTLY DAMP	DAMP	MOIST (Plastic Limit)	VERY MOIST	WET (SATURATED) (Liquid Limit)

CONSISTENCY CORRELATION: CLAYS & SILTS	BLOWS/FOOT*	RELATIVE DENSITY CORRELATION: SANDS & GRAVELS	BLOWS/FOOT*
VERY SOFT	0-2	VERY LOOSE	0-4
SOFT	2-4	LOOSE	4-10
FIRM	4-8	MEDIUM DENSE	10-30
STIFF	8-16	DENSE	30-50
VERY STIFF	16-32	VERY DENSE	OVER 50
HARD	OVER 32		

*Number of blows of 140 lb hammer falling 30" to drive a 2" O.D. (1-3/8" I.D.) split-spoon sampler (ASTM D1586).

TEST BORING LOG

Project: Fitness Building-TCRHCC – Tuba City, Arizona Test Boring: 1
Elevation: Not Determined Datum: --- Date: 6-6-17

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density, pcf	Water Content, %	Unified Classification	Description
		19	R	105	18	SC	FILL: Clayey Sand, Some Gravel; brown, slightly damp, medium dense, medium plasticity fines.
		11	R	107	14	CL	Sandy Clay, Trace Gravel; brown, damp to slightly damp, firm to very stiff, medium plasticity fines.
5		11	R	111	8		
						SP	Fine Sand; yellow, damp, somewhat loose to medium dense, non-plastic.
10		6	R	NR			
		6	N		17		Wet below 11 feet.
							Refusal to auger penetration at 12.5 feet on hard clay. Groundwater observed at 12 feet. NR = No Recovery.
15							
20							
25							

This boring log represents the conditions encountered on the date of drilling at this particular location. No other warranty is expressed or implied to the actual conditions which may exist within the vicinity of this boring location.

APPENDIX B
LABORATORY ANALYSIS

R·A·M·M

LABORATORY TEST RESULTS

Date: 19-Jun-17

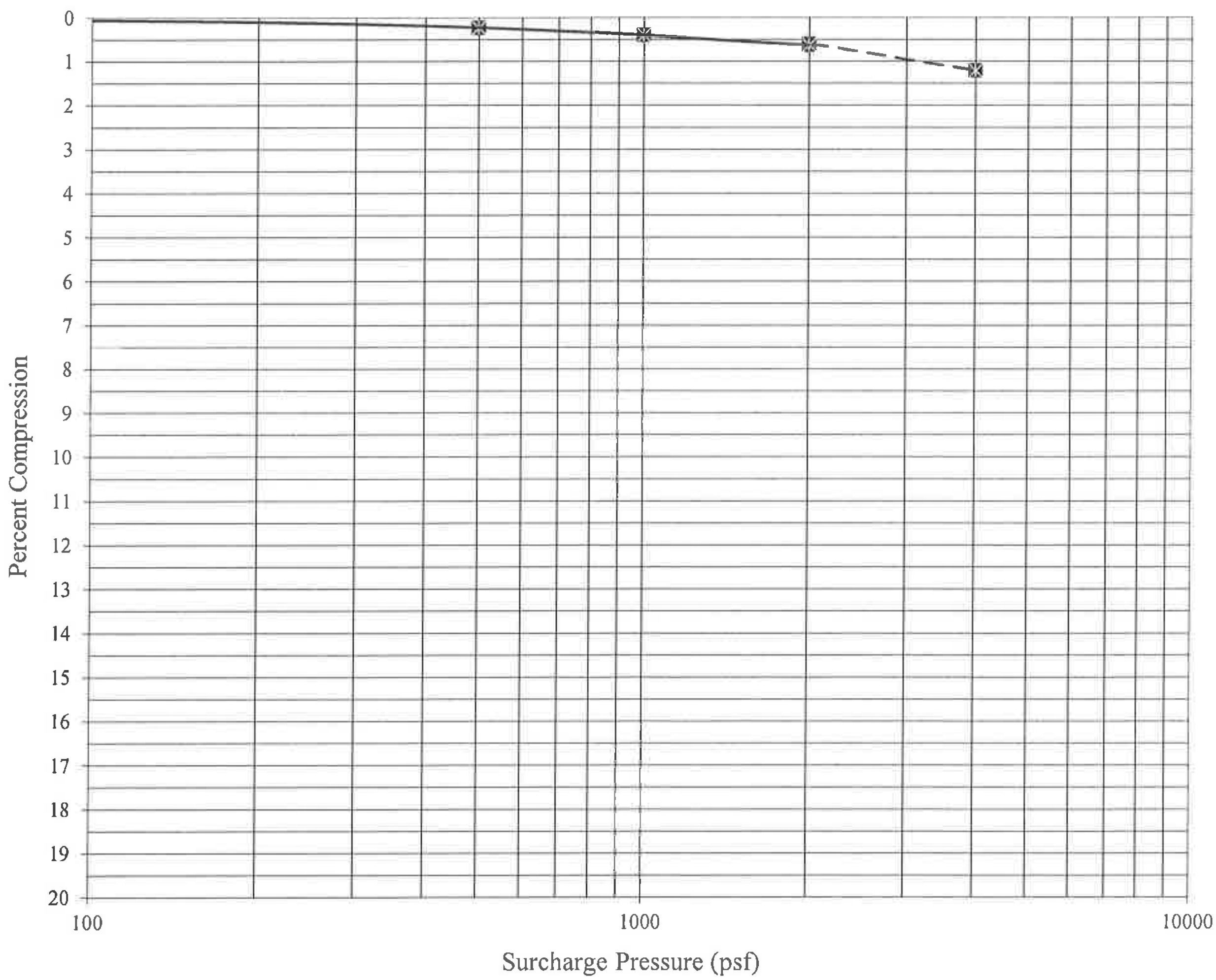
SAMPLE SOURCE: 1B @ 2'-3'

TESTING PERFORMED: Compression (ASTM D2435) - Driven Ring Sample

SAMPLED BY: RAMM/Durot

RESULTS:

Dry Density (pcf): 107 Moisture Content (%): 14



REMARKS: Sample submerged at 2000 psf.

LABORATORY TEST RESULTS

Date: 19-Jun-17

SAMPLE SOURCE: As noted below

TESTING PERFORMED: Percent Passing No. 200 Sieve, Atterberg Limits, Percent Expansion (ASTM D1140, D4318, D4546)

SAMPLED BY: RAMM/Durot

RESULTS:

Sample Source	Percent Retained No. 4 Sieve	Percent Passing No. 200 Sieve	Liquid Limit	Plasticity Index	Percent Expansion*	Remolded Dry Density (pcf)	Remolded Moisture Content (%)
1B @ 0'-5'	1	66	34	19	5.4	108	13

* Based upon sample remolded to 95% of the estimated maximum dry density at 2% below the estimated optimum moisture content, with a surcharge pressure of 100 psf.

Shephard Wesnitzer, Inc.

110 West Dale Avenue
Flagstaff, AZ 86001

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Engineering an environment of excellence.

DRAINAGE REPORT
for
TUBA CITY REGIONAL HEALTHCARE CORPORATION
HRSA COUNSELING CENTER
AND
DIABETES PREVENTION PROGRAM FITNESS

A portion of Section 20
Township 32 North, Range 11 East, G&SRM
Coconino County, Arizona

Prepared for
Tuba City Regional Healthcare Corporation
Facilities Management Department
167 North Main St.
PO Box 600
Tuba City, AZ 86045

Prepared by
Shephard-Wesnitzer, Inc.
Consulting Engineers
110 West Dale Avenue
Flagstaff, Arizona 86001

Registered Professional Engineer (Civil)
CERTIFICATE NO.
51303
OTTIS
BEGAY
7/25/2017
Date Signed
ARIZONA, USA
Expires 9/30/2019

July 25, 2017
Job #17095

TABLE OF CONTENTS

APPENDICES

INTRODUCTION

The addition of the Diabetes Prevention Program Fitness and HRSA Counseling Center buildings are proposed at the northeast corner of the Tuba City Healthcare Corporation campus. The project site is currently used as an unpaved parking area. The existing improvements on the site consist of the approximately 1 acre graded parking area and an existing storm drain pipe that crosses through the site. The site is located in Section 20, Township 32 North, Range 11 East, of the Gila and Salt River Meridian, Coconino County, Arizona.

The improvements will include an 8,000 square foot modular building for the Diabetes Prevention Program Fitness facility, a 5,800 square foot modular building for the HRSA Counseling Center facility, adjacent parking and associated utility service connections. The existing site slopes to the southeast toward the existing fence at the property boundary. Offsite flows originating from the parking area and helipad to the west currently sheet flows onto the site. Offsite flows also enter the project site via the existing 24" diameter storm drain that ends at the proposed location for the Fitness building. A drainage ditch carries the flows to the property boundary. The project site is located within an area that is not mapped on the FEMA Flood Insurance Rate Maps. Appendix A includes a Vicinity Map with the location of the project site.

OBJECTIVE

The objective of this report is to determine the impact the proposed development will have on the runoff characteristics of the site. Mitigation measures will be provided for adverse impacts to the runoff conditions per the Coconino County Drainage Design Criteria (DDC).

PROCEDURE

The Rational Method was used to calculate peak discharge rates for the pre- and post-development conditions. Topographic survey information from Shephard Wesnitzer Inc., was used to determine the drainage patterns on the site. Boundary information was taken from the Boundary Survey Plat prepared by Surveying Control, Inc. Rainfall data was taken from the NOAA Atlas 14 rainfall Intensity-Duration-Frequency data for Tuba City, AZ found on the NOAA National Weather Service website. Soil information was taken from the NRCS Web Soil Survey website. The site plan prepared by the architect and proposed grading was used to determine the post-development drainage patterns on the site. Appendix B of this report includes a drainage exhibit showing the existing and proposed improvements, drainage patterns and drainage basin areas. The site plan was also used to determine the impervious areas proposed with the development. Rational 'C' coefficients were determined based on existing site conditions, proposed improvements and weighted based on coverage area. Figure 2-2 from the _ADOT Highway Drainage Design Manual, Volume 2 – Hydrology_ was used to determine the Rational 'C' coefficient for the pre-development conditions.

