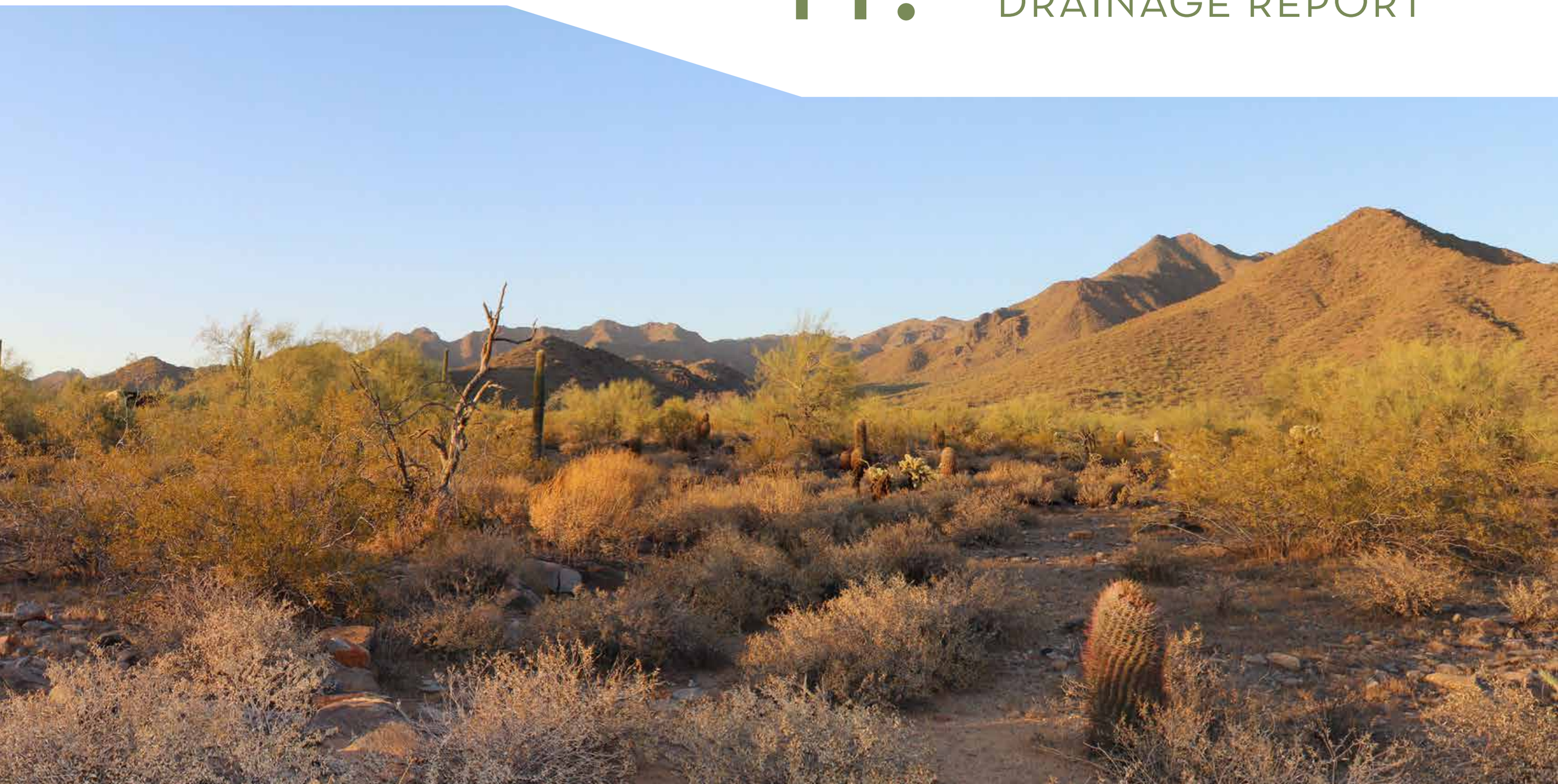
11. CONCEPTUAL DRAINAGE REPORT



CONCEPTUAL DRAINAGE REPORT

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Jul 2017

WP# 164487

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CONCEPTUAL DRAINAGE REPORT

1.0 INTRODUCTION

1.1 Project Description

This report presents the drainage concepts in support of the proposed Desert Discovery Center (DDC). The project will consist of a number of structures, including interpretive, educational, and research facilities; addition of an access way to the center; expansion of the parking lot at the Gateway; and extension of access ways from the parking area to the center.

