

water tank

Michelle <notvhs@aol.com>

Mon 10/8/2018 5:31 PM

To: Matthew Kessler <MKessler@sedonaaz.gov>;

Hello, Mr. Kessler.

>

> I hope you have been well. As you may recall, my family has a residence at 20 Cathedral Rock Trail, two doors down from the proposed industrial project: the hazardous chemical storage and treatment facility being sought by the California-based "Arizona" water company.

>

> It has been quite a while since we have spoken about the industrial project that is being proposed in our neighborhood. I would like to reiterate the concerns that I have previously voiced over having a massive, hazardous chemical storage and treatment facility, with a parking lot and regular trucks entering and exiting, in our neighborhood. It is pretty much the same as having a large gas station being forced into what was once a quiet and beautiful neighborhood. It will destroy it.

>

> It is precisely the thing that zoning laws were intended to protect against.

>

> Typically conditional use variances are denied unless the conditional use fills a need within the precise community where it is sought. To that end, a small water tank that would serve 20 or 25 homes, might be appropriate in our neighborhood if there was no other way for us to get water. That is not at all what is going on here! Accordingly, there is no reason for our neighborhood to be destroyed because it is the most profitable option for a large California corporation.

>

> I hope that the town will honor its previous commitment to its residents, in the form of residential zoning, and deny the California corporations' request for a conditional use permit.

>

> In the alternative, I would request that the town put off the hearing that is currently set for 16 October 2018 in order that my husband and I can secure an expert on the issue of diminished property values when the residential sanctity of a neighborhood is destroyed. We would, of course, have no issue with the meeting going forward as scheduled if the California corporation will concede that their project will diminish our property values.

>

> I should tell you that we have started looking for homes in Tucson, in the unlikely event that the plans are approved. As much as I love Sedona, I do not want to live near this monstrosity, with all of the chemicals, noise and trucks that will obviously and inevitably destroy our neighborhood.

>

> Moreover, with all of the traffic problems that Sedona and VOC residents have been enduring, I am disheartened that the town would even consider asking residents and businesses to endure this long and disruptive construction project.

- >
- > Thank you for your kind attention to this matter.
- >
- > Michelle Filippone McGeary
- >
- >
- >
- >

Oct 11, 2018

SEDONA CITY COUNCIL MEMBERS, P&Z COMMISSIONERS and Robert Pickels,

This Packet is an attempt to address lower W. Mallard flooding getting worse. Floods can be deadly; witness recent storms Florence and now Michael. The AWC site is a very Bad idea with Flawed data, based on old data, and violates at least 3 city codes.

Homeowners are not questioning the need for a water storage facility east of Oak Creek, but the need for a 1.5 mm gallon tank IS very questionable. SFD needs + potential water hookups east of Oak Creek require 888,000 leaving 35% cushion for 1 mm gal tank.

With that said, we are questioning the severe flooding experienced on Lower West Mallard. West Mallard has 8 built homes and two build-able lots and the city's soon to be expanded lift station. SEE 8 PHOTOS in packet.

We are also questioning the need for a 1.5mm gal tank. AWC says "that is the max size that fits for the lot size" for a residential zoned lot/neighborhood. The required need is 890,000 gal which includes a 20% cushion.

When Hwy 179 east side was redone, the ADOT design drained ~ 600 acres of rainwater runoff, channeled under the HWY through one 9'x14' tunnel, onto AWC's lot which is at a higher elevation than Hwy 179. Look at the new AWC drawing where it moved their road and retaining walls north and east directly on 2 private lots, violation of City code, on to 10 homes, lift station, then to Oak Creek.

We accept AWC is not going to create more rainwater. However, AWC's clear cutting of the lot creates considerably more runoff, especially for the early 8-12 years.

We question the wisdom multiple residential lots can be combined and simply zoned into other than Residential zoning. No residential lot removes 15,000 cu ft of bedrock, only industrial endeavors.

We are suckered by AWC statements of no decrease in property values. Yet, a week after the August P&Z meeting, lot 120 directly/& adjacent to AWC went up for sale for \$119,000, purchased for \$195,000. Now the lot next to 120 is for sale for \$110,000 also purchased at almost \$200,000. NO DECREASE??? Who's listening?

The cost of this entire project has never been stated. As a Utility, that means WE, the tax payers, are paying for this with every gallon; yet, P&Z is considering approval based upon unknown cost.

AWC has not presented a construction schedule. Their Sept 2018, 196pps web update says, "a schedule will be presented at the time of permitting." Is that all we get? Who is making the calls here--P&Z or AWC.

AWC prefers to do Blasting." Has P&Z required a bond? A bond of \$20mm and 10 years in case of structural damage should be required since several high end homes and a state HWY border the site. If any homes sustain damage or the tunnel cracks, simply saying we have liability coverage is what? A\$20 mm promise? P&Z needs to require a bond.

AWC keeps saying "generators can be added". Then why aren't they in the specs? Without electric, they get no gravity benefit.

All of these and more, bring us to the alternate site. We all keep being told THE USFS 'rule'. ***The USFS POLICIES are to authorize a use of National Forest only if it cannot reasonably accommodate off National Forest land***
This the real Rule! See attachment E.

In the attached aerial photo (with yellow tabs) of an alternate site less than 600 feet North of the AWC proposed, the alternate solves almost every issue brought up in the first part of this letter. Alternate site benefits: *Below 179 elevation. *No obstructed view. *Lower water rates for our citizens. *Far less extraction. *Depth could be 10 feet. *Excess rock could be backfill or fascia rock. *Far less noise. *Less truck traffic and diesel smoke. *Has highway access. *No unsightly buildings on top. *Does not violate city codes

This alternate has citizen appeal and supports USFS policy. There are No private property, lots/homes, city lift station affected or at risk. This entire USFS area estimates under 100 acres, is mostly ravine, drains to Oak Creek, is land locked by 179. There is no interference with a trail ridge 525 ft along a cliff to the Creek.

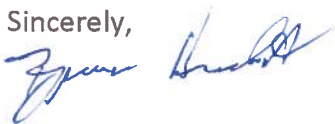
I contend AWC conveniently uses 'their USFS rule' to convince themselves they can't do it! Mr Snickers, after reading a brochure, (NOT THE USFS POLICIES) states, "That means 'No' to me." AWC stated that it seems clear the USFS is not going let us on USFS land. Then our P&Z **rejecting their request** should convince AWC to **exhaust all efforts** to reasonably accommodate this critical and flawed decision.

I also am convinced without a considerable effort to engage **USFS, Coconino CTY, FEMA, including Appeals, perhaps the courts and all entities impacted by this flooding issue opens liability risks to our city, the P&Z, to create a worse flooding issue because of the <200 feet down stream impact on private property. DENY THIS CUP when just 600 feet away is what appears to be a viable alternative. In the end, all attempts to put the AWC tank on USFS land must be exhausted!** Enclosed, is back up information for the above.

It seems clear AWC does not want to fight a perceived fight with USFS. COCONINO County's engineer, John Carr, was unaware of the issue on W. Mallard. He says there may be FEMA funds available for the Mallard Flooding project.

Lastly, at the public meeting, we were told by a P&Z board member, that the flooding claims made by the homeowners/citizens were now "debunked". Read the definition of Debunk--a very strong word. The water flooding is not false or a myth, and the comment that it was 'Debunked' is not true. The flooding is very real. If it was stated in ridicule, it was in poor taste at best and insulting at worse, especially by a steward of this high class city. Can we work together without the unnecessary innuendo? This a Bad Idea and we can fix it.

Sincerely,



Bruce & Terri Huelat
92 W. Mallard Dr.

ARIZONA WATER COMPANY

A

December 21, 2017

Dear Neighbor,

As you may know, Arizona Water Company is proposing to construct an underground drinking water storage facility in your community. In order to keep residents and government officials aware of our activities, we will host a second community meeting on the subject:

East Sedona Water Storage Facility Community Meeting
Wednesday, January 10, 2018
6 pm to 8 pm
Sedona United Methodist Church
110 Indian Cliffs Road
Sedona, AZ

At our first community meeting in March, residents raised a number of questions and we have done our best to answer them all. In addition, we have received questions from the Mystic Hills Homeowners Association's Design Review Board, which have also been answered. Please check our project website at www.azwater.com/east-sedona-water-storage/ for all those materials.

As a reminder, the project will include:

- Water storage tank with a capacity to hold between 1 million and 1.5 million gallons.
- Most of the tank will be underground and not visible to neighbors or drivers on Highway 179
- Operating equipment, including booster pumps capable of delivering 3,000 gallons per minute, will be inside a building on top of the tank that will be designed to look like neighboring homes.

At the upcoming meeting, we will present more detail about construction techniques and other technical issues. In addition, we will report on our meeting with the Mystic Hills HOA Design Review Board and our meeting with Judy Adams of the US Forest Service.

Thank you again for your participation in this process. We look forward to seeing you at the meeting.

Sincerely,

Keith Self
Verde Valley Division Manager
Arizona Water Company

ARIZONA WATER COMPANY

December 21, 2017

Dear Neighbors,

In advance of the January 10, 2018 community meeting to discuss our water storage facility project, we wanted to give you an update on the activities that have taken place since our first community meeting in March.

Following the March meeting, Arizona Water Company took the written questions and comments and responded to them. In addition, we received a set of written questions from the Mystic Hills Design Review Board and responded to them. All questions and our responses are attached and are available on our project web site at www.azwater.com/east-sedona-water-storage/.

In April, Arizona Water asked for a meeting with the Mystic Hills Design Review Board, but due to scheduling issues, the meeting did not take place until October.