The offsite drainage areas consist of the parking area and helipad located to the west and adjacent to the site, and a portion of the hospital building and parking nearest Elm Avenue. The stormwater runoff from the adjacent parking area and helipad currently sheet flows across the site and exits the property at the east boundary. Flows from the existing storm drain originate from the existing hospital building and the parking areas at the north side of the hospital. There are no existing drainage reports on file with the Hospital that details the hydrology and hydraulic calculations used to size the existing storm drain. The flow in the outlet pipe will be determined by calculating the full flow capacity of the pipe per Chapter 7 of the DDC.

The proposed HRSA and Fitness buildings and the associated parking area will be graded to drain east to match the existing drainage patterns. A detention facility will be designed to offset the increase in peak discharge rates from the site in the post-development condition. Bentley's *PondPack* computer program was used to calculate the peak discharge rates, to design the proposed detention facility and size the outlet structure. The storm drain will be re-routed to create the area necessary for the Fitness building. Bentley's *StormCAD* computer program was used to size the proposed storm drain.

RESULTS

The Rational Method was used to calculate peak discharge rates used to size the proposed detention pond and storm drain. The runoff coefficients for the site in the pre-development condition were determined to be 0.33 in the 2- and 10-year storm event, and 0.41 in the 100-year storm event. In the post-development condition, the impervious areas were assigned a runoff coefficient of 0.95 and the landscape/pervious areas were assigned a runoff coefficient of 0.33. The composite runoff coefficients for the site in the post-development condition were calculated to be 0.65 in the 2- and 10-year storm events, and 0.71 in the 100-year storm event. The offsite drainage basin that is located to the west and adjacent to the project site has an area of 0.87 acres. The composite runoff coefficients for the offsite drainage area were determined to be 0.87 in the 2- and 10-year storm event, and 0.93 in the 100-year storm event. The calculations for the runoff coefficients are included in appendix C. The time of concentration for the project site and offsite drainage area were determined to be 5 minutes. The table below summarizes the peak discharge rates for the pre- and post-development conditions.

Table 1: Peak Discharge Rates (cfs)

Scenario	Area (acres)	T_c (mins.)	$C_{2,10}$	C_{100}	Q_2	Q_{10}	Q_{100}
HRSA & Fitness Sites							
Pre-Development	0.66	5	0.33	0.41	0.43	0.75	1.78
Post-development	0.66	5	0.87	0.93	1.15	1.98	4.00
Offsite Drainage Basin							
Existing Condition	0.87	5	0.87	0.93	1.51	2.61	5.29

The hydraulic capacity of the existing storm drain on the site was determined using Equation 7.5 in section 7.5.2 Hydraulic Capacity from the DDC. The equation calculates the capacity of the pipes assuming the pipe is flowing full. Topographic survey information provided by SWI was used to determine the invert elevations of the downstream pipe to the existing storm drain. The pipe has a length of 158 feet and a slope of 0.76%. The capacity of the downstream 24" concrete pipe was calculated to be 17.1 cubic feet per second (cfs). The capacity calculations are included in appendix D of this letter.

Bentley's *StormCAD* software was used to design the proposed storm drain. The proposed storm drain will be 24" diameter ADS N-12 HDPE pipe. The pipe has a manning's roughness coefficient of 0.012, allowing the pipe to have a minimum slope to meet the grades on the site. The storm drain will outlet to the proposed detention pond for the HRSA & Fitness buildings. An overflow weir will be included with the construction of the detention pond to allow the offsite flows to pass through the pond in the event that the pond was full. The *StormCAD* model for the proposed storm drain begins at the existing catch basin located to the north of the helipad. The *StormCAD* model for the proposed storm drain had a tailwater elevation set to the 100-year water surface elevation of the detention pond. ADS drain basins will be installed at changes in the storm drain alignment and the drain basins were modeled with the standard headloss method. Headloss coefficients for the drain basins were set according to the bend angle between the pipes entering and exiting the structure. The flow velocities in the pipes will range from 6.47 to 8.55 feet per second (ft/s). The flow velocities are within an acceptable range for the ADS N-12 HDPE pipe. The Hydraulic Grade Line (HGL) within the storm drain is within the pipes and at an acceptable depth below the rim elevation of the ADS drain basins. The *StormCAD* output, including design peak discharge rates, pipe capacities, flow velocities and the profile showing the HGL are included in Appendix E of this letter.

The required storage capacity for the proposed detention pond was estimated to be 1,800 cubic feet during the 100-year, 39 minute storm event. The detention pond is designed as an above ground pond with a capacity of 2,397 cubic feet. The side slopes to the pond will be 3:1 (horizontal: vertical) and the fill embankment will have a top width of 3 feet. The detention pond will have a bottom elevation of 4,945.20 and the top elevation of 4,946.50. The outlet to the pond will be a 12” diameter HDPE pipe to be located at the south end of the pond. The actual peak storage volume during the 39 minute, 100-year storm event was 1,359 cubic feet. The water surface elevation during the 100-year storm event was calculated to be 4,946.02. The pond will have an emergency riprap overflow weir to be located at the south end of the pond with a top elevation at the 100-year water surface elevation. The *PondPack* output is included in appendix F.

CONCLUSION

Peak discharges for the 2-, 10- and 100-year storm events were determined for the project site for both the pre- and post-development conditions. The proposed detention pond and outlet pipe are designed to reduce the post-development peak discharge rates to be below pre-development levels. No further detention of stormwater runoff is required. All drainage conveyance structures and detention facilities are designed per the requirements outlined in the DDC. Refer to the construction plans by SWI for grades, locations and notes.

The design concepts in this report will ensure that the drainage integrity of the site is sustained with proper maintenance activity. Activities include frequent clearing of debris and sediment from the detention facility and catch basins, disturbed slope treatment and erosion control at the outlet pipe. Frequent monitoring will ensure expedient remedies to common problems such as erosion, sedimentation, and flow obstructions.

REFERENCES

Publications

Coconino County Drainage Design Criteria, January 2001

Software

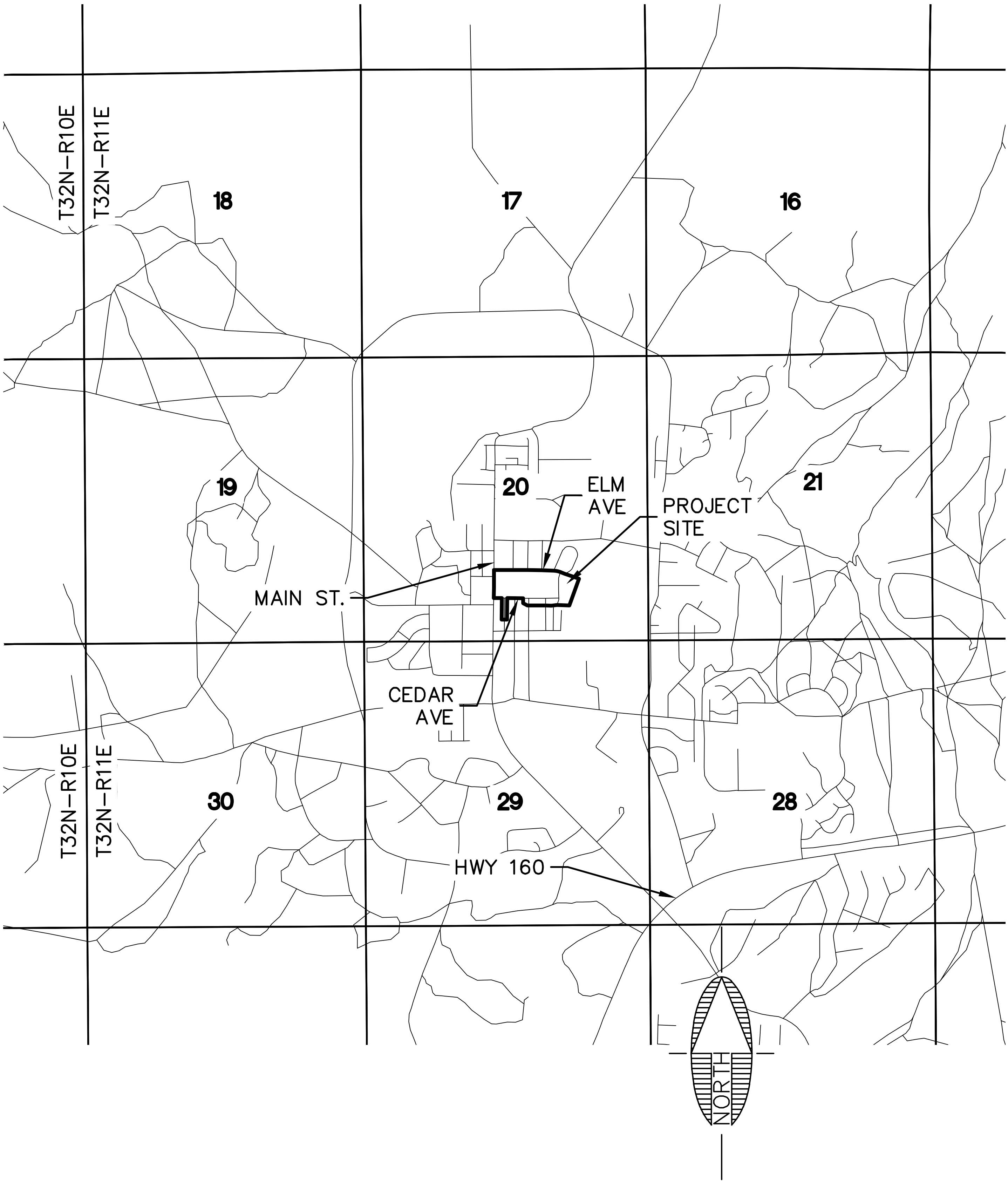
StormCAD, Bentley Systems, Inc., Version *8i*

PondPack, Bentley Systems, Inc., Version *8i*

Appendix A

Vicinity Map

SECTIONS 20, TOWNSHIP 32 NORTH, RANGE 11 EAST



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JOB NO.	17095
DATE	JUL 17
SCALE	1"=2500'
DRAWN	OKB
DESIGN	
CHECKED	OKB