1.2 Project Location

The structural elements of the DDC sit on approximately 5.5 acres of land located south of the Gateway Trailhead and north of the Thompson Peak Wash within the McDowell Sonoran Preserve. Specifically, the proposed DDC site is located east of Thompson Peak Parkway approximately half a mile north of Bell Road, in the City of Scottsdale, within Section 32 of Township 04N, Range 05E, of the Gila and Salt River Base Line and Meridian, Maricopa, Arizona. Figure 1 – Project Location Map shows the location of the DDC site.

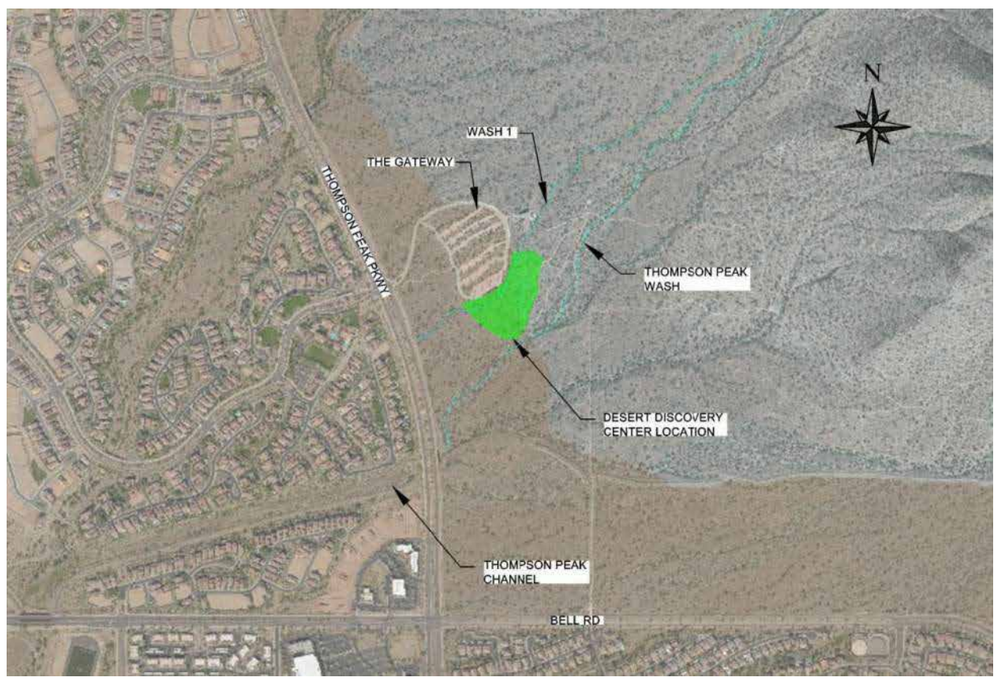


Figure 1 - Project Location Map

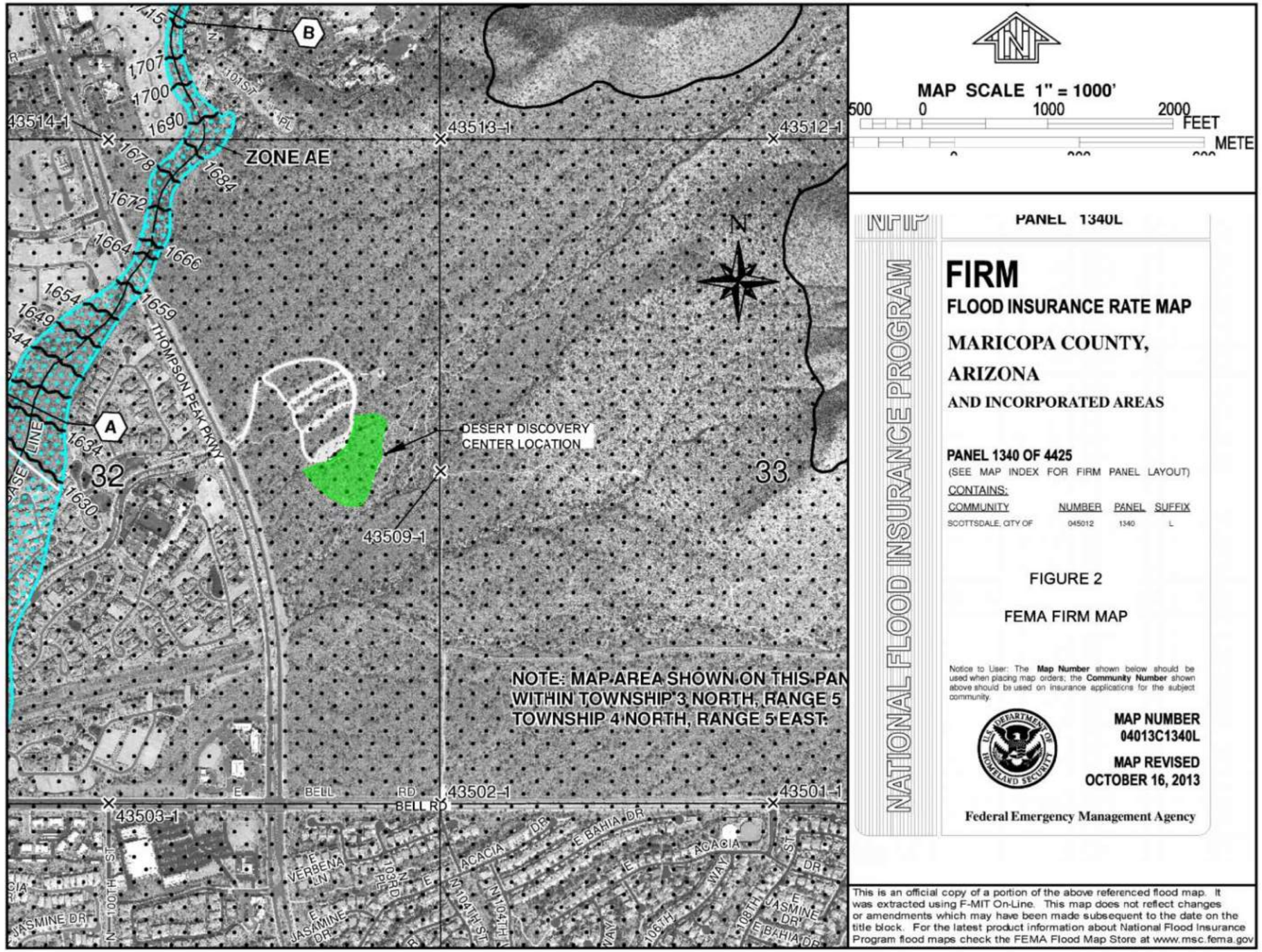
2.0 SITE DESCRIPTION

2.1 Existing Site Characteristics

The DDC site is currently undeveloped land. A small wash, herein referred to as Wash 1, runs along the northwest side of the site, and a large wash commonly referred to as the Thompson Peak Wash runs along the south side of the site. The land generally slopes from the northeast to the southwest, with runoff originating from the McDowell Mountains. Runoff from Thompson Peak Wash is conveyed west under the roadway via a 3-cell Conspan structure. Runoff from smaller washes is collected in drop inlets along the east side of Thompson Peak Parkway and conveyed in a storm drain under the roadway to the Conspan structure.

2.2 FEMA Designation

The DDC site is located within the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) Panel 04021C1340L, revised 10/16/2013, for Maricopa County and Incorporated Areas. The FIRM panel indicates the site is located within Shaded Zone 'X', which is defined as "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood." Figure 2 – FEMA FIRM Map shows the project location within the FIRM panels.