On October 4, Arizona Water met with the Mystic Hills Design Review Board to get their input and feedback on issues related to our project. They raised two key issues:

1. The possibility of using US Forest Service land a few hundred yards away.
2. How to safeguard several homes downstream of our property from increased stormwater runoff.

Arizona Water agreed to look at several sites on US Forest Service land near the Poco Diablo Resort on Highway 179. We also agreed to talk to the US Forest Service (USFS) to determine the feasibility of building our project on their land.

X On October 12, Arizona Water's Vice President of Engineering, Fred Schneider, along with Richard Hacker and Keith Self, also from Arizona Water, John Matta, of Water Works Engineers and Rick Ruiz, a consultant to Arizona Water, visited the three sites pointed out by the Design Review Committee team. One of the parcels (the one farthest away from the resort and a public campground) seemed potentially suitable for a water storage project.

On November 9, the same team from Arizona Water (minus John Matta) and consultant (Rick Ruiz who participated by phone) met with Judy Adams of the USFS, to discuss the USFS site and the possibility of the allowing a project such as the one we are proposing. During previous efforts to find a site for a water storage facility to serve the area, the USFS made it clear that its policies and federal law require interested parties to use private property if available.

Ms. Adams handed us a USFS brochure that describes the project approval requirements and pointed out one of the key requirements: "Alternatives – You must first consider using nonfederal land. **Lower costs or fewer restrictions are not adequate reasons for use of NFS lands.** (Boldface added for emphasis.)"

We have informed the Mystic Hills HOA Design Review Board about the results of our meeting with the USFS. It is our understanding that a member of the HOA contacted the USFS as well, and was given the same general explanation and direction as we were.

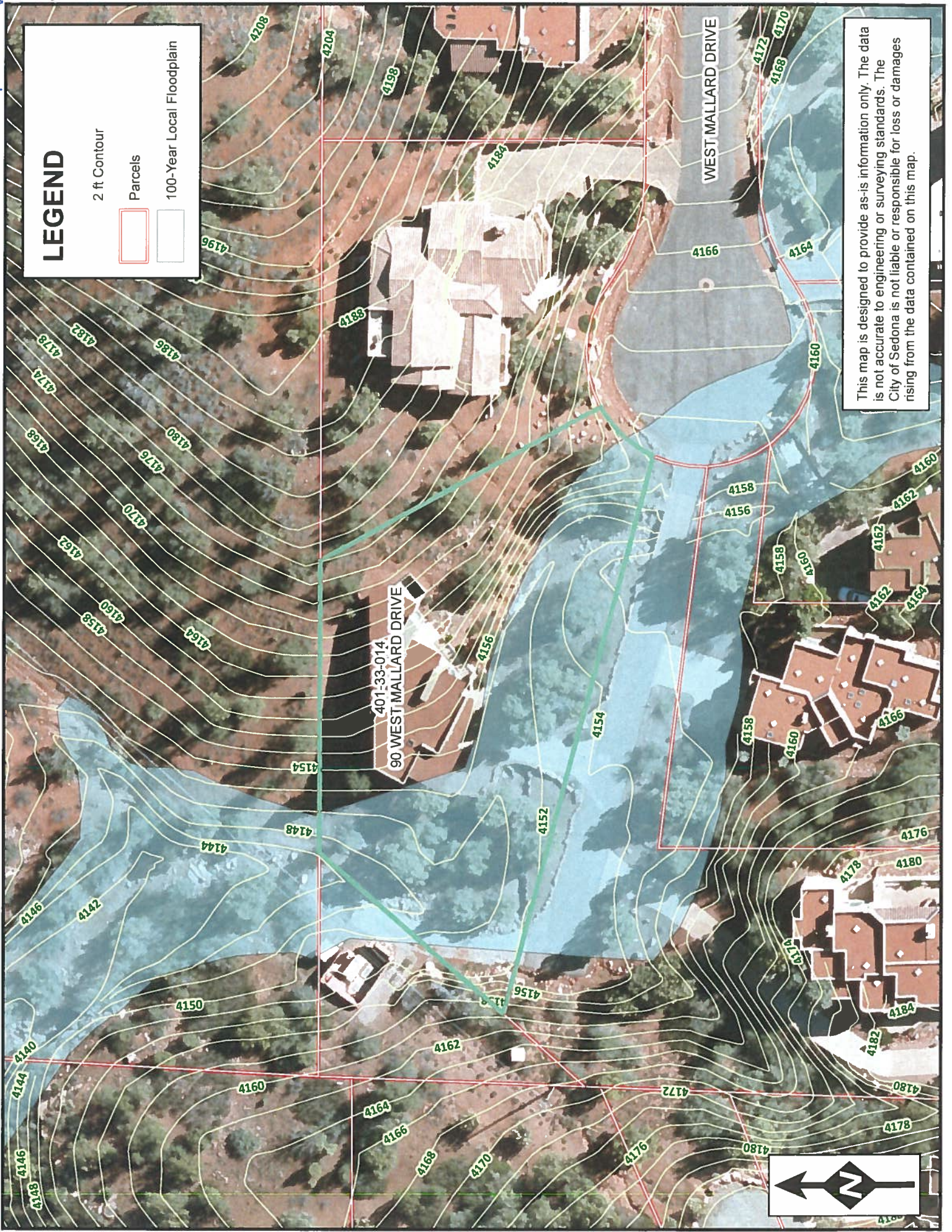
Given the development restrictions applied by the USFS, we believe it would be virtually impossible to achieve our goals on USFS lands. With these restrictions in mind, we intend to move ahead with our current plan.

We understand that some of the neighbors in the area are concerned about the impact of the construction activities related to our proposed project. Arizona Water pledges to work with the community to mitigate construction and operational issues that are raised during City of Sedona's Conditional Use Permit process.

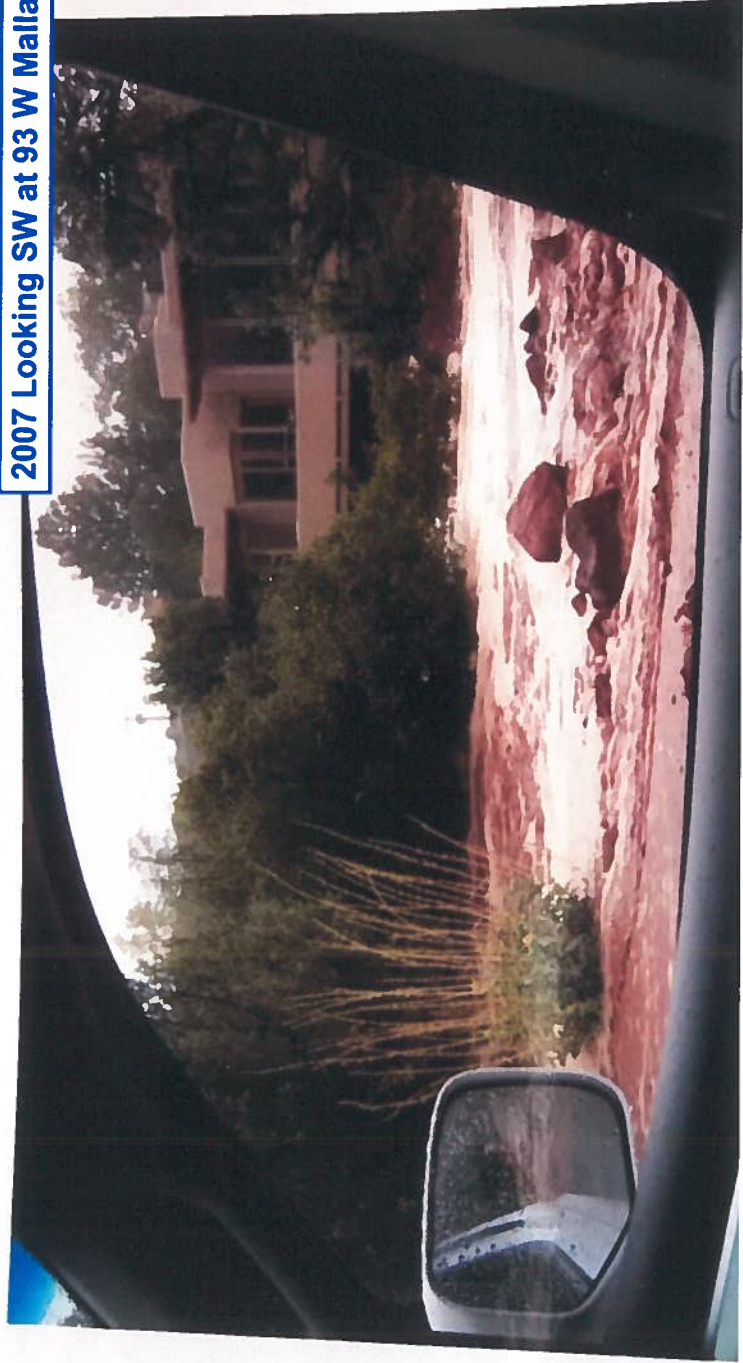
X



FLOOD HAZARD STATUS for 90 W. Mallard Dr. City of Sedona Public Works Dept. 6/21/17



2007 Looking SW at 93 W Mallard Dr



2010 Looking NW from 95 W Mallard Dr, see water line in street



2012 95 W Mallard Dr, front yard to the North



2012 Looking NW from 95 W Mallard Dr, mud covering driveway



2015 95 W Mallard Dr, rainwater rushing down street and mud-filled driveway



Street flooding



2017 90 W Mallard Dr, water overflowing on east side of driveway

2017 Looking north toward 90 W Mallard Dr



2017 Looking NE from 91 W Mallard Dr





United States
Department of
Agriculture

Forest
Service

Coconino National Forest
Red Rock Ranger District

P.O. Box 20429
Sedona, AZ 86341
928-203-7500
Fax: 928-203-7539

E

File Code: 2720
Date: April 17, 2018

Audree Juhlin
Community Development Director, City of Sedona
102 Roadrunner Drive
Sedona, AZ 86336

RECEIVED
APR 23 2018
CITY OF SEDONA
COMMUNITY DEVELOPMENT

Dear Ms. Juhlin

This letter is in response to Arizona Water Company's Water Tank proposed development, project PZ17-00001. I would like to clarify the Forest Service policies related to uses of national forest land for facilities such as water tanks so that this can be shared with your staff, Planning and Zoning Commission and City Council.