TCRHCC HRSA & FITNESS

TUBA CITY
ARIZONA

DRAINAGE REPORT
VICINITY MAP

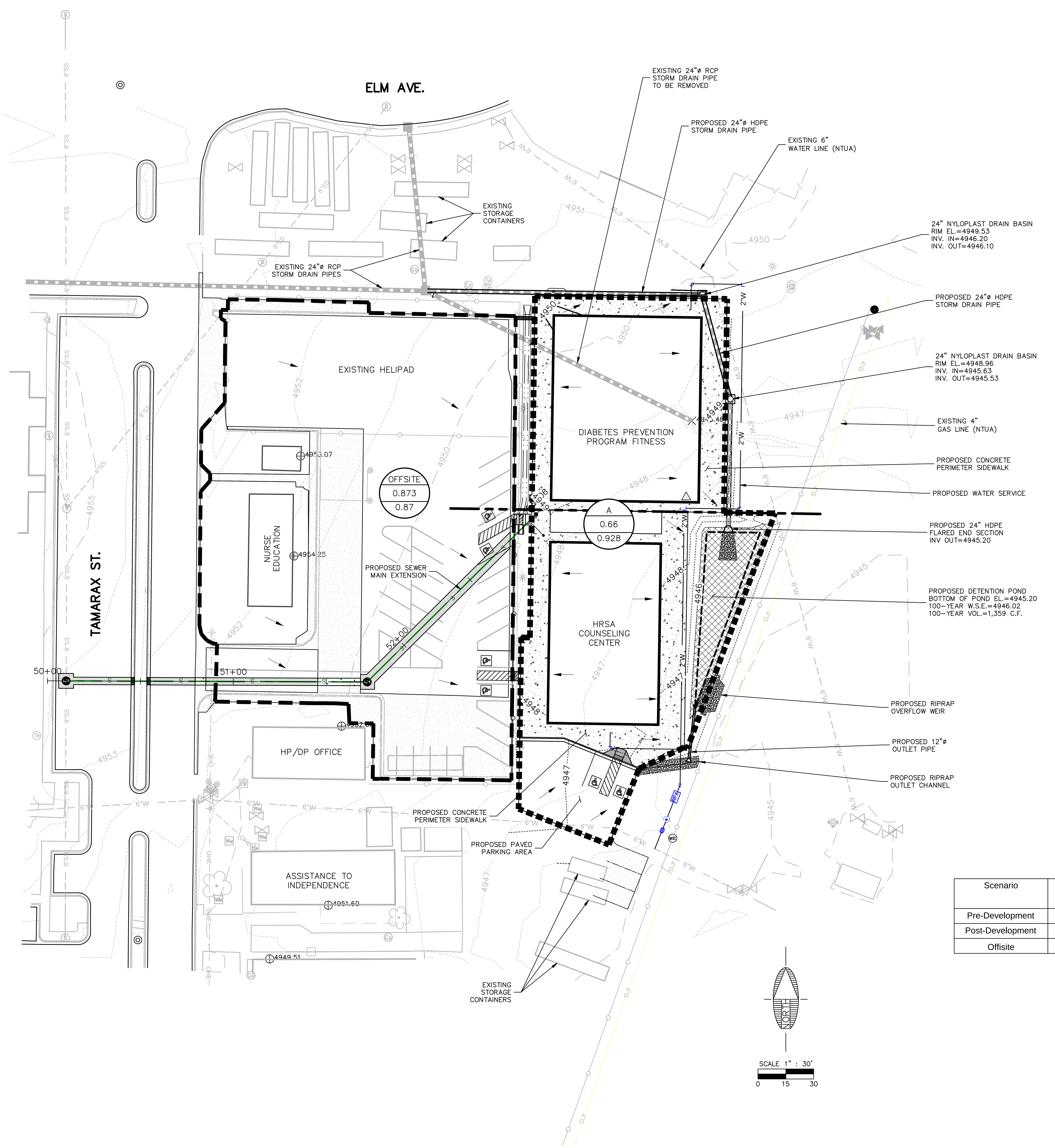
SHEET
1
OF 1

PLOTTED: Jul 18, 2017-6:27pm

FILE: P:\2017\17095\Drawings\Exhibits\17095-VIC MAP.dwg OKB-C3D-17

Appendix B

Drainage Exhibit



LEGEND

ID = BASIN IDENTIFICATION
A = AREA IN ACRES
CN = CURVE NUMBER

FLOW DIRECTION

MAJOR BASIN BOUNDARY

MINOR BASIN BOUNDARY

LID/DETENTION POND

PROPOSED CULVERT

Scenario	Area (acres)	Tc (min)	2-Year			10-Year			100-Year		
			C	i (in/hr)	Q2	C	i (in/hr)	Q10	C	i (in/hr)	Q100
Pre-Development	0.66	5	0.33	1.99	0.43	0.33	3.43	0.75	0.41	6.54	1.78
Post-Development	0.66	5	0.87	1.99	1.15	0.87	3.43	1.98	0.93	6.54	4.00
Offsite	0.87	5	0.87	1.99	1.51	0.87	3.43	2.61	0.93	6.54	5.29

TUBA CITY
ARIZONA

TCRHCC HRSA & FITNESS

DRAINAGE REPORT DRAINAGE EXHIBIT

JOB NO: 17095
DATE: JUL 17
SCALE: 1"=30'
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DESIGN: OKB
CHECKED: OKB

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REVISIONS

NO.	DESCRIPTION	DATE	BY

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Dial 8-1-1 or 1-800-STAKE-IT (782-5348)

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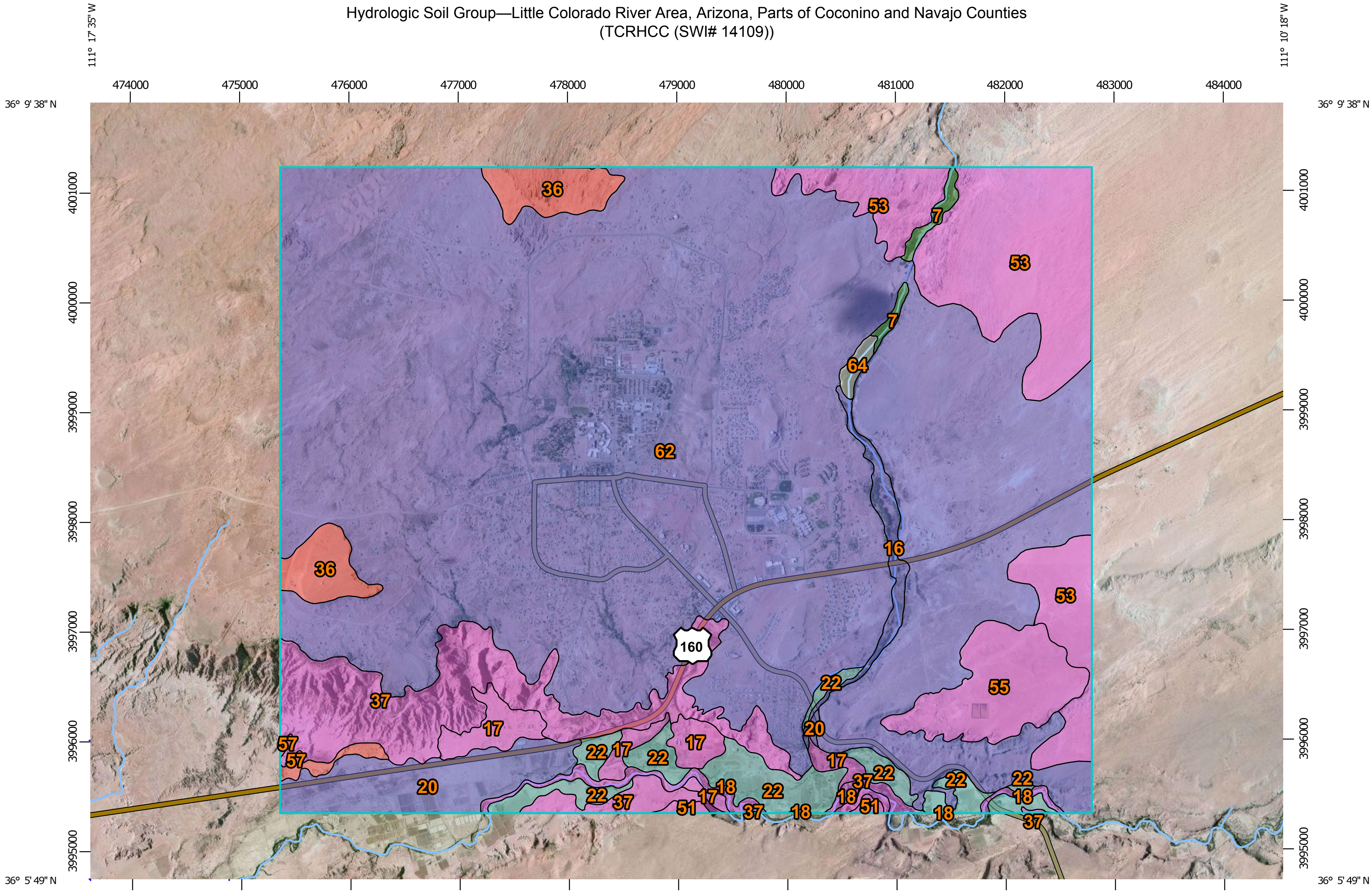
Appendix C

Rational Method Calculations

Hydrologic Soil Group—Little Colorado River Area, Arizona, Parts of Coconino and Navajo Counties
(TCRHCC (SWI# 14109))



Map Scale: 1:49,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Little Colorado River Area, Arizona, Parts of Coconino and Navajo Counties
Survey Area Data: Version 8, Sep 20, 2014

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

Date(s) aerial images were photographed: May 15, 2011—May 27, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Little Colorado River Area, Arizona, Parts of Coconino and Navajo Counties (AZ707)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
7	Endoaquolls-Haplofibrists-Psammaquents complex, 0 to 3 percent slopes	A/D	35.7	0.3%
16	Ives-Bebeevar family-Oxyaquic Torripsamments complex, 0 to 3 percent slopes	B	82.8	0.8%
17	Ives-Jocity complex, 1 to 4 percent slopes	A	182.6	1.7%
18	Ives-Riverwash association, 0 to 2 percent slopes	A	85.3	0.8%
20	Jocity sandy clay loam, 0 to 2 percent slopes	B	299.2	2.8%
22	Jocity-Tuba, complex, 1 to 3 percent slopes	C	329.0	3.0%
36	Needle-Rock outcrop-Sheppard complex, 2 to 15 percent slopes	D	212.7	2.0%
37	Nepalto family-Tsaya-Rock outcrop complex, 35 to 70 percent slopes	A	690.5	6.4%
51	Sheppard-Monue complex, 1 to 8 percent slopes	A	17.5	0.2%
53	Sheppard-Rock outcrop-Sheppard, moderately deep complex, 2 to 15 percent slopes	A	937.1	8.6%
55	Shoegame family, 1 to 5 percent slopes	A	287.6	2.6%
57	Shorthair-Rock outcrop-Sheppard complex, 2 to 15 percent slopes	D	31.4	0.3%
62	Tuba-Tyende family-Fajada family complex, 2 to 15 percent slopes	B	7,640.2	70.4%
64	Water		21.1	0.2%
Totals for Area of Interest			**10,852.7**	**100.0%**

Description

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

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

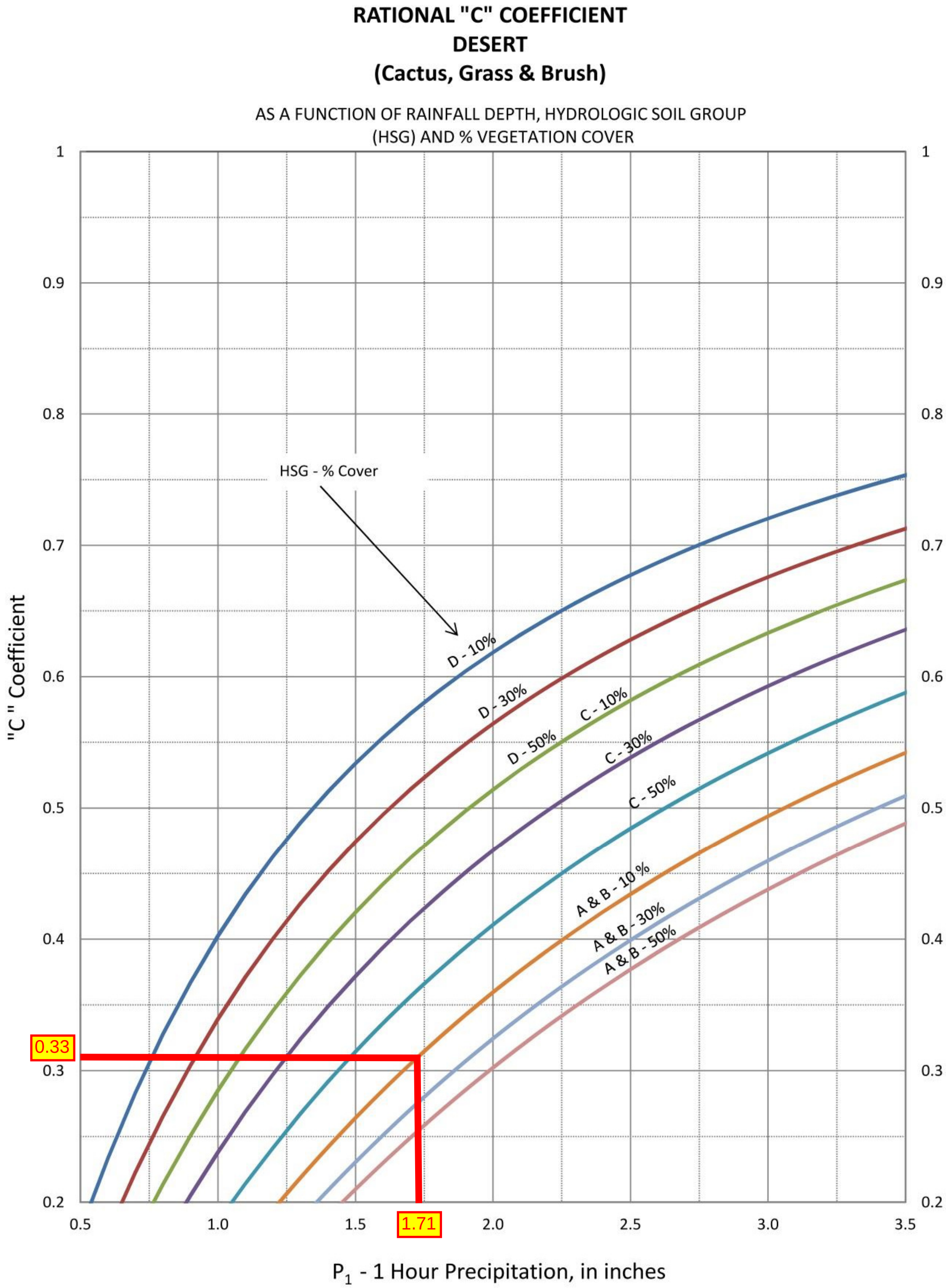


Figure 2–2 Rational "C" Coefficient – Desert

NOAA Atlas 14, Volume 1, Version 5
Location name: Tuba City, Arizona, USA*
Latitude: 36.1359°, Longitude: -111.2376°
Elevation: 4960.11 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

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.55 (1.33-1.84)	1.99 (1.70-2.36)	2.75 (2.35-3.26)	3.43 (2.90-4.07)	4.50 (3.73-5.33)	5.44 (4.44-6.43)	6.54 (5.22-7.76)	7.79 (6.06-9.32)	9.72 (7.28-11.8)	11.4 (8.30-13.9)
10-min	1.18 (1.01-1.40)	1.52 (1.30-1.80)	2.09 (1.79-2.48)	2.62 (2.21-3.10)	3.43 (2.84-4.06)	4.14 (3.38-4.90)	4.98 (3.97-5.91)	5.93 (4.61-7.10)	7.40 (5.54-8.95)	8.67 (6.32-10.6)
15-min	0.976 (0.836-1.16)	1.25 (1.08-1.49)	1.73 (1.48-2.06)	2.16 (1.83-2.56)	2.83 (2.35-3.35)	3.42 (2.80-4.04)	4.11 (3.28-4.89)	4.90 (3.81-5.86)	6.12 (4.58-7.40)	7.17 (5.22-8.77)
30-min	0.658 (0.562-0.778)	0.844 (0.724-1.00)	1.17 (0.998-1.38)	1.45 (1.23-1.72)	1.91 (1.58-2.26)	2.30 (1.88-2.72)	2.77 (2.21-3.29)	3.30 (2.57-3.95)	4.12 (3.09-4.98)	4.83 (3.51-5.91)
60-min	0.407 (0.348-0.481)	0.523 (0.448-0.620)	0.721 (0.617-0.856)	0.900 (0.761-1.07)	1.18 (0.978-1.40)	1.43 (1.17-1.69)	1.71 (1.37-2.04)	2.04 (1.59-2.44)	2.55 (1.91-3.08)	2.99 (2.17-3.66)
2-hr	0.244 (0.212-0.283)	0.309 (0.268-0.359)	0.416 (0.359-0.482)	0.511 (0.436-0.590)	0.658 (0.554-0.761)	0.790 (0.652-0.914)	0.942 (0.762-1.10)	1.12 (0.879-1.31)	1.39 (1.05-1.66)	1.63 (1.20-1.96)
3-hr	0.177 (0.156-0.204)	0.224 (0.197-0.259)	0.295 (0.258-0.339)	0.357 (0.309-0.409)	0.450 (0.385-0.516)	0.531 (0.448-0.610)	0.629 (0.520-0.738)	0.751 (0.601-0.882)	0.934 (0.721-1.11)	1.10 (0.823-1.32)
6-hr	0.102 (0.092-0.115)	0.128 (0.114-0.144)	0.163 (0.145-0.184)	0.194 (0.172-0.218)	0.239 (0.209-0.269)	0.277 (0.239-0.312)	0.320 (0.273-0.374)	0.380 (0.312-0.447)	0.473 (0.374-0.564)	0.555 (0.427-0.669)
12-hr	0.060 (0.054-0.067)	0.075 (0.068-0.083)	0.094 (0.084-0.104)	0.109 (0.098-0.121)	0.130 (0.116-0.144)	0.146 (0.130-0.163)	0.164 (0.144-0.188)	0.191 (0.160-0.224)	0.237 (0.188-0.283)	0.279 (0.214-0.336)
24-hr	0.035 (0.032-0.038)	0.044 (0.040-0.048)	0.055 (0.050-0.061)	0.065 (0.059-0.072)	0.078 (0.071-0.086)	0.089 (0.079-0.098)	0.100 (0.089-0.110)	0.112 (0.099-0.123)	0.128 (0.112-0.144)	0.141 (0.122-0.170)
2-day	0.019 (0.017-0.020)	0.023 (0.021-0.025)	0.029 (0.027-0.032)	0.034 (0.031-0.037)	0.041 (0.037-0.045)	0.046 (0.042-0.051)	0.051 (0.046-0.056)	0.057 (0.051-0.063)	0.065 (0.057-0.072)	0.071 (0.062-0.086)
3-day	0.013 (0.012-0.014)	0.017 (0.015-0.018)	0.021 (0.019-0.023)	0.024 (0.022-0.026)	0.029 (0.026-0.031)	0.032 (0.029-0.035)	0.036 (0.032-0.039)	0.040 (0.035-0.043)	0.045 (0.040-0.049)	0.049 (0.043-0.058)
4-day	0.010 (0.010-0.011)	0.013 (0.012-0.014)	0.016 (0.015-0.018)	0.019 (0.017-0.021)	0.022 (0.020-0.024)	0.025 (0.023-0.027)	0.028 (0.025-0.030)	0.031 (0.027-0.034)	0.035 (0.031-0.038)	0.038 (0.033-0.043)
7-day	0.007 (0.006-0.007)	0.008 (0.008-0.009)	0.010 (0.010-0.011)	0.012 (0.011-0.013)	0.014 (0.013-0.016)	0.016 (0.014-0.017)	0.018 (0.016-0.019)	0.019 (0.017-0.021)	0.021 (0.019-0.024)	0.023 (0.021-0.025)
10-day	0.005 (0.005-0.006)	0.007 (0.006-0.007)	0.008 (0.007-0.009)	0.009 (0.009-0.010)	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.015)	0.015 (0.013-0.016)	0.016 (0.015-0.018)	0.018 (0.016-0.019)
20-day	0.003 (0.003-0.004)	0.004 (0.004-0.004)	0.005 (0.005-0.006)	0.006 (0.005-0.006)	0.007 (0.006-0.007)	0.008 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)
30-day	0.003 (0.002-0.003)	0.003 (0.003-0.003)	0.004 (0.004-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.009)
45-day	0.002 (0.002-0.002)	0.003 (0.002-0.003)	0.003 (0.003-0.003)	0.004 (0.003-0.004)	0.004 (0.004-0.004)	0.005 (0.004-0.005)	0.005 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.006)	0.006 (0.006-0.007)
60-day	0.002 (0.002-0.002)	0.002 (0.002-0.002)	0.003 (0.002-0.003)	0.003 (0.003-0.003)	0.003 (0.003-0.004)	0.004 (0.003-0.004)	0.004 (0.004-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.005)	0.005 (0.005-0.006)