The Forest Service did not comment on this project originally since the project does not impact National Forest, however we were pleased to see that the water tank design incorporated comments that the forest had received when the water tanks were initially proposed on national forest lands back in 2010.

Forest Service policies are to authorize a use of national forest only if it cannot reasonably ** This is the real issue!* accommodate off National Forest lands. In 2010, the forest was willing to consider water tanks on the National Forest lands in Broken Arrow, the Chapel or Little Horse area only because the water company indicated a requirement for a gravity feed system that required an elevation only available on the forest. At that time, the forest received considerable concern from the community regarding the locations and potential impacts of these tanks on the forest. Many comments from the public suggested alternative methods including pumping, other locations, below grade tanks.

It appears the current water tank location being considered by the city has been designed to address concerns expressed by the public in 2010. Since the water company is willing to develop tanks that do not require the elevation associated with a gravity feed system, it is unlikely that the Forest Service would consider a proposed location on national forest lands as non-federal land can accommodate this use. In addition, we would expect any request for construction of a new water tank on the forest would generate extensive concerns from the community as what occurred in 2010. *Those tanks were above ground tanks*

We appreciate the effort the City and Arizona Water Company has made to find a suitable location off the National Forest for this type of community infrastructure and that provides needed services to the community while protecting the valuable resources of the National Forest.



Audree Juhlin

2

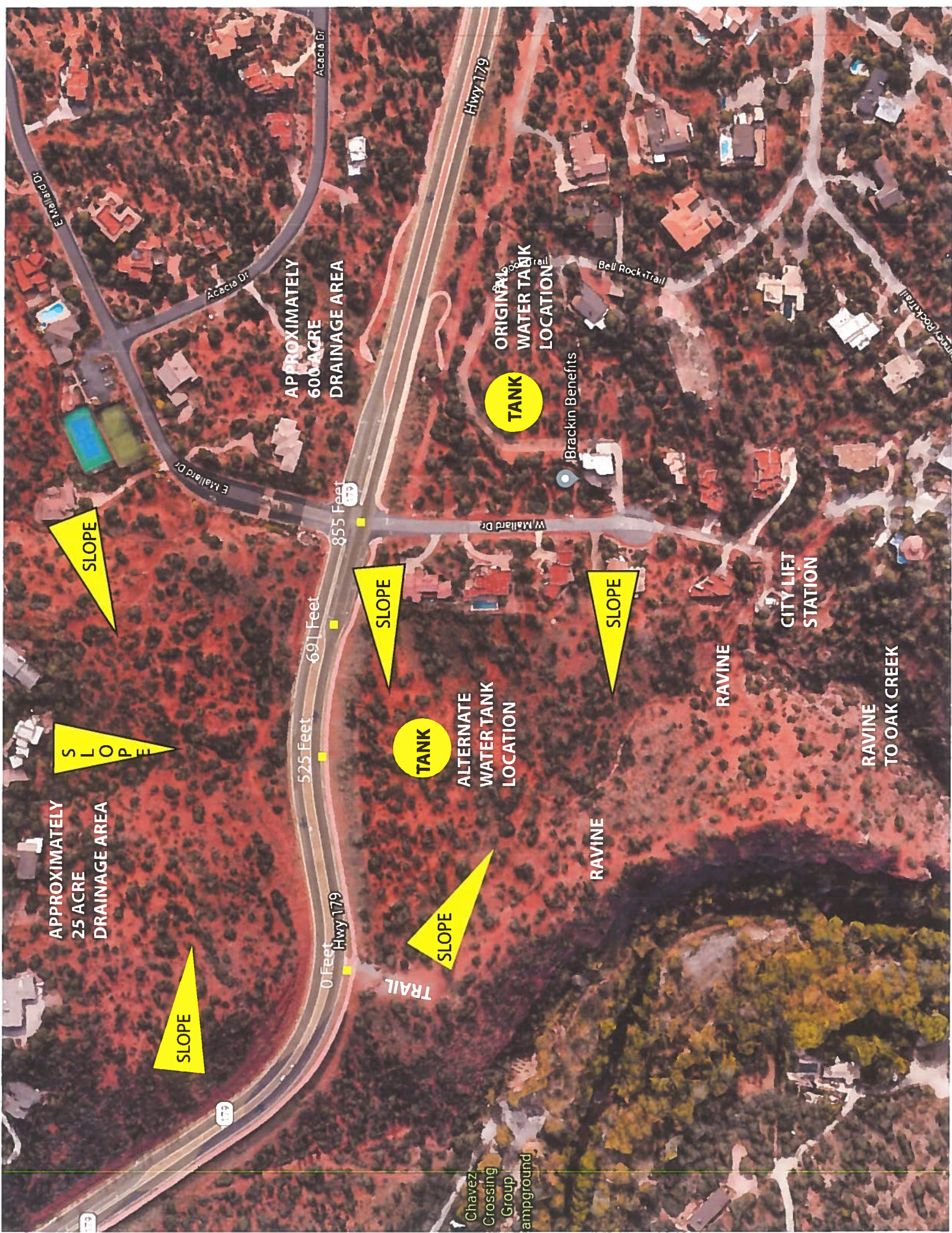
Please contact Judy Adams at 928-203-7506 if you have questions or would like additional information about Forest Service policies.

Sincerely,

A handwritten signature in black ink, appearing to read 'N. Branton', with a long horizontal flourish extending to the right.

NICOLE BRANTON
District Ranger

cc: Arizona Water Company



APPROXIMATELY
25 ACRE
DRAINAGE AREA

APPROXIMATELY
600 ACRE
DRAINAGE AREA

ORIGINAL
WATER TANK
LOCATION

ALTERNATE
WATER TANK
LOCATION

SLOPE

SLOPE

SLOPE

SLOPE

SLOPE

SLOPE

RAVINE

RAVINE

CITY LIFT
STATION

RAVINE
TO OAK CREEK

Chavez
Crossing
Group
Campground

Brackin Benefits

Bell Rock Trail

Hwy 179

Acacia Dr

E Mallard Dr

Acacia Dr

E Mallard Dr

W Mallard Dr

Bell Rock Trail

Hwy 179

179

179

YAVAPAI COUNTY FLOOD CONTROL DISTRICT

1120 COMMERCE DRIVE
PRESCOTT, AZ 86305
928.771.3197 PHONE
928.771.3427 FAX



www.ycflood.com

10 S. 6TH STREET
COTTONWOOD, AZ 86326
928.639.8151 PHONE
928.639.8118 FAX

March 13, 2018

BIVINS MICHAEL & ELIZABETH LIVING TRUST DTD 10-06-14
90 WEST MALLARD DRIVE
SEDONA, AZ 86336
RE: 401-33-014

Dear Property Owner:

A multiyear project to re-examine the flood risks along Oak Creek and develop updated, detailed, digital flood hazard maps has reached its first milestone through the completion of draft work maps. The Yavapai Flood Control District (YCFCD) is leading this effort and has been working closely with the Federal Emergency Management Agency (FEMA), Coconino County Flood Control District (CCFCD) and the City of Sedona. This study is re-examining the flood risks along Oak Creek and its tributaries from Sterling Canyon in Coconino County, through the City of Sedona down to Cornville where it empties into the Verde River. To learn more about project and to view the draft work flood maps, two public open house meetings are being held.

Oak Creek Flood Maps Need Updating

~~The flood maps presently in use are out-of-date as detailed studies have not been performed in more than 30 years.~~ The flood risks currently shown on the current flood map do not reflect the effects of growth since then nor changes in drainage and run-off patterns caused by land-use and natural forces. In addition, more detailed information is now available and the mapping-related technology has improved. As a result, the updated flood maps will more accurately represent these changes and the current flood risk and be an important tool in the effort to protect lives and properties along Oak Creek.

Draft Maps

Your property has been identified as having a flood risk change based on the new maps. We have attached a copy of your property with both the current, effective floodplains and the proposed, draft floodplains. Please note that these maps are considered draft and preliminary in nature. They will not be considered final until they have been reviewed and accepted by FEMA, which is not expected to occur until sometime in 2019/2020. We are issuing these draft maps to you now so that you can review and ask questions of the technical team before the information is sent to FEMA.

You Are Invited

The Yavapai County Flood Control District and its project partners invite you to an upcoming open house to view the draft work maps and meet one-on-one with county staff about your property, as well as speak with mapping and insurance specialists who can help answer questions related to map changes. There will be no formal presentations, so come at your convenience to either meeting listed below:

Sedona Open House
March 28, 2018
5:30-7:00 pm
Sedona Community Center
2615 Melody Lane
Sedona, AZ 86339

Cornville Open House
March 29, 2018
5:30-7:00 pm
Oak Creek School Gymnasium
11490 Purple Sage Road
Cornville, AZ 86325

You are encouraged to attend this meeting. Meanwhile, for more information about the project, visit www.YCFlood.com/Oak-Creek-Floodplain-Remap.

Sincerely,

A handwritten signature in cursive script that reads "Lynn Whitman".