[1] 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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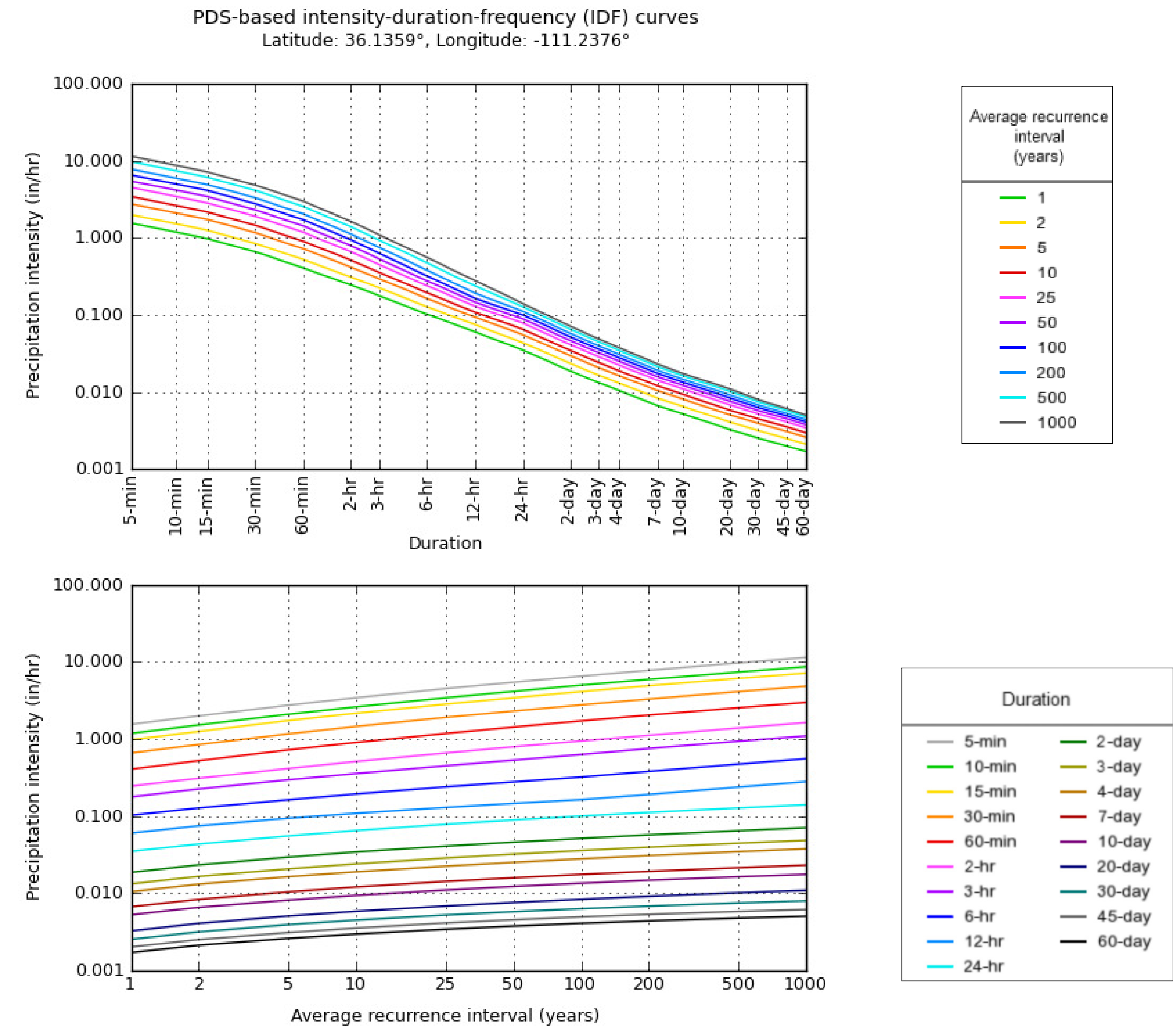
PF graphical



NOAA Atlas 14, Volume 1, Version 5 Created (GMT): Wed Jun 7 02:11:00 2017

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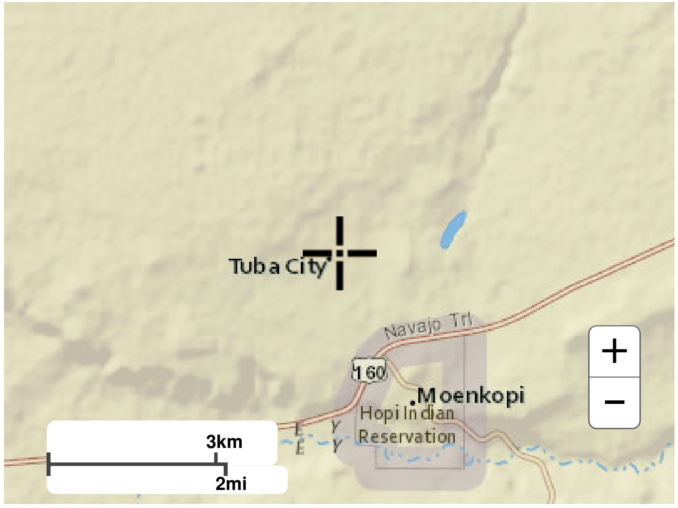
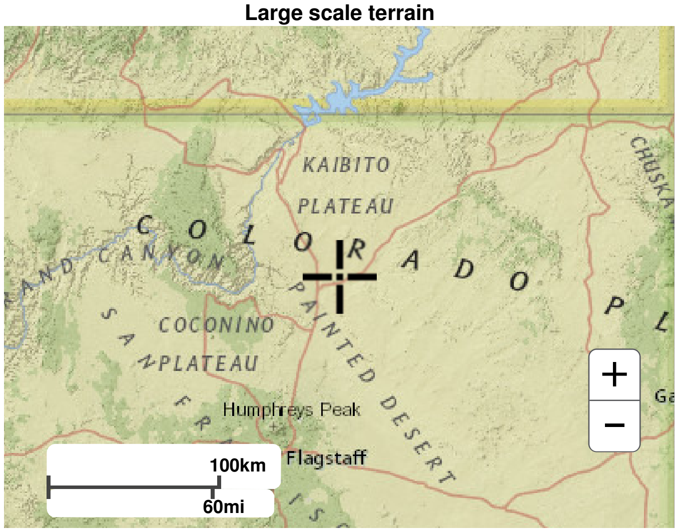
Maps & aerials

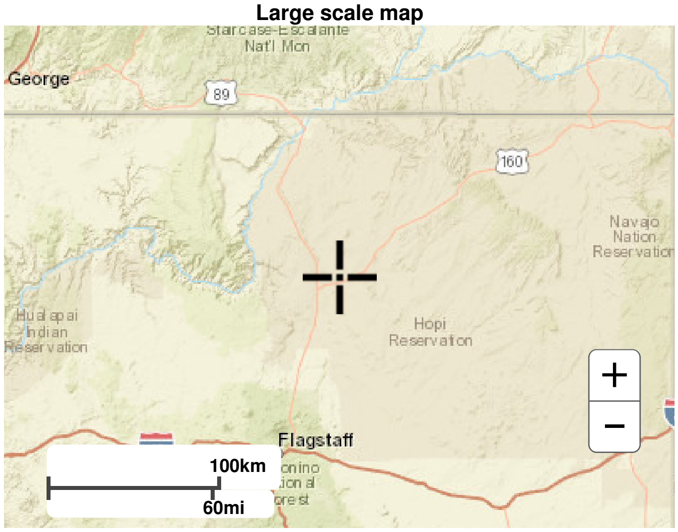
Small scale terrain



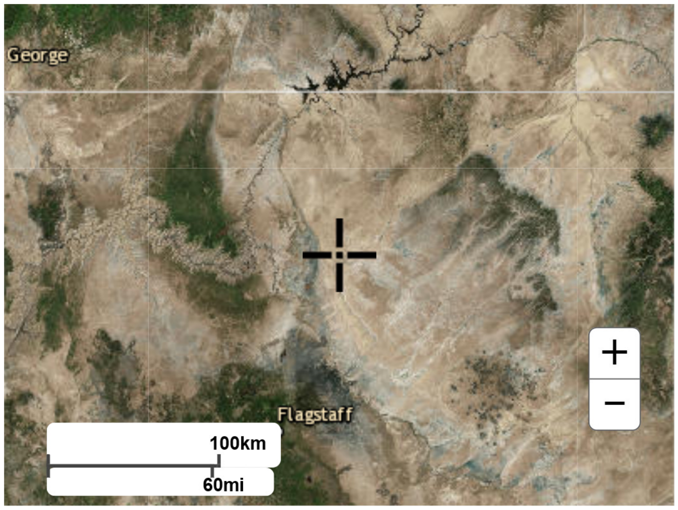
Large scale terrain



Large scale map



Large scale aerial



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

Disclaimer

TCRHCC HRSA & Fitness
SWI Job No. 17095
Rational 'C' coefficient Calculations

Existing Condition:

$C_{2\ \&\ 10\ yr}$ = **0.33**

$C_{100\ yr}$ = 0.33*1.25 = **0.41** (antecedent precipitation factor = 1.25)

Notes:
1.) Uses ADOT Figure 2-2
2.) Land use is Desert
3.) Hydrologic Soil Group is 'B'

Proposed Condition:

$C_{2\ \&\ 10\ yr}$

Impervious Areas
Area (ac.) = 0.577
C = 0.95
C * Area = 0.5481

Open Space (for landscape and cut/fill areas)
Area (ac.) = 0.081
C = 0.33
C * Area = 0.0268

Composite 'C' coefficient = $[(C * Area)_{impervious} + (C * Area)_{open\ space}]$/ Total Area
= [0.5481 + 0.0268] /0.66
= **0.874**

$C_{100\ yr}$

Impervious Areas
Area (ac.) = 0.577
C = 0.95*1.25 = 1.0 (antecedent precipitation factor = 1.25)
C * Area = 0.5770

Open Space (for landscape and cut/fill areas)
Area (ac.) = 0.081
C = 0.33*1.25 = 0.41 (antecedent precipitation factor = 1.25)
C * Area = 0.0334