Lynn Whitman
Yavapai County
Flood Control District Director



Letter to residents and business stakeholders
Near the Mystic Hills & Chapel Lift Station

B

April 10, 2018

The city has begun design efforts for the Mystic Hills & Chapel Lift Station Replacement project, a capital improvement project identified as necessary during assessments conducted as part of our 2017 Wastewater Master Plan update.

This project will provide capacity improvements focused on wet well volume capacity and upgrades to pumps.

The city's design consultant for the project is Sunrise Engineering, which will develop construction plans and related documents for the project, an effort anticipated to take approximately seven months, with completion in roughly November 2018.

Activities that will occur in the next few months include:

- Geotechnical site investigations
- Site topographic survey
- Preliminary design
- Neighborhood meetings.

What to expect. You can expect to see the personnel from Sunrise Engineering or its subconsultants in the area from time to time. Our contractors' personnel are expected to confine their operations within public property, easements or rights of way; however, activities related to land and boundary surveying may require them to briefly be on private properties at times. Persons making land surveys have certain rights and obligations under Arizona Revised Statutes Title 33, Article 33-104, when entering lands. Please visit the following site for more information: <https://www.azleg.gov/viewdocument/?docName=https://www.azleg.gov/ars/33/00104.htm>.

The geotechnical site investigations will include drilling/auger equipment that will sample soils and subsurface geological formations. This is expected to cause some noise, and we ask your patience; we anticipate only a day or less than a day will be needed to complete this task.

The sampling is currently scheduled for April 24th and 25th and will be conducted between the hours of 8 a.m. and 5 p.m. If you plan to host a special event and need the city to avoid scheduling or conducting these operations during these days please contact me as soon as possible (on or before April 16th). The city will keep you informed of activities on this project; please watch for neighborhood and/or public outreach meetings.

Please feel free to contact me with questions or needs.

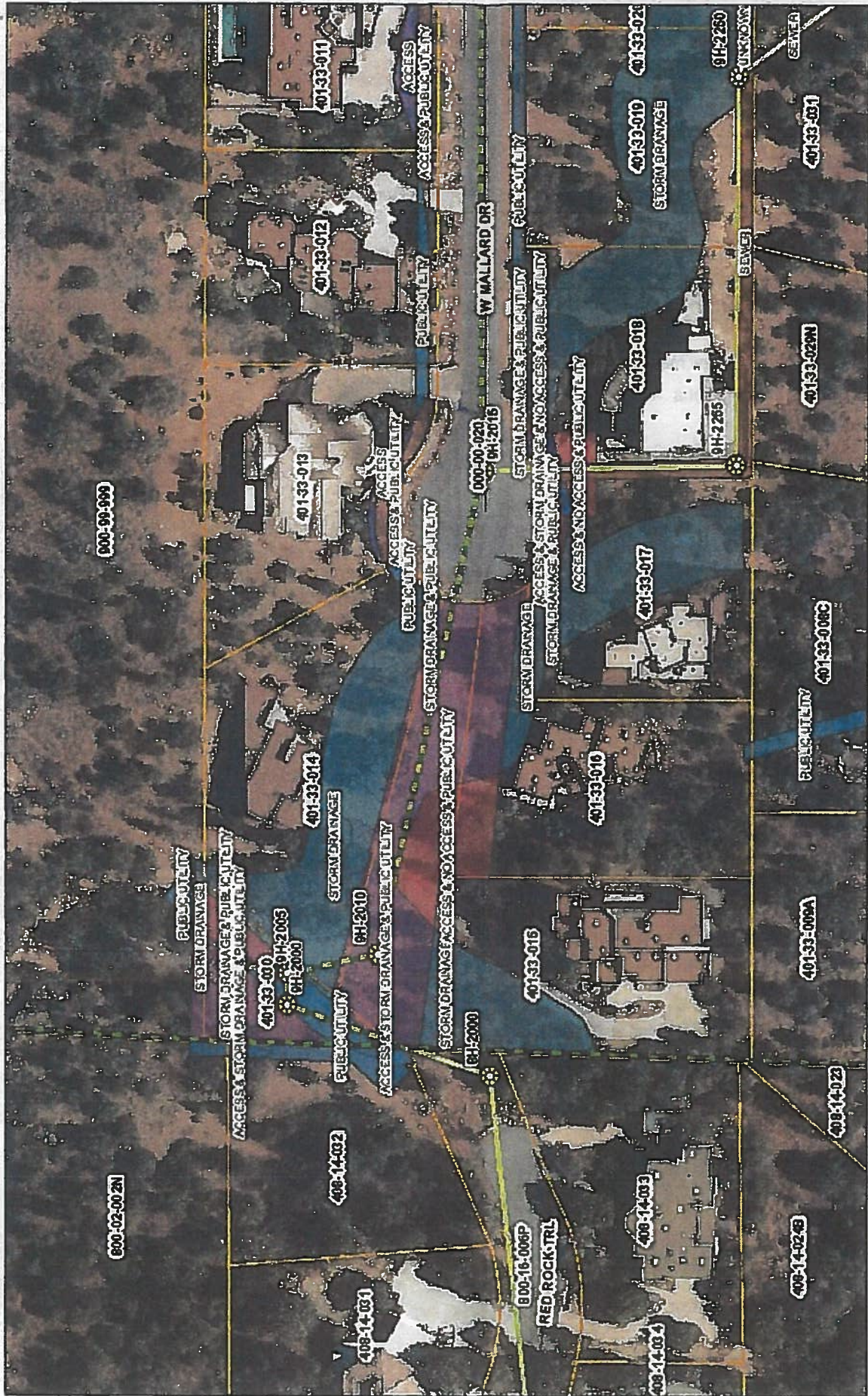
Robert Welch, PE, associate engineer
Public Works Department
102 Roadrunner Dr., Sedona, AZ 86336
(928) 203-5120 Office
(928) 203-6251 Cell
bwelch@sedonaaz.gov

For additional project information and updates visit our capital improvement project web page at sedonaaz.gov/cip and click on *Mystic Hills & Chapel Lift Station Replacement Project* under the Wastewater Projects listing near the bottom of the page.

Robert J. Welch, PE, associate engineer

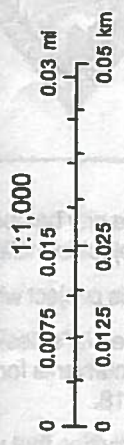
cc: Roxanne Holland, PE, manager, Sedona Wastewater Department
Tyson Glock, PE, project engineer, Sunrise Engineering, Inc.

City of Sedona Public Works



April 16, 2018

- OAK CREEK
- COUNTY LINE
- Manholes
- AR
- AROF
- CB
- CO
- FS
- IR
- CO
- IV
- LCO
- MH
- MHFS
- PL
- + Lift Station



Attention Desiree Brackin
Arizona Water Tank Plan Review
55 Bell Rock Road
Sedona, AZ 86336
desiree.brackin@gmail.com

SUBJECT: Review of East Sedona Water Storage Tank, Booster Pump Station and Related Appurtenances, Drainage Report September 2018

Dear Ms. Brackin,

Please see the attached review comments pertaining to the “East Sedona Water Storage Tank, Booster Pump Station and Related Appurtenances”, dated September 2018 (report) and written by the Arizona Water Company.

In my review of the report you have provided I have presented my concerns in the attached table. In the first column of the table I have numbered the comments and in the second column I identify the page in the report where the comment is generated from. I hope this format is easy to understand. In the three attachments provided I present some calculations with the corrections I suggest. These calculations are not meant to replace the report provided, but to give the reader of this document an idea of the impact that the corrections will have on the discharge rates. Volumes for detention have not been calculated, but they should be recalculated to address the deficiencies noted.

In general, this letter and the associated attachments simply provide a review of the report. This letter and the associated attachments do not provide a substitute or replacement for the report.

I thank you for this opportunity to assist you. Please do not hesitate to contact me if you have any questions.

Sincerely,



Christine Laguna, PE, President/CEO

- Enclosed:
- Table with Comments and Executive Summary
 - Attachment A - Tc
 - Attachment B - Existing Condition Flowrates
 - Attachment C - Developed Condition Flowrates
 - Attachment D - NOAA resources
 - Attachment E - FIRM Map



ENGINEERING • SURVEY

PO Box 30836, Flagstaff, AZ 86003 | 928.522.9287
618 East Route 66, Flagstaff, AZ 86001 | Fax 928.522.9358
14001 N 7th ST, Suite C-106, Phoenix, AZ 85022 | 602.438.2700