Composite 'C' coefficient = $[(C * Area)_{impervious} + (C * Area)_{open\ space}]$/ Total Area
= [0.577 + 0.0334] / 0.66
= **0.928**

TCRHCC HRSA & Fitness
SWI Job No. 17095
Rational 'C' coefficient Calculations, Offiste Drainage Basin

Existing Condition:

$C_{2\ \&\ 10\ yr}$

Impervious Areas

Area (ac.) = 0.763
C = 0.95
C * Area = 0.7250

Open Space (for landscape and cut/fill areas)

Area (ac.) = 0.109
C = 0.33
C * Area = 0.0361

Composite 'C' coefficient = $[(C * Area)_{impervious} + (C * Area)_{open\ space}]$/ Total Area
= [0.7250 + 0.0361] /0.87
= **0.875**

$C_{100\ yr}$

Impervious Areas

Area (ac.) = 0.763
C = 0.95*1.25 = 1.0 (antecedent precipitation factor = 1.25)
C * Area = 0.7632

Open Space (for landscape and cut/fill areas)

Area (ac.) = 0.109
C = 0.33*1.25 = 0.4125 (antecedent precipitation factor = 1.25)
C * Area = 0.0451

Composite 'C' coefficient = $[(C * Area)_{impervious} + (C * Area)_{open\ space}]$/ Total Area
= [0.7632 + 0.0451] / 0.87
= **0.929**

Notes:

1.) Uses ADOT Figure 2-2
2.) Land use is Desert
3.) Hydrologic Soil Group is 'B'

TCRHCC HRSA & Fitness
SWI Job No. 17095
Rational 'C' coefficient Calculations

Scenario	Area (acres)	Tc (min)	2-Year			10-Year			100-Year		
			C	i (in/hr)	Q_2	C	i (in/hr)	Q_{10}	C	i (in/hr)	Q_{100}
Pre-Development	0.66	5	0.33	1.99	0.43	0.33	3.43	0.75	0.41	6.54	1.78
Post-Development	0.66	5	0.87	1.99	1.15	0.87	3.43	1.98	0.93	6.54	4.00
Offsite	0.87	5	0.87	1.99	1.51	0.87	3.43	2.61	0.93	6.54	5.29

Note: Rainfall intensity values taken from NOAA Atlas 14 for Tuba City, AZ

Appendix D

Existing Pipe Capacity

$$V = [1.486\ R^{2/3}\ S^{1/2}] / n \tag{7.2}$$

where:
- V = mean velocity of flow, ft/s
- R = hydraulic radius (area/wetted perimeter)
- S = slope of the hydraulic grade line, ft/ft
- n = Manning's roughness coefficient

In terms of discharge, the above equation then becomes:

$$Q = [1.486\ A\ R^{2/3}\ S^{1/2}]\ n \tag{7.3}$$

where:
- Q = rate of flow, cfs
- A = cross sectional area of flow, ft²

For a conduit flowing full, the above equations become:

$$V = [0.590\ D^{2/3}\ S^{1/2}] / n \tag{7.4}$$

$$Q = [0.463\ D^{8/3}\ S^{1/2}] / n \tag{7.5}$$

where:
- D = diameter of the pipe, ft

Manning's Equation can also be written to determine friction losses for storm drain pipes as:

$$H_f = [2.87\ n^2\ V^2\ L] / [S^{4/3}] \tag{7.6}$$

and,

$$H_f = [29\ n^2\ L\ V^2] / [R^{4/3}\ (2g)] \tag{7.7}$$

where:
- H_f = total head loss due to friction, ft (refer to Section 7.7.2)
- L = length of pipe, ft, and

All other terms are as previously defined.

7.5.2.1 *Roughness Coefficient*

Manning's "n" values for closed conduit storm drains can be found in Tables 5-3 or 5-4 located in Chapter 5. These values are typically for new pipe based on laboratory testing. Therefore, it is recommended that the Manning's roughness coefficient used for storm drain design reflect the "aged" condition of the storm drain material or actual field conditions since in reality, sediments, dirt, debris, anti-skid materials, leaves, pine needles, and other materials are deposited into storm drain systems and deposit there.

7.5.2.2 *Storm Drain Shape*

The shape of a storm drain pipe also influences its capacity. For most applications, circular conduit will be utilized, however a significant increase in capacity can be realized by using an alternate shape. Table 7-2 provides a listing of the increase in capacity which can be achieved using alternate conduit shapes that have the same height as the original shape, but have a different cross sectional area. Although alternate shapes are typically more expensive than circular ones, their use can be justified in some cases based on their increased capacity or to provide required cover.

SHEPHARD - WESNITZER, INC.
consulting engineers
P.O. Box 3924 • Sedona, AZ 86340

Job No.	17095
Date	7/21/17
By	OKB
Sheet No.	1/1

Subject EXISTING STORM DRAIN CAPACITY

EXISTING PIPE

24" Ø RCP
U.S. INV. = 4947.43
D.S. INV. = 4946.23
L = 158.0'
S = 0.76%

USING EQ 7.5, SECTION 7.5.2 HYDRAULIC CAPACITY, COCONINO COUNTY DRAINAGE DESIGN CRITERIA

$$Q = \left[0.463\ D^{8/3}\ S^{1/2}\right] / n$$

$$= \left[(0.463)(2^{8/3})(0.0076^{1/2})\right] / 0.015$$

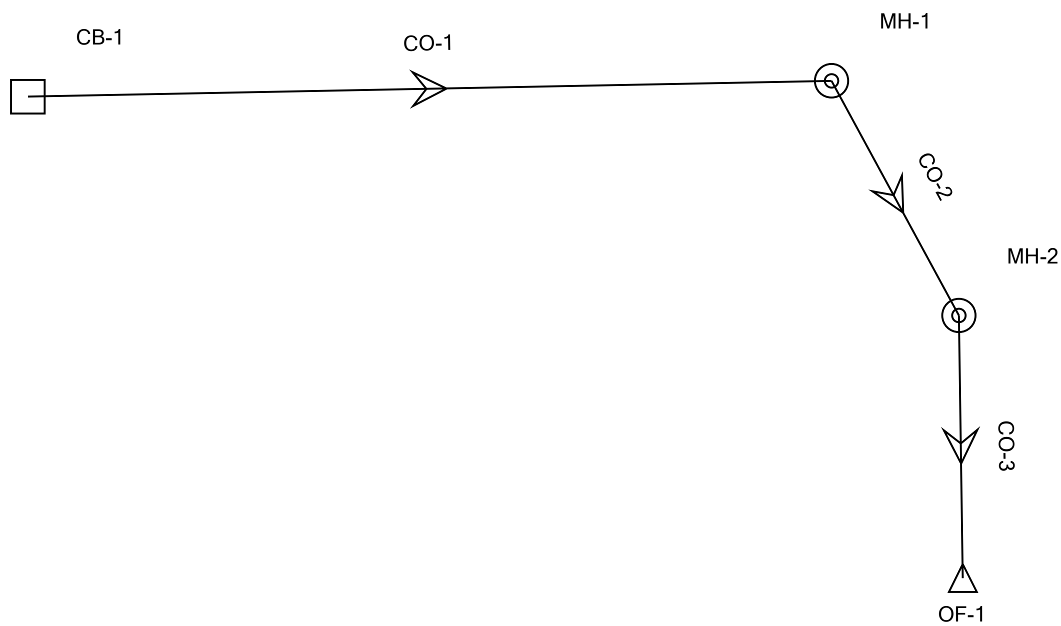
D = DIA. OF PIPE, FT
S = SLOPE OF HGL, FT/FT
n = MANNING'S ROUGHNESS COEFF.

$Q = 17.1$ CFS

Appendix E

StormCAD Output

Scenario: Base
Active Scenario: Base



Conduit FlexTable: Combined Pipe/Node Report (17905 - HRSA & Fitness.stc)
Active Scenario: Base

Label	Start Node	Stop Node	Diameter (in)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Length (Unified) (ft)	Slope (ft/ft)	Total Flow (ft³/s)	Capacity (Full Flow) (ft³/s)
CO-1	CB-1	MH-1	24.0	4,947.43	4,946.10	146.2	0.009	17.10	23.37
CO-2	MH-1	MH-2	24.0	4,946.10	4,945.53	55.0	0.010	17.10	24.95
CO-3	MH-2	OF-1	24.0	4,945.53	4,945.20	62.2	0.005	17.10	17.85

Velocity (Average) (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Froude Number	Manning's n
8.13	4,948.92	4,948.02	1.370	0.012
8.55	4,947.59	4,947.49	1.490	0.012
6.47	4,947.10	4,946.69	0.900	0.012

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W Watertown, CT 06795 USA
+1-203-755-1666
Bentley StormCAD V8i (SELECTseries 2)
[08.11.02.75]

FlexTable: Catch Basin Table (17905 - HRSA & Fitness.stc)
Active Scenario: Base

Label	Elevation (Ground) (ft)	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Flow (Additional) (ft^3/s)	Flow (Known) (ft^3/s)	Flow (Total Out) (ft^3/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Is Flooded?
CB-1	4,951.13	4,951.13	4,947.43	0.00	17.10	17.10	4,948.92	4,948.92	False

Downstream Conduit	Headloss (ft)
CO-1	0.00

FlexTable: Manhole Table (17905 - HRSA & Fitness.stc)
Active Scenario: Base

Label	Station (Calculated) (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Bolted Cover?	Diameter (in)	Headloss Method
MH-1	1+17	4,949.53	True	4,949.53	4,946.10	False	24.0	Standard
MH-2	0+62	4,948.96	True	4,948.96	4,945.53	False	24.0	Standard