Comments Pertaining to Drainage Report dated September 2018

No.	Page	Issue	Comment																
1	3	Description of 2,10,25, & 100, 1-hour storm	<p>i in $Q=cia$ calculation. Per good engineering practices and as explained in the ADOT Drainage Design Manual. "The intensity in $Q=cia$ is the average rainfall intensity in inches/hour for the period of maximum rainfall of a specified return period having a duration equal to the time of concentration for the drainage area." In the calculations provided the author has assumed an intensity 'i' based upon a 1 hour time of concentration (t_c). For this small site the t_c and the related 'i' should be based upon the actual travel path to determine the t_c.</p> <p>The attached illustration depicts a time of concentration path and the related t_c based upon that path. With this path and t_c, the i would be higher resulting in a much higher flowrate. See the tables below for calculations adjusted with 'i' based upon t_c.</p> <p>Existing</p> <table> <tr><td>2 year</td><td>0.94 cfs</td></tr> <tr><td>10 year</td><td>1.69 cfs</td></tr> <tr><td>25 year</td><td>2.31 cfs</td></tr> <tr><td>100 year</td><td>3.24 cfs</td></tr> </table> <p>Developed</p> <table> <tr><td>2 year</td><td>1.47 cfs</td></tr> <tr><td>10 year</td><td>2.65 cfs</td></tr> <tr><td>25 year</td><td>3.62 cfs</td></tr> <tr><td>100 year</td><td>5.09 cfs</td></tr> </table> <p>See attachments A, B and C.</p>	2 year	0.94 cfs	10 year	1.69 cfs	25 year	2.31 cfs	100 year	3.24 cfs	2 year	1.47 cfs	10 year	2.65 cfs	25 year	3.62 cfs	100 year	5.09 cfs
2 year	0.94 cfs																		
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2 year	1.47 cfs																		
10 year	2.65 cfs																		
25 year	3.62 cfs																		
100 year	5.09 cfs																		
	5	'c'	<p>The table on page 5 should be used with the appropriate 'P' numbers for Sedona. Based upon NOAA they are as follows:</p> <table> <tr><td>2-year, 1 hour storm</td><td>– 0.864 inches</td></tr> <tr><td>10-year, 1 hour storm</td><td>– 1.42 inches</td></tr> <tr><td>25-year, 1 hour storm</td><td>– 1.77 inches</td></tr> <tr><td>100-year, 1 hour storm</td><td>– 2.39 inches</td></tr> </table> <p>See Attachment D</p> <p>This results in 'c' values from the table on page 5 of the following:</p>	2-year, 1 hour storm	– 0.864 inches	10-year, 1 hour storm	– 1.42 inches	25-year, 1 hour storm	– 1.77 inches	100-year, 1 hour storm	– 2.39 inches								
2-year, 1 hour storm	– 0.864 inches																		
10-year, 1 hour storm	– 1.42 inches																		
25-year, 1 hour storm	– 1.77 inches																		
100-year, 1 hour storm	– 2.39 inches																		

			<p>2 year 'c' 0.37 10 year 'c' 0.50 25 year 'c' 0.57 100 year 'c' 0.66</p>
3	7	Site Runoff %	The site runoff as a percentage of the offsite watershed will change slightly when the correct Q's are used
4	8	Offsite runoff	The statement that offsite runoff does not impact the site is incorrect. The channel in the north east corner of the site is significant and prevents development in that corner.
5	8	More mention of the 1- year storm	The time of concentration (t_c) needs to be calculated for the site and the correct intensity used, based upon the time of concentration. The use of the 1 hr i is incorrect. See attachment A.
6	9	Table 3-1	Table 3-1 lists 1 hour storms for the 2, 10, 25, and 100-year frequencies, but the intensities used should reflect the t_c not default to the 1 hour storm, which is used. When the t_c is calculated and used to determine the frequencies, the Q will increase.
7	10	Table 3-1	If recalculated, the increase in runoff is likely to exceed 1 cfs. See Attachments B and C.
8	11	Table 3-3	Table 3-3 will change significantly when the correct 'i' is used. See Attachments B and C.
9	11	Table 3-3	No calculation is provided for the volume. It is unclear how the volume of the storm was calculated. Typically this is done with a unit hydrograph, although that information has not been provided.
10	Appendix B	FIRM Map	The FIRM Maps have been updated and the current map is not in the report. No significant changes are noted. A current copy is attached in Attachment E.
11	Appendix C	C_f	<p>The Rational Method typically includes a C_f coefficient. C_f is a runoff coefficient adjustment factor to account for reduction of infiltration and other losses during high intensity storms. The factor is adjust for the various frequency storms as follows:</p> <p>2-year $C_f=1.0$ 10-year $C_f=1.1$ 25-year $C_f=1.2$</p>

			100-year $C_f=1.25$
12	3, 6, 9	2- hour intensity	The Arizona Department of Transportation Drainage Design Manual indicates that t_c shall not exceed 60 minutes if the Rational Method is used. The 2-hour t_c should not be used with this program.
13	Cover	No engineer's seal	The author of the document is not identified. It does not appear that the document was written by a professional engineer.
14	4	Figure 2	Figure 2 "Existing Site Grading Conditions" illustrates that runoff leaves the site in two directions. The design of the retention does not have a proportional amount of storage that relates to the size of the subarea. The larger retention volume is in the smaller watershed and the smaller detention are is located in the larger watershed area. The two areas should be evaluated separately.
15	12	Retention	Retention is not typically used in northern Arizona, due to the poor percolation rates. Typically detention is used in Northern Arizona. The difference is a release at the bottom of the detention basin that is small and controls the discharge rate to pre-construction rates.
15	Appendix C	Retention Volume	If calculations were to be updated with the correct 'I' the volumes to be retained would be much larger. Therefore volume of retention proposed is insufficient.
16		Floodplain	The calculations and HEC-RAS analysis was not included in the drainage report, therefore the limits of the floodplain in the un-named wash in the northeast corner could not be evaluated.
17	Multiple Locations	Yavapai County Drainage Polices	The designer cites Yavapai County Drainage Polices, but the site is located in Coconino County. Design should follow either the City of Sedona Regulations or Coconino County requirements.
18	Grading Plan	Per the City of Sedona Table 8.1	The maximum slope on an unprotected detention pond is 3:1. The pond shown on Grading plan C-101 appears to have slopes that are steeper than 3:1.
19	General		These plans are preliminary in nature and

			consistent with a CUP application. Prior to construction more detailed drainage analysis, design documents and SWPPP must be created, submitted, reviewed and approved.
--	--	--	---

Comments Pertaining to Conditional Use Permit Package Dated April 2018

No.	Page	Issue	Comment
16	31 of 196	Dirt Volume Calculation	The Volume of a 1.5 million gallon tank is 200,534 cubic feet. The quantity in the response indicating that 13,000 to 15,557 cf of rock to be removed is unlikely.
17	60 of 196	Truck Traffic	The size of truck indicated in the photo will hold 14 cubic yards of material. If 200,534 cubic feet of material (200,534/27=7,427 cubic yards) of material are going to be moved, the number of trucks required will be 530. If they cycle at two per hour then it will take 265 hours to remove the material. This will result in truck traffic for seven weeks just for the excavation.
18	65 of 196	Back up generator	ADEQ recommends an alternative power source for booster pumps.
19		Zoning	The current zoning is RS-18b. Per the current zoning, the allowable lot coverage shall not exceed 35% of the net lot area. It appears that this tank and the associated buildings and drives would exceed that ratio.

Executive Summary

CD&E has been contracted to review a document titled “East Sedona Water Storage Tank, Booster Pump Station and Related Appurtenances Drainage Report” dated September 2018. The comments listed above provide our detailed comments relating to the Drainage Report and some supplemental comments that pertain to the Conceptual Design Report.

These reports were presented to the City of Sedona by the Arizona Water Company to support their request for a conditional use permit on the property with address 55 Bell Rock Trail. The Conditional Use Permit (CUP) is being requested by the Arizona Water Company to allow the placement of a 1.5 million gallon water tank and the associated booster pumps and hydropneumatic tanks.

In general, these documents are preliminary in nature and consistent with what is necessary for a CUP application.

Fundamental concerns identified by CD&E include insufficient detention volume. Based upon



PO Box 30836, Flagstaff, AZ 86003 | 928.522.9287
618 East Route 66, Flagstaff, AZ 86001 | Fax 928.522.9358
14001 N 7th ST, Suite C-106, Phoenix, AZ 85022 | 602.438.2700

the calculation errors listed in the table above, the current grading plan does not provide sufficient retention or detention volume. It is likely that the design will change from retention to detention when the final design is done, since it very difficult to provide retention volume in Northern Arizona with the rock and clay that is the predominant soil type.

Additional concerns include the volume of material to be removed. Accurate calculations of the volume of material to be removed should be provided by the engineer given the large volume of disturbance anticipated.

One consideration that should be discussed with the City of Sedona is that the zoning does not allow the percent coverage that is proposed. The City of Sedona should be consulted to determine if an increase in the lot coverage can be achieved with a Conditional Use Permit.

These comments are based upon the review of the preliminary documents presented. Additional design is necessary.

Time of Concentration Calculations

$$L = 226 \text{ feet}$$

$$S = (4192-4171)/226 = 0.0929 \text{ ft/ft}$$

Sheet Flow

Range Land $n = 0.13$

Two year 24 hour inches = 2.05

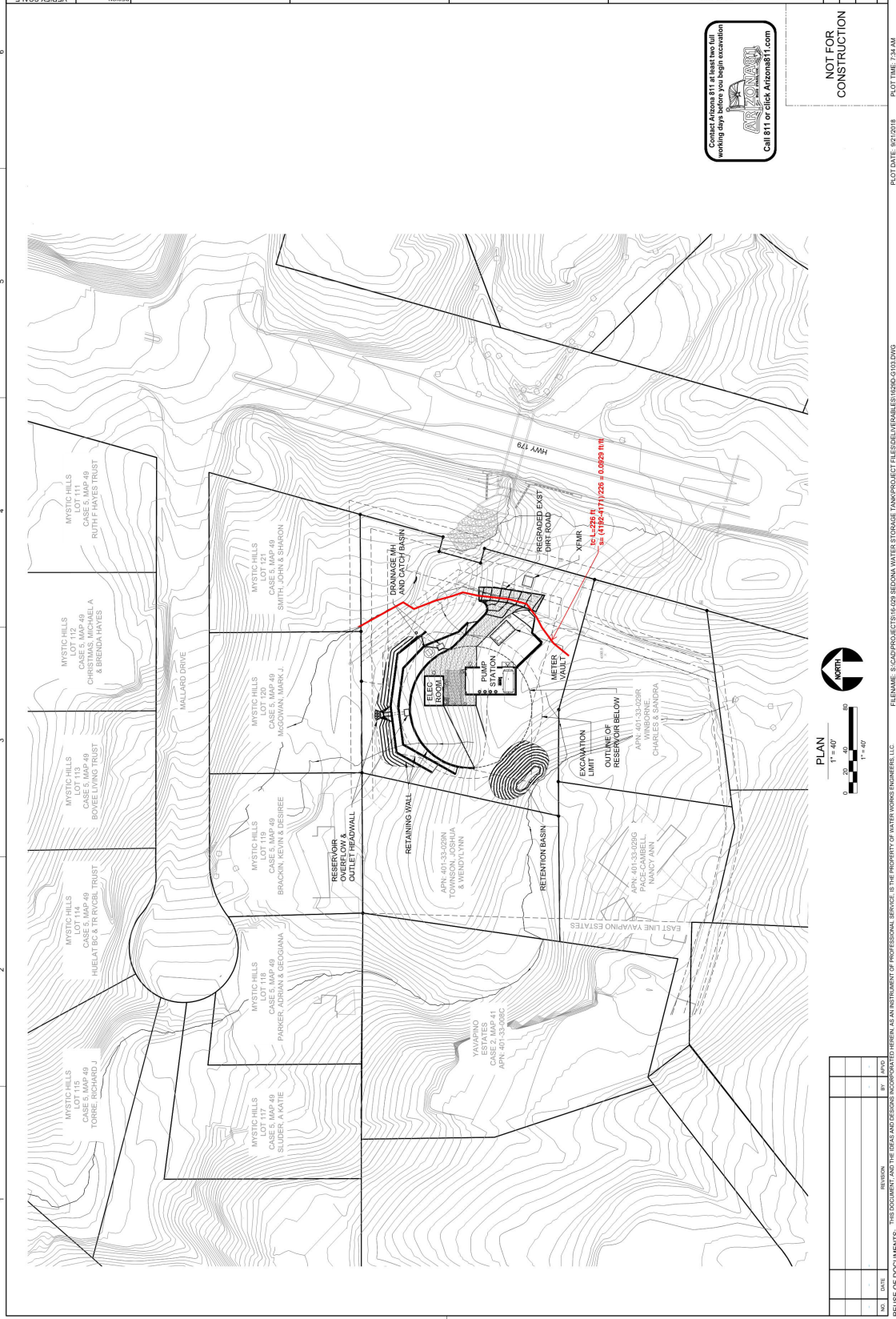
$$T = 0.07(nL)^{0.08} / P_2^{0.5} S^{0.4}$$

$$T = 0.189 \text{ hours}$$

WATERWORKS ENGINEERS
 10000 W. BUCKLEBOURNE BLVD. SUITE 200 • WEST VALLEY CITY, UT 84119
 (801) 373-7700

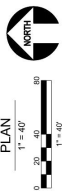
DATE: SEPT 2018
 PROJECT: EAST SEDONA WATER STORAGE TANK PROJECT
 DRAWING NUMBER: E-0209
 SHEET: C-103
 SCALE: 1" = 40'

GENERAL
 AREA SITE PLAN
 PLANNING AND ZONING
 EAST SEDONA
 WATER STORAGE TANK



Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA
 Call 811 or click Arizona1.com

NOT FOR CONSTRUCTION



NO.	DATE	REVISION

PLOT DATE: 09/12/18 PLOT TIME: 7:34 AM FILENAME: S:\C:\PROJECTS\16-028 SEDONA WATER STORAGE TANK\PROJECT FILES\DWG\ENR\1609-0310.DWG

Rational Method Q Peak Detailed Report: Arizona Water Tank

<General>		
ID	18	Notes
Label	Arizona Water Tank	
Category		
Time of Concentration	0.189 hours	

Storm Collection

Storm	C Adjustment
Sedona - Inch/hour (Sedona - Inch/hour - 2 Year) - 2 Year	1.000
Sedona - Inch/hour (Sedona - Inch/hour - 10 Year) - 10 Year	1.100
Sedona - Inch/hour (Sedona - Inch/hour - 25 Year) - 25 Year	1.200
Sedona - Inch/hour (Sedona - Inch/hour - 100 Year) - 100 Year	1.250

C/Area Collection

Description	C Coefficient	Area (acres)
Grass & Brush Existing	0.370	1.050

Summary of Rational method Peak Discharges

Frequency (years)	C Coefficient	C Adjustment Factor	C Coefficient (Final)	Intensity (in/h)	Area (acres)	Peak Flow (ft ³ /s)
2	0.370	1.000	0.370	2.392	1.050	0.94
10	0.370	1.100	0.407	3.920	1.050	1.69
25	0.370	1.200	0.444	4.912	1.050	2.31
100	0.370	1.250	0.463	6.626	1.050	3.24

Tc Data List

Tc Method
TR-55 Sheet Flow

Rational Method Q Peak Detailed Report: Arizona Water Tank

<General>		
ID	18	Notes
Label	Arizona Water Tank	
Category		
Time of Concentration	0.189 hours	

Storm Collection

Storm	C Adjustment
Sedona - Inch/hour (Sedona - Inch/hour - 2 Year) - 2 Year	1.000
Sedona - Inch/hour (Sedona - Inch/hour - 10 Year) - 10 Year	1.100
Sedona - Inch/hour (Sedona - Inch/hour - 25 Year) - 25 Year	1.200
Sedona - Inch/hour (Sedona - Inch/hour - 100 Year) - 100 Year	1.250

C/Area Collection

Description	C Coefficient	Area (acres)
Grass & Brush Existing	0.370	0.633
Impervious	0.900	0.417

Summary of Rational method Peak Discharges

Frequency (years)	C Coefficient	C Adjustment Factor	C Coefficient (Final)	Intensity (in/h)	Area (acres)	Peak Flow (ft ³ /s)
2	0.581	1.000	0.581	2.392	1.050	1.47
10	0.581	1.100	0.639	3.920	1.050	2.65
25	0.581	1.200	0.697	4.912	1.050	3.62
100	0.581	1.250	0.726	6.626	1.050	5.09

Tc Data List

Tc Method
TR-55 Sheet Flow



NOAA Atlas 14, Volume 1, Version 5
Location name: Sedona, Arizona, USA*
Latitude: 34.8383°, Longitude: -111.778°
Elevation: 4198.27 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 Trypanuk, 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