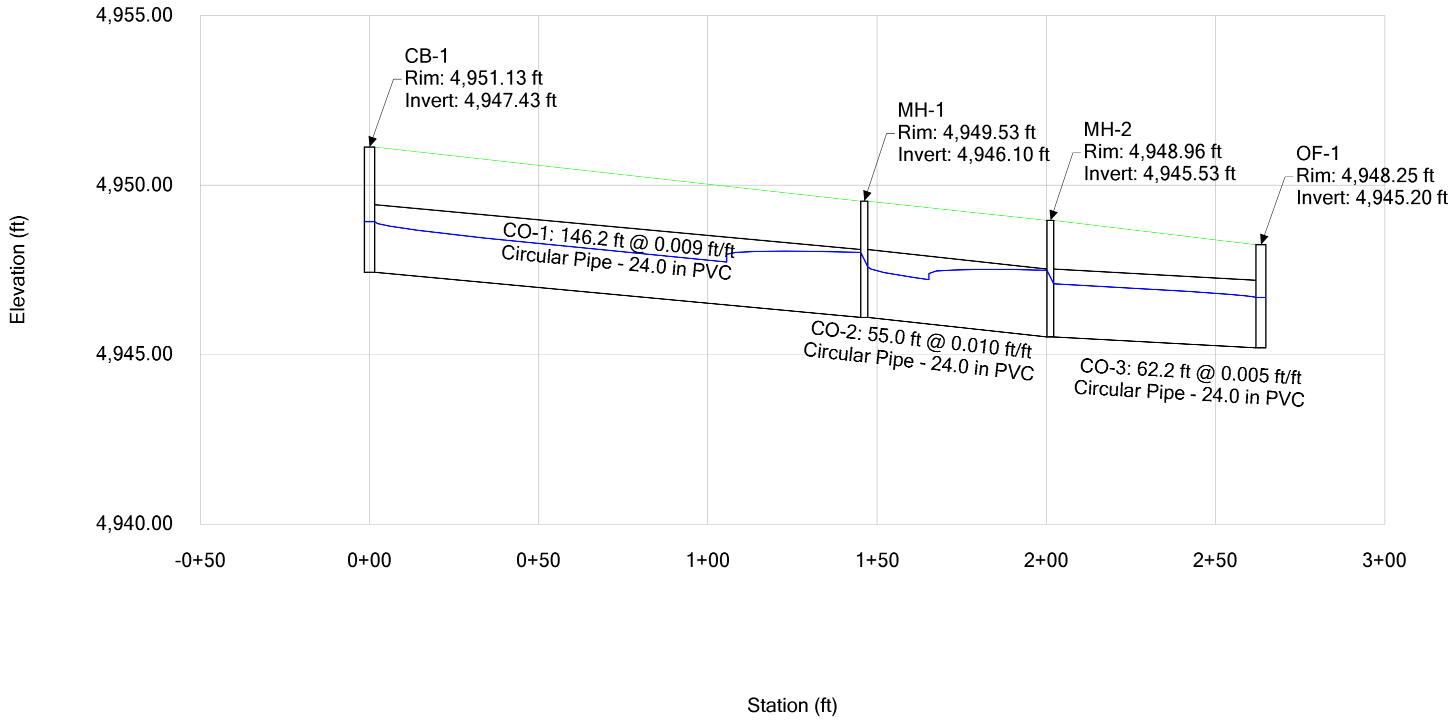
FlexTable: Outfall Table (17905 - HRSA & Fitness.stc)
Active Scenario: Base

Label	Station (ft)	Elevation (Ground) (ft)	Set Rim to Ground Elevation	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (Tailwater) (ft)
OF-1	0+00	4,948.25	True	4,945.20	User Defined Tailwater	4,946.02

Profile Report

Engineering Profile - Profile - Proposed Storm Drain (17905 - HRSA & Fitness.stc)

Active Scenario: Base



Appendix F

PondPack Output

Project Summary

Title	TCRHCC HRSA & Fitness
Engineer	Ottis Begay, P.E.
Company	Shephard-Wesnitzer, Inc.
Date	7/18/2017

Notes	Design of proposed detention pond for HRSA and Fitness buildings.

Table of Contents

Subsection: User Notifications

User Notifications?	No user notifications generated.

Subsection: Modified Rational Grand Summary

Modified Rational Method

Q = CiA * Units Conversion; Where conversion = 43560 / (12 * 3600)

Frequency (years)	Area (ft^2)	Adjusted C Coefficient	Duration (hours)	Intensity (in/h)	Flow (Peak) (ft^3/s)	Flow (Allowable) (ft^3/s)	Volume (inflow) (ft^3)	Volume (Storage) (ft^3)
2	28,666	0.928	0.650	0.748	0.46	0.40	1,077	549
10	28,666	0.928	0.650	1.285	0.79	0.69	1,851	942
100	28,666	0.928	0.650	2.452	1.51	1.31	3,532	1,800

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
HRSA & Fitness	Post-Development 2yr	2	1,060	0.084	0.46
HRSA & Fitness	Post-Development 10yr	10	1,822	0.084	0.79
HRSA & Fitness	Post-Development 100yr	100	3,477	0.084	1.51

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
O-1	Post-Development 2yr	2	1,066	0.650	0.37
O-1	Post-Development 10yr	10	1,832	0.650	0.69
O-1	Post-Development 100yr	100	3,496	0.650	1.38

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
PO-1 (IN)	Post-Development 2yr	2	1,066	0.100	0.46	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 2yr	2	1,066	0.650	0.37	4,945.59	581
PO-1 (IN)	Post-Development 10yr	10	1,832	0.100	0.79	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 10yr	10	1,832	0.650	0.69	4,945.75	851
PO-1 (IN)	Post-Development 100yr	100	3,496	0.100	1.51	(N/A)	(N/A)
PO-1 (OUT)	Post-Development 100yr	100	3,496	0.650	1.38	4,946.02	1,359

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	3.430
0.167	2.620
0.250	2.160
0.500	1.450
1.000	0.900
2.000	0.511
3.000	0.357
6.000	0.194
12.000	0.109
24.000	0.065

Subsection: I-D-F Table

Label: User Defined IDF Table - TCRHCC

Return Event: 100 years

Storm Event: User Defined IDF Table - TCRHCC - 100 Year

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	6.540
0.167	4.980
0.250	4.110
0.500	2.770
1.000	1.710
2.000	0.942
3.000	0.629
6.000	0.320
12.000	0.164
24.000	0.100

Subsection: I-D-F Table

Label: User Defined IDF Table - TCRHCC

Return Event: 2 years

Storm Event: User Defined IDF Table - TCRHCC - 2 Year

I-D-F Curve

Time (hours)	Intensity (in/h)
0.083	1.990
0.167	1.520
0.250	1.250
0.500	0.844
1.000	0.523
2.000	0.309
3.000	0.224
6.000	0.128
12.000	0.075
24.000	0.044

Subsection: Time of Concentration Calculations (Pre-Development)

Label: HRSA & Fitness

Return Event: 100 years

Storm Event: User Defined IDF Table - TCRHCC - 2 Year

Time of Concentration Results (Pre-Development)

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	90.00 ft
Manning's n	(N/A)
Slope	0.025 ft/ft
2 Year 24 Hour Depth	1.0 in
Average Velocity	0.25 ft/s
Segment Time of Concentration	0.100 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	115.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.013 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.113 hours

==== SCS Channel Flow

Tc =	R = Qa / Wp V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n (Lf / V) / 3600
Where:	R= Hydraulic radius Aq= Flow area, square feet Wp= Wetted perimeter, feet V= Velocity, ft/sec Sf= Slope, ft/ft n= Manning's n Tc= Time of concentration, hours Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =	Unpaved surface: V = 16.1345 * (Sf**0.5) Paved Surface: V = 20.3282 * (Sf**0.5) (Lf / V) / 3600
Where:	V= Velocity, ft/sec Sf= Slope, ft/ft Tc= Time of concentration, hours Lf= Flow length, feet

Subsection: Elevation-Area Volume Curve

Label: PO-1

Return Event: 100 years

Storm Event: User Defined IDF Table - TCRHCC - 2 Year

Elevation (ft)	Planimeter (ft^2)	Area (ft^2)	A1+A2+sqr(A1*A2) (ft^2)	Volume (ft^3)	Volume (Total) (ft^3)
4,945.20	0.0	1,360	0	0	0
4,946.00	0.0	1,951	4,940	1,317	1,317
4,946.50	0.0	2,375	6,479	1,080	2,397

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	4,945.20 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	4,946.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Culvert-Circular	Culvert - 1	Forward	TW	4,945.20	4,946.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	12.0 in
Length	30.00 ft
Length (Computed Barrel)	30.00 ft
Slope (Computed)	0.007 ft/ft

Outlet Control Data	
Manning's n	0.024
Ke	0.500
Kb	0.107
Kr	0.500
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0078
M	2.0000
C	0.0379
Y	0.6900
T1 ratio (HW/D)	1.132
T2 ratio (HW/D)	1.293
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	4,946.33 ft	T1 Flow	2.75 ft³/s
T2 Elevation	4,946.49 ft	T2 Flow	3.14 ft³/s

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

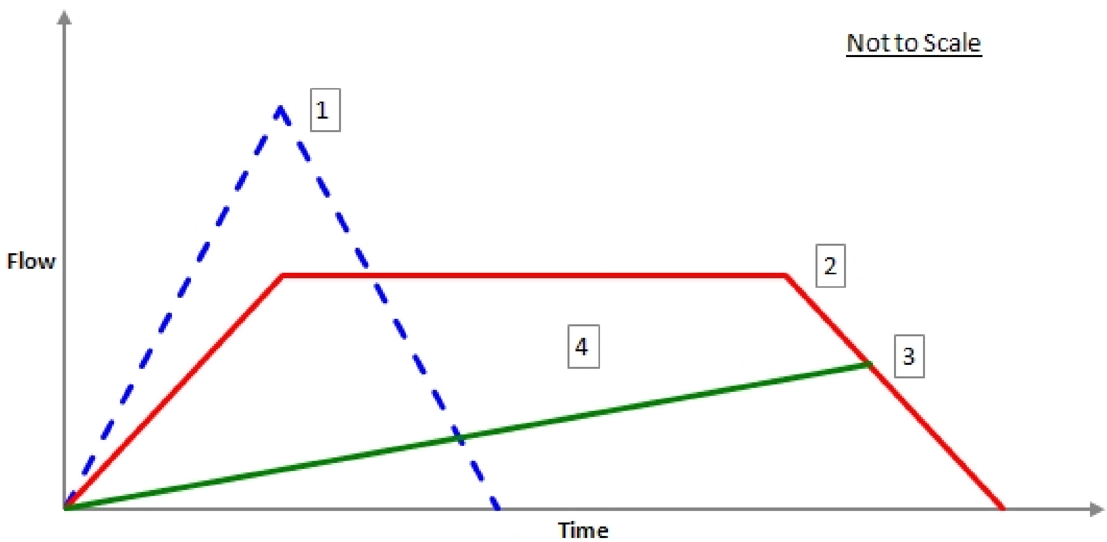
Subsection: Modified Rational Graph

Label: HRSA & Fitness

Return Event: 2 years

Storm Event: User Defined IDF Table - TCRHCC - 2 Year

Method Type	Method I
Time of Duration (Modified Rational, Critical)	0.650 hours



[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.083	hours	Time of Duration (Modified Rational, Critical)	0.650	hours
Intensity (Modified Rational, Peak)	1.988	in/h	Intensity (Modified Rational, Critical)	0.748	in/h
Flow (Modified Rational, Peak)	1.22	ft³/s	Flow (Modified Rational, Critical)	0.46	ft³/s

[3]			[4]		
Second Outflow Breakpoint (Modified Rational)	0.661	hours	Storage (Modified Rational, Estimated)	549	ft³
Flow (Modified Rational, Allowable)	0.40	ft³/s			

Modified Rational Method
--- Summary for Single Storm Frequency ---

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

C Coefficient (Weighted)	C Coefficient (Adjusted)	Duration (hours)	Intensity (in/h)	Area (ft²)	Flow (Peak) (ft³/s)	Volume (Inflow) (ft³)	Volume (Storage) (ft³)
0.928	0.928	0.083	1.988	28,666	1.22	367	247
0.928	0.928	0.167	1.522	28,666	0.94	562	382
0.928	0.928	0.250	1.250	28,666	0.77	692	453
0.928	0.928	0.333	1.115	28,666	0.69	823	524
0.928	0.928	0.500	0.844	28,666	0.52	935	516
							Storage Maximum
0.928	0.928	0.650	0.748	28,666	0.46	1,077	549
0.928	0.928	0.667	0.737	28,666	0.45	1,089	549
0.928	0.928	0.833	0.630	28,666	0.39	(N/A)	(N/A)

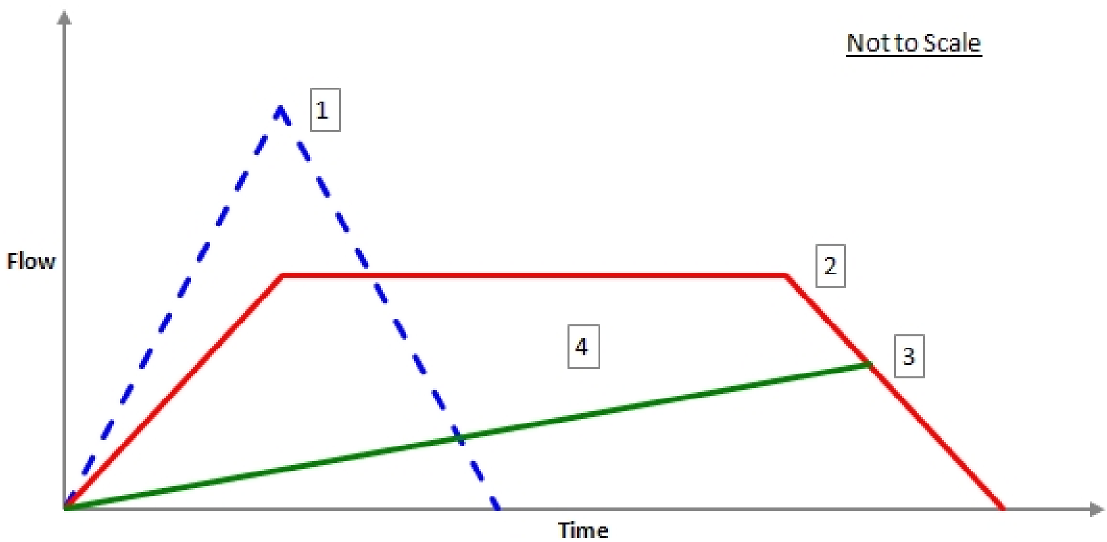
Subsection: Modified Rational Graph

Label: HRSA & Fitness

Return Event: 10 years

Storm Event: User Defined IDF Table - TCRHCC - 10 Year

Method Type	Method I
Time of Duration (Modified Rational, Critical)	0.650 hours



[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.083	hours	Time of Duration (Modified Rational, Critical)	0.650	hours
Intensity (Modified Rational, Peak)	3.427	in/h	Intensity (Modified Rational, Critical)	1.285	in/h
Flow (Modified Rational, Peak)	2.11	ft³/s	Flow (Modified Rational, Critical)	0.79	ft³/s

[3]			[4]		
Second Outflow Breakpoint (Modified Rational)	0.661	hours	Storage (Modified Rational, Estimated)	942	ft³
Flow (Modified Rational, Allowable)	0.69	ft³/s			

Modified Rational Method
--- Summary for Single Storm Frequency ---

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

C Coefficient (Weighted)	C Coefficient (Adjusted)	Duration (hours)	Intensity (in/h)	Area (ft²)	Flow (Peak) (ft³/s)	Volume (Inflow) (ft³)	Volume (Storage) (ft³)
0.928	0.928	0.083	3.427	28,666	2.11	633	426
0.928	0.928	0.167	2.623	28,666	1.61	969	659
0.928	0.928	0.250	2.160	28,666	1.33	1,197	783
0.928	0.928	0.333	1.923	28,666	1.18	1,421	904
0.928	0.928	0.500	1.450	28,666	0.89	1,607	883

Storage Maximum

0.928	0.928	0.650	1.285	28,666	0.79	1,851	942

0.928	0.928	0.667	1.267	28,666	0.78	1,871	941
0.928	0.928	0.833	1.083	28,666	0.67	(N/A)	(N/A)

Subsection: C and Area (Pre-Development)

Label: HRSA & Fitness

Return Event: 100 years

Storm Event: User Defined IDF Table - TCRHCC - 2 Year

C and Area Results (Pre-Development)

Soil/Surface Description	C Coefficient	Area (ft²)	Area (Adjusted) (ft²)
Existing graded site	0.330	28,666	(N/A)
Weighted C & Total Area --->	0.330	28,666	9,460

Subsection: C and Area (Post-Development)

Label: HRSA & Fitness

Return Event: 100 years

Storm Event: User Defined IDF Table - TCRHCC - 2 Year

C and Area Results

Soil/Surface Description	C Coefficient	Area (ft²)	Area (Adjusted) (ft²)
HRSA	1.000	8,015	(N/A)
Fitness	1.000	5,881	(N/A)
Sidewalk & Pav	1.000	11,238	(N/A)
Bare Soil	0.413	3,532	(N/A)
Weighted C & Total Area --->	0.928	28,666	26,591

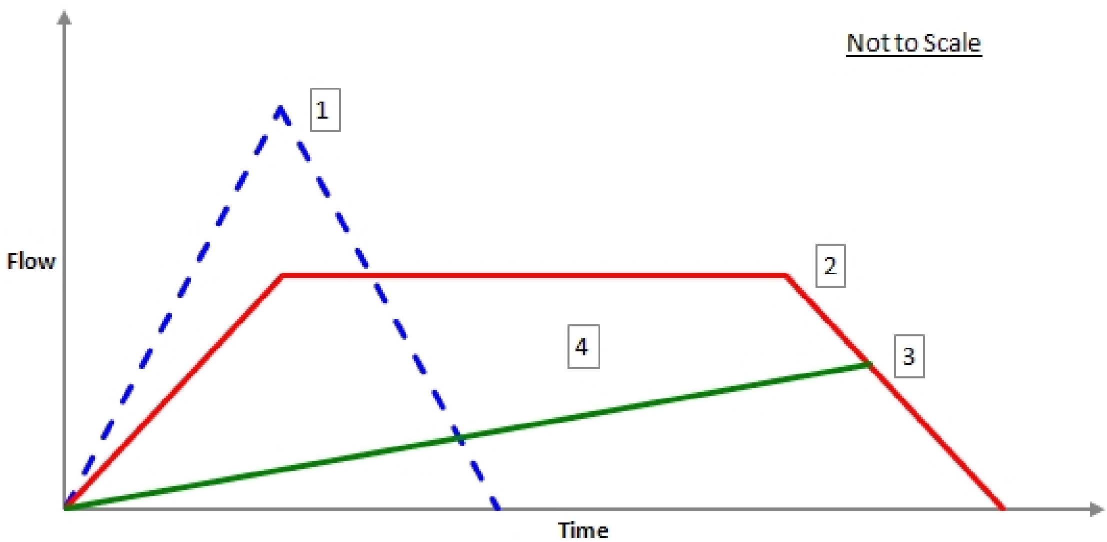
Subsection: Modified Rational Graph

Label: HRSA & Fitness

Return Event: 100 years

Storm Event: User Defined IDF Table - TCRHCC - 100 Year

Method Type	Method I
Time of Duration (Modified Rational, Critical)	0.650 hours



[1]			[2]		
Time of Concentration (Modified Rational, Composite)	0.083	hours	Time of Duration (Modified Rational, Critical)	0.650	hours
Intensity (Modified Rational, Peak)	6.534	in/h	Intensity (Modified Rational, Critical)	2.452	in/h
Flow (Modified Rational, Peak)	4.02	ft³/s	Flow (Modified Rational, Critical)	1.51	ft³/s

[3]			[4]		
Second Outflow Breakpoint (Modified Rational)	0.661	hours	Storage (Modified Rational, Estimated)	1,800	ft³
Flow (Modified Rational, Allowable)	1.31	ft³/s			

Modified Rational Method
--- Summary for Single Storm Frequency ---

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

C Coefficient (Weighted)	C Coefficient (Adjusted)	Duration (hours)	Intensity (in/h)	Area (ft²)	Flow (Peak) (ft³/s)	Volume (Inflow) (ft³)	Volume (Storage) (ft³)
0.928	0.928	0.083	6.534	28,666	4.02	1,207	813
0.928	0.928	0.167	4.986	28,666	3.07	1,841	1,251
0.928	0.928	0.250	4.110	28,666	2.53	2,277	1,490
0.928	0.928	0.333	3.663	28,666	2.25	2,706	1,722
0.928	0.928	0.500	2.770	28,666	1.71	3,069	1,691
							Storage Maximum
0.928	0.928	0.650	2.452	28,666	1.51	3,532	1,800
0.928	0.928	0.667	2.417	28,666	1.49	3,570	1,799
0.928	0.928	0.833	2.063	28,666	1.27	(N/A)	(N/A)

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PROJECT MANUAL

FOR THE

DIABETES PREVENTION PROGRAM FITNESS

FOR THE

TUBA CITY REGIONAL HEALTH CARE CORPORATION

TUBA CITY, ARIZONA