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PF tabular

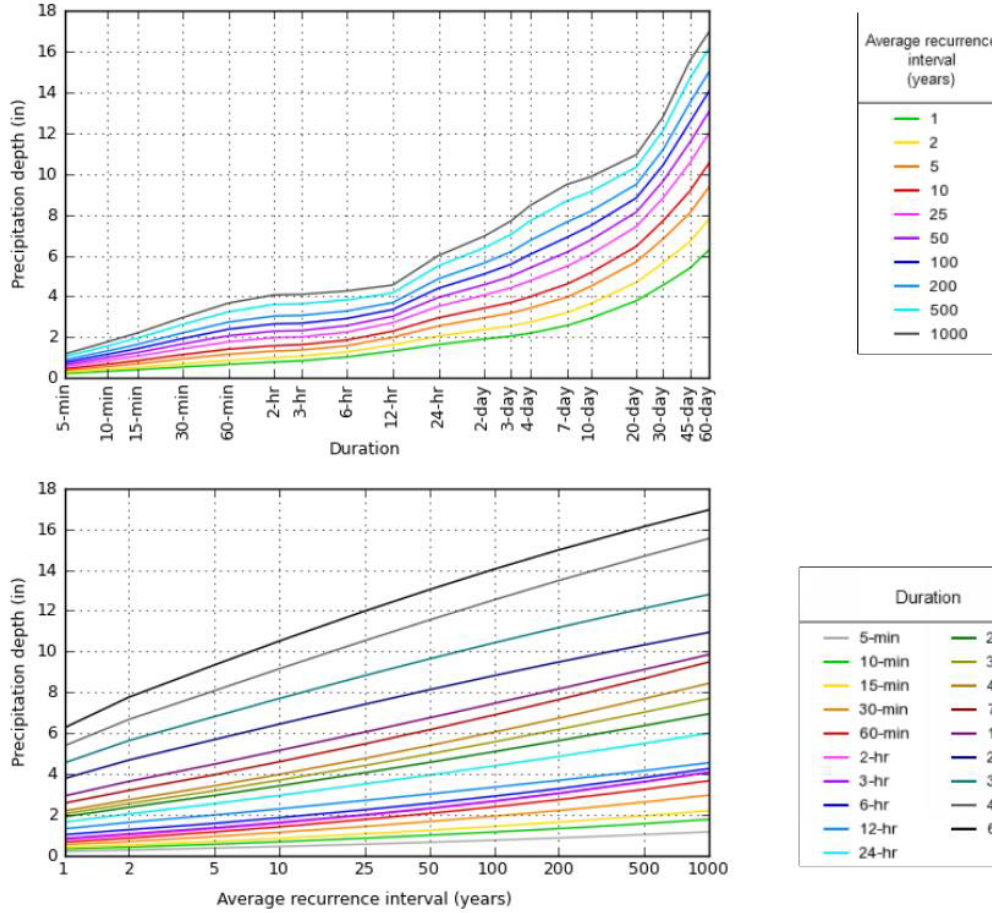
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.213 (0,179-0,253)	0.275 (0,230-0,327)	0.370 (0,309-0,440)	0.450 (0,376-0,534)	0.564 (0,467-0,666)	0.658 (0,541-0,779)	0.761 (0,619-0,901)	0.871 (0,699-1,03)	1.03 (0,813-1,23)	1.17 (0,907-1,40)
10-min	0.324 (0,272-0,386)	0.418 (0,349-0,497)	0.563 (0,470-0,670)	0.685 (0,572-0,814)	0.858 (0,710-1,01)	1.00 (0,823-1,19)	1.16 (0,942-1,37)	1.33 (1,06-1,57)	1.57 (1,24-1,88)	1.78 (1,38-2,13)
15-min	0.402 (0,337-0,478)	0.518 (0,433-0,616)	0.698 (0,582-0,831)	0.849 (0,708-1,01)	1.06 (0,880-1,26)	1.24 (1,02-1,47)	1.44 (1,17-1,70)	1.64 (1,32-1,95)	1.95 (1,53-2,33)	2.20 (1,71-2,65)
30-min	0.541 (0,454-0,644)	0.698 (0,583-0,830)	0.940 (0,784-1,12)	1.14 (0,954-1,36)	1.43 (1,19-1,69)	1.67 (1,37-1,98)	1.93 (1,57-2,29)	2.21 (1,78-2,62)	2.62 (2,07-3,13)	2.97 (2,30-3,56)
60-min	0.670 (0,561-0,797)	0.864 (0,722-1,03)	1.16 (0,970-1,38)	1.42 (1,18-1,68)	1.77 (1,47-2,10)	2.07 (1,70-2,45)	2.39 (1,95-2,83)	2.74 (2,20-3,25)	3.25 (2,56-3,88)	3.67 (2,85-4,41)
2-hr	0.788 (0,685-0,916)	0.997 (0,861-1,16)	1.32 (1,14-1,53)	1.59 (1,36-1,84)	1.98 (1,68-2,28)	2.30 (1,93-2,66)	2.65 (2,21-3,08)	3.04 (2,49-3,53)	3.61 (2,91-4,20)	4.07 (3,23-4,75)
3-hr	0.845 (0,744-0,976)	1.07 (0,944-1,24)	1.37 (1,20-1,58)	1.63 (1,43-1,88)	2.01 (1,74-2,31)	2.33 (2,00-2,67)	2.68 (2,27-3,09)	3.07 (2,56-3,54)	3.63 (2,98-4,22)	4.10 (3,30-4,79)
6-hr	1.03 (0,920-1,14)	1.27 (1,14-1,42)	1.58 (1,42-1,77)	1.86 (1,66-2,07)	2.25 (1,99-2,51)	2.57 (2,26-2,86)	2.92 (2,54-3,26)	3.28 (2,82-3,68)	3.83 (3,23-4,33)	4.27 (3,54-4,86)
12-hr	1.32 (1,19-1,47)	1.63 (1,47-1,81)	1.99 (1,79-2,20)	2.29 (2,06-2,53)	2.71 (2,42-2,98)	3.02 (2,68-3,33)	3.36 (2,95-3,71)	3.69 (3,22-4,09)	4.17 (3,58-4,65)	4.55 (3,87-5,11)
24-hr	1.64 (1,49-1,81)	2.05 (1,86-2,26)	2.55 (2,31-2,82)	2.95 (2,67-3,27)	3.51 (3,16-3,88)	3.95 (3,55-4,36)	4.40 (3,93-4,86)	4.86 (4,32-5,38)	5.50 (4,84-6,11)	6.00 (5,23-6,68)
2-day	1.91 (1,74-2,11)	2.37 (2,16-2,63)	2.95 (2,69-3,27)	3.42 (3,11-3,78)	4.06 (3,68-4,48)	4.57 (4,12-5,04)	5.09 (4,56-5,62)	5.63 (5,01-6,23)	6.37 (5,62-7,06)	6.95 (6,07-7,72)
3-day	2.05 (1,87-2,26)	2.55 (2,33-2,82)	3.19 (2,91-3,52)	3.70 (3,36-4,08)	4.41 (4,00-4,86)	4.98 (4,49-5,47)	5.57 (4,99-6,13)	6.19 (5,50-6,81)	7.03 (6,20-7,77)	7.70 (6,73-8,54)
4-day	2.19 (2,01-2,41)	2.74 (2,50-3,01)	3.42 (3,12-3,76)	3.98 (3,62-4,37)	4.76 (4,32-5,23)	5.39 (4,86-5,91)	6.05 (5,43-6,64)	6.74 (6,00-7,40)	7.69 (6,78-8,48)	8.44 (7,38-9,36)
7-day	2.57 (2,36-2,81)	3.20 (2,93-3,51)	3.97 (3,63-4,34)	4.60 (4,20-5,03)	5.48 (4,99-5,98)	6.17 (5,60-6,75)	6.89 (6,23-7,55)	7.64 (6,86-8,37)	8.68 (7,71-9,55)	9.49 (8,35-10,5)
10-day	2.93 (2,68-3,21)	3.64 (3,33-3,99)	4.48 (4,10-4,91)	5.15 (4,70-5,65)	6.05 (5,50-6,62)	6.75 (6,12-7,39)	7.46 (6,72-8,17)	8.17 (7,32-8,96)	9.12 (8,12-10,0)	9.85 (8,72-10,9)
20-day	3.78 (3,47-4,13)	4.69 (4,31-5,13)	5.69 (5,23-6,22)	6.45 (5,91-7,04)	7.41 (6,78-8,09)	8.13 (7,41-8,87)	8.82 (8,02-9,64)	9.49 (8,60-10,4)	10.3 (9,31-11,3)	10.9 (9,82-12,0)
30-day	4.55 (4,17-4,97)	5.64 (5,17-6,17)	6.81 (6,23-7,44)	7.70 (7,04-8,39)	8.82 (8,04-9,61)	9.64 (8,77-10,5)	10.4 (9,45-11,4)	11.2 (10,1-12,2)	12.1 (10,9-13,3)	12.8 (11,5-14,0)
45-day	5.38 (4,91-5,94)	6.68 (6,09-7,38)	8.08 (7,37-8,90)	9.15 (8,34-10,1)	10.5 (9,58-11,6)	11.5 (10,5-12,7)	12.5 (11,3-13,8)	13.5 (12,1-14,8)	14.7 (13,2-16,2)	15.5 (13,9-17,2)
60-day	6.26 (5,70-6,87)	7.77 (7,07-8,52)	9.34 (8,51-10,2)	10.5 (9,56-11,5)	12.0 (10,9-13,1)	13.0 (11,8-14,3)	14.0 (12,7-15,4)	15.0 (13,5-16,4)	16.1 (14,5-17,7)	16.9 (15,2-18,6)

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

PDS-based depth-duration-frequency (DDF) curves
 Latitude: 34.8383°, Longitude: -111.7780°



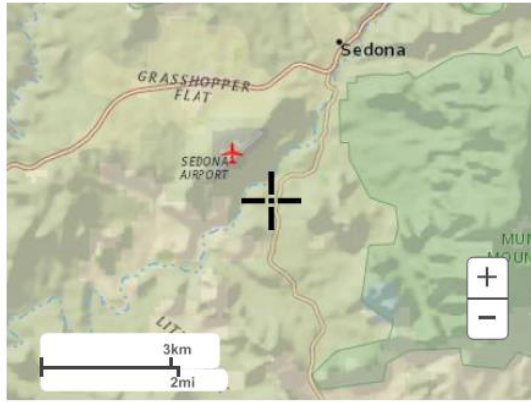
NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Oct 4 16:01:50 2018

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Maps & aerials

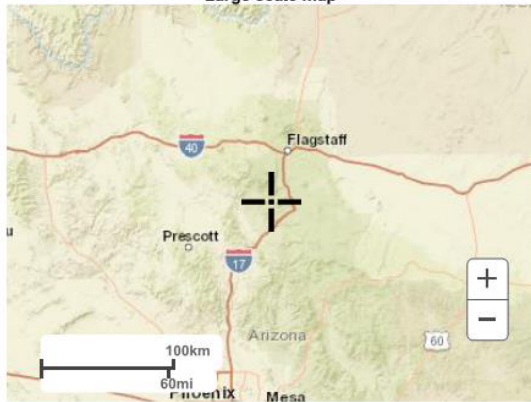
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



NOAA Atlas 14, Volume 1, Version 5
Location name: Sedona, Arizona, USA*
Latitude: 34.8383°, Longitude: -111.778°
Elevation: 4198.27 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

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PF tabular

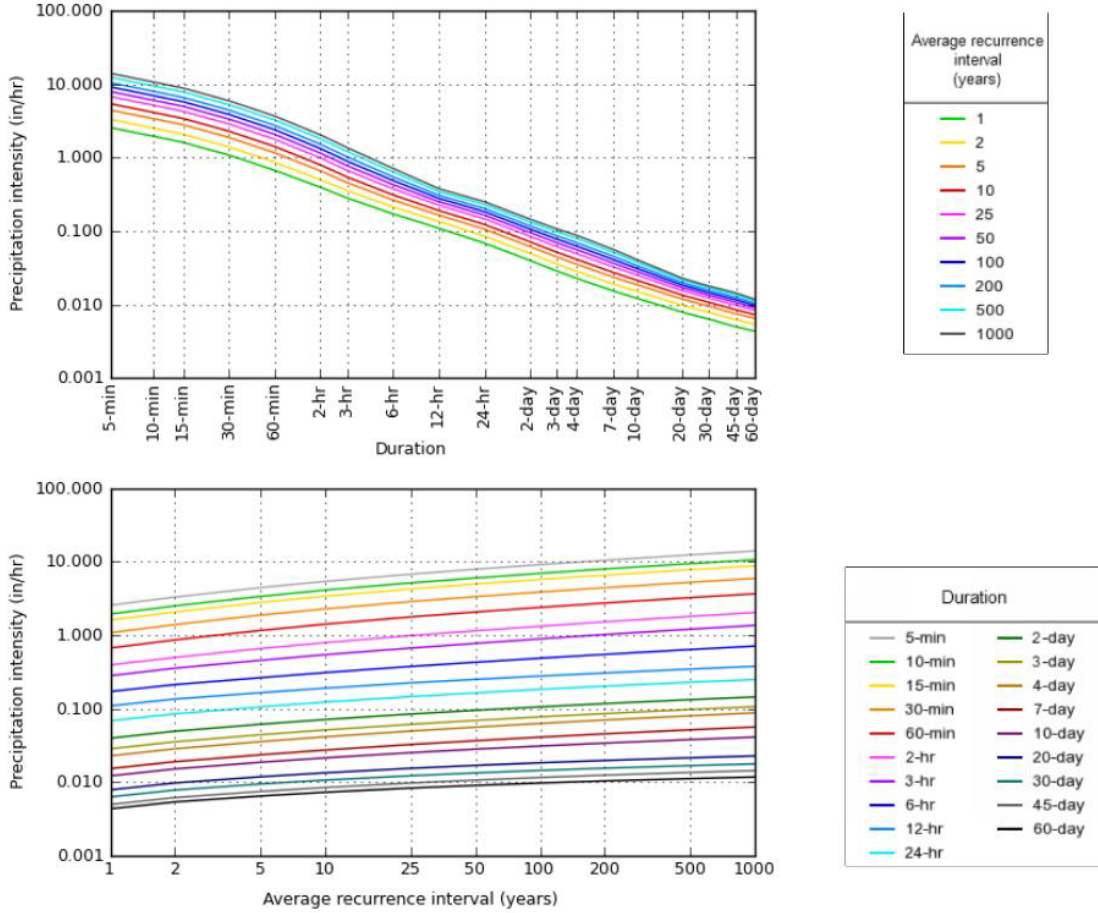
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.56 (2,15-3,04)	3.30 (2,76-3,92)	4.44 (3,71-5,28)	5.40 (4,51-6,41)	6.77 (5,60-7,99)	7.90 (6,49-9,35)	9.13 (7,43-10,8)	10.5 (8,39-12,4)	12.4 (9,76-14,8)	14.0 (10,9-16,8)
10-min	1.94 (1,63-2,32)	2.51 (2,09-2,98)	3.38 (2,82-4,02)	4.11 (3,43-4,88)	5.15 (4,26-6,08)	6.01 (4,94-7,11)	6.95 (5,65-8,23)	7.96 (6,38-9,43)	9.43 (7,42-11,3)	10.7 (8,29-12,8)
15-min	1.61 (1,35-1,91)	2.07 (1,73-2,46)	2.79 (2,33-3,32)	3.40 (2,83-4,03)	4.26 (3,52-5,03)	4.97 (4,08-5,88)	5.74 (4,67-6,80)	6.57 (5,28-7,80)	7.79 (6,14-9,30)	8.81 (6,84-10,6)
30-min	1.08 (0,908-1,29)	1.40 (1,17-1,66)	1.88 (1,57-2,24)	2.29 (1,91-2,72)	2.86 (2,37-3,39)	3.35 (2,75-3,96)	3.87 (3,15-4,58)	4.43 (3,55-5,25)	5.25 (4,13-6,26)	5.93 (4,61-7,12)
60-min	0.670 (0,561-0,797)	0.864 (0,722-1,03)	1.16 (0,970-1,38)	1.42 (1,18-1,68)	1.77 (1,47-2,10)	2.07 (1,70-2,45)	2.39 (1,95-2,83)	2.74 (2,20-3,25)	3.25 (2,56-3,88)	3.67 (2,85-4,41)
2-hr	0.394 (0,342-0,458)	0.498 (0,430-0,580)	0.658 (0,568-0,765)	0.794 (0,680-0,921)	0.988 (0,842-1,14)	1.15 (0,966-1,33)	1.33 (1,11-1,54)	1.52 (1,25-1,76)	1.80 (1,45-2,10)	2.04 (1,61-2,38)
3-hr	0.281 (0,248-0,325)	0.356 (0,314-0,412)	0.456 (0,401-0,526)	0.544 (0,475-0,626)	0.668 (0,579-0,769)	0.775 (0,666-0,889)	0.892 (0,756-1,03)	1.02 (0,852-1,18)	1.21 (0,991-1,40)	1.36 (1,10-1,60)
6-hr	0.172 (0,154-0,191)	0.213 (0,191-0,237)	0.264 (0,236-0,295)	0.310 (0,277-0,346)	0.376 (0,333-0,419)	0.429 (0,377-0,478)	0.487 (0,424-0,544)	0.548 (0,471-0,615)	0.639 (0,539-0,723)	0.712 (0,592-0,811)
12-hr	0.109 (0,099-0,122)	0.135 (0,122-0,150)	0.165 (0,149-0,183)	0.190 (0,171-0,210)	0.225 (0,201-0,248)	0.251 (0,223-0,276)	0.279 (0,245-0,308)	0.306 (0,267-0,339)	0.346 (0,297-0,386)	0.378 (0,321-0,424)
24-hr	0.068 (0,062-0,075)	0.085 (0,077-0,094)	0.106 (0,096-0,117)	0.123 (0,111-0,136)	0.146 (0,132-0,162)	0.165 (0,148-0,182)	0.183 (0,164-0,202)	0.203 (0,180-0,224)	0.229 (0,202-0,254)	0.250 (0,218-0,279)
2-day	0.040 (0,036-0,044)	0.049 (0,045-0,055)	0.061 (0,056-0,068)	0.071 (0,065-0,079)	0.085 (0,077-0,093)	0.095 (0,086-0,105)	0.106 (0,095-0,117)	0.117 (0,104-0,130)	0.133 (0,117-0,147)	0.145 (0,127-0,161)
3-day	0.028 (0,026-0,031)	0.035 (0,032-0,039)	0.044 (0,040-0,049)	0.051 (0,047-0,057)	0.061 (0,056-0,067)	0.069 (0,062-0,076)	0.077 (0,069-0,085)	0.086 (0,076-0,095)	0.098 (0,086-0,108)	0.107 (0,093-0,119)
4-day	0.023 (0,021-0,025)	0.028 (0,026-0,031)	0.036 (0,033-0,039)	0.041 (0,038-0,046)	0.050 (0,045-0,054)	0.056 (0,051-0,062)	0.063 (0,057-0,069)	0.070 (0,062-0,077)	0.080 (0,071-0,088)	0.088 (0,077-0,097)
7-day	0.015 (0,014-0,017)	0.019 (0,017-0,021)	0.024 (0,022-0,026)	0.027 (0,025-0,030)	0.033 (0,030-0,036)	0.037 (0,033-0,040)	0.041 (0,037-0,045)	0.045 (0,041-0,050)	0.052 (0,046-0,057)	0.056 (0,050-0,062)
10-day	0.012 (0,011-0,013)	0.015 (0,014-0,017)	0.019 (0,017-0,020)	0.021 (0,020-0,024)	0.025 (0,023-0,028)	0.028 (0,025-0,031)	0.031 (0,028-0,034)	0.034 (0,031-0,037)	0.038 (0,034-0,042)	0.041 (0,036-0,045)
20-day	0.008 (0,007-0,009)	0.010 (0,009-0,011)	0.012 (0,011-0,013)	0.013 (0,012-0,015)	0.015 (0,014-0,017)	0.017 (0,015-0,018)	0.018 (0,017-0,020)	0.020 (0,018-0,022)	0.022 (0,019-0,024)	0.023 (0,020-0,025)
30-day	0.006 (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)	0.014 (0,013-0,016)	0.016 (0,014-0,017)	0.017 (0,015-0,018)	0.018 (0,016-0,019)
45-day	0.005 (0,005-0,006)	0.006 (0,006-0,007)	0.007 (0,007-0,008)	0.008 (0,008-0,009)	0.010 (0,009-0,011)	0.011 (0,010-0,012)	0.012 (0,010-0,013)	0.012 (0,011-0,014)	0.014 (0,012-0,015)	0.014 (0,013-0,016)
60-day	0.004 (0,004-0,005)	0.005 (0,005-0,006)	0.006 (0,006-0,007)	0.007 (0,007-0,008)	0.008 (0,008-0,009)	0.009 (0,008-0,010)	0.010 (0,009-0,011)	0.010 (0,009-0,011)	0.011 (0,010-0,012)	0.012 (0,011-0,013)

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

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 34.8383°, Longitude: -111.7780°



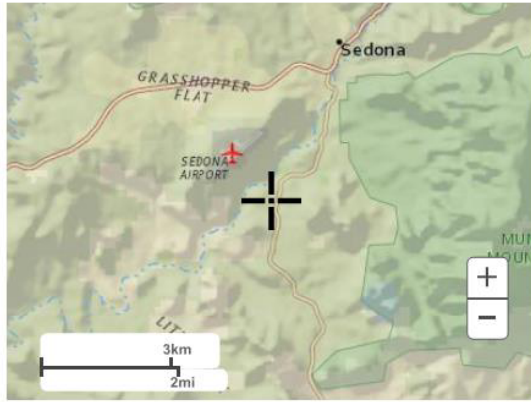
NOAA Atlas 14, Volume 1, Version 5

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Maps & aerials

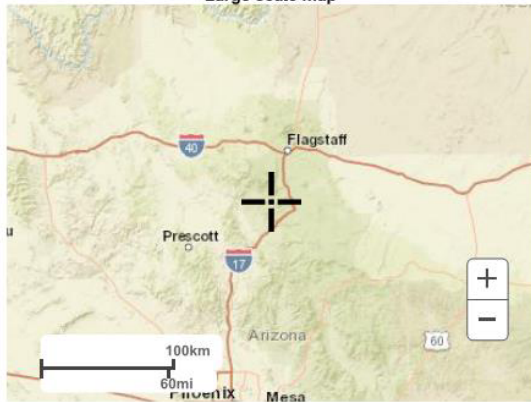
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

National Flood Hazard Layer FIRMette



Legend

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

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

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
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transact
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transact Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS

- Digital Data Available
- No Digital Data Available
- Unmapped

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