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3.0 DRAINAGE EVALUATION

3.1 Hydrology

The regional hydrology for the Thompson Peak Wash along the south side of the project site is based on hydrology performed for the Reata Wash Flood Control Improvement Study. The HEC-1 model from this project was obtained and updated to reflect the area tributary to the Thompson Peak Wash. The HEC-1 analysis indicates that the existing 100-year peak discharge is 1,793 cfs.

For Wash 1, which has a drainage area of 26.2 acres, the Rational Method was used to calculate the peak discharge. This analysis estimates the 100-year peak discharge for Wash 1 at 75 cfs. Exhibit 1 is a drainage map showing the delineation for the contributing drainage areas to Wash 1 and the Thompson Peak Wash, along with the peak discharges.

3.2 Hydraulics

A hydraulic analysis was performed to determine if the regional flow tributary to the Thompson Peak Wash is contained within the limits of the wash. This analysis was performed using the HEC-RAS software, and shows that a breakout occurs approximately 920 feet north of the site for a 100-year rainfall event. The breakout is approximately 80 cfs. This breakout flows in a small wash and combines with Wash 1 approximately 250 feet north of the site. The 80 cfs from the breakout is not additive to the discharge in Wash 1 because the time of concentration of the breakout flow is much greater than the time of concentration of Wash 1. The recommended design flow for Wash 1 is 80cfs.

The capacity of Wash 1 was checked using the normal depth method in the FlowMaster software. Four sections were analyzed, and the following average results were obtained:

- Average capacity = 178 cfs (at elevation 6 inches below top of wash)
- Average flow velocity = 7.15ft/s
- Average flow depth = 1.7feet
- Average top width = 27.9feet

4.0 DRAINAGE CONCEPTS

4.1 Design Requirements

The DDC is located within the City's Environmentally Sensitive Lands Overlay (ESLO), Lower Desert Landform, which requires that 25% of the site be permanently preserved as natural area open space (NAOS) and that specific environmental features, such as vegetation, washes, and mountain ridges and peaks, be protected from inappropriate development. The goal of the DDC is to minimize disturbance to existing land features as much as possible.

Based on the current edition of the City of Scottsdale's Design and Standards & Policies Manual, the lowest floor elevation for a habitable structure is to be set at whichever criterion controls:

- a minimum of 14 inches above the highest natural grade
- a minimum of one foot above the 100-year water surface elevation if a wash is present

4.2 Offsite Drainage Concept

The offsite flows impacting the project site consist of the 80 cfs from Wash 1. Other than three proposed wash crossings, the wash will be left in its natural condition and the 80 cfs will continue to flow through it. Drainage structures will be proposed to allow pedestrians and vehicles to cross the wash with minimal disturbance to the wash.

Lateral migration must be considered in the design of structures near the washes. The recommended setback for structures near a wash was estimated based on a Level 1 analysis from Arizona Department of Water Resources (ADWR) State Standard 5-96. The recommended setback is 43 to 106 feet for the Thompson Peak Wash and 9 to 23 feet for Wash 1. In lieu of providing a setback, the footings of the structures could be extended to the scour depth to prevent lateral migration.

4.3 Onsite Drainage Concept

The concept under discussion is to allow minor runoff to sheet flow through the site and be collected in drainage swales along the east side of Thompson Peak Parkway, which then conveys the runoff to the Conspan structure. As-built plans for Thompson Peak Parkway show the Conspan structure has sufficient capacity for the post-development discharge from the DDC. The Conspan structure was designed for a flow of 5202 cfs. The peak discharge from the HEC-1 model which accounts for the DDC indicates a lower peak discharge of 4587 cfs at the Conspan structure.

Additionally, the time of concentration for the onsite flows is less than 10 minutes, while the time of concentration for the regional peak discharge is much greater. By the time the regional peak discharge arrives, the local peak discharge has already come and gone. Therefore, the additional runoff from the DDC's post-development condition has no adverse drainage impact on the existing drainage system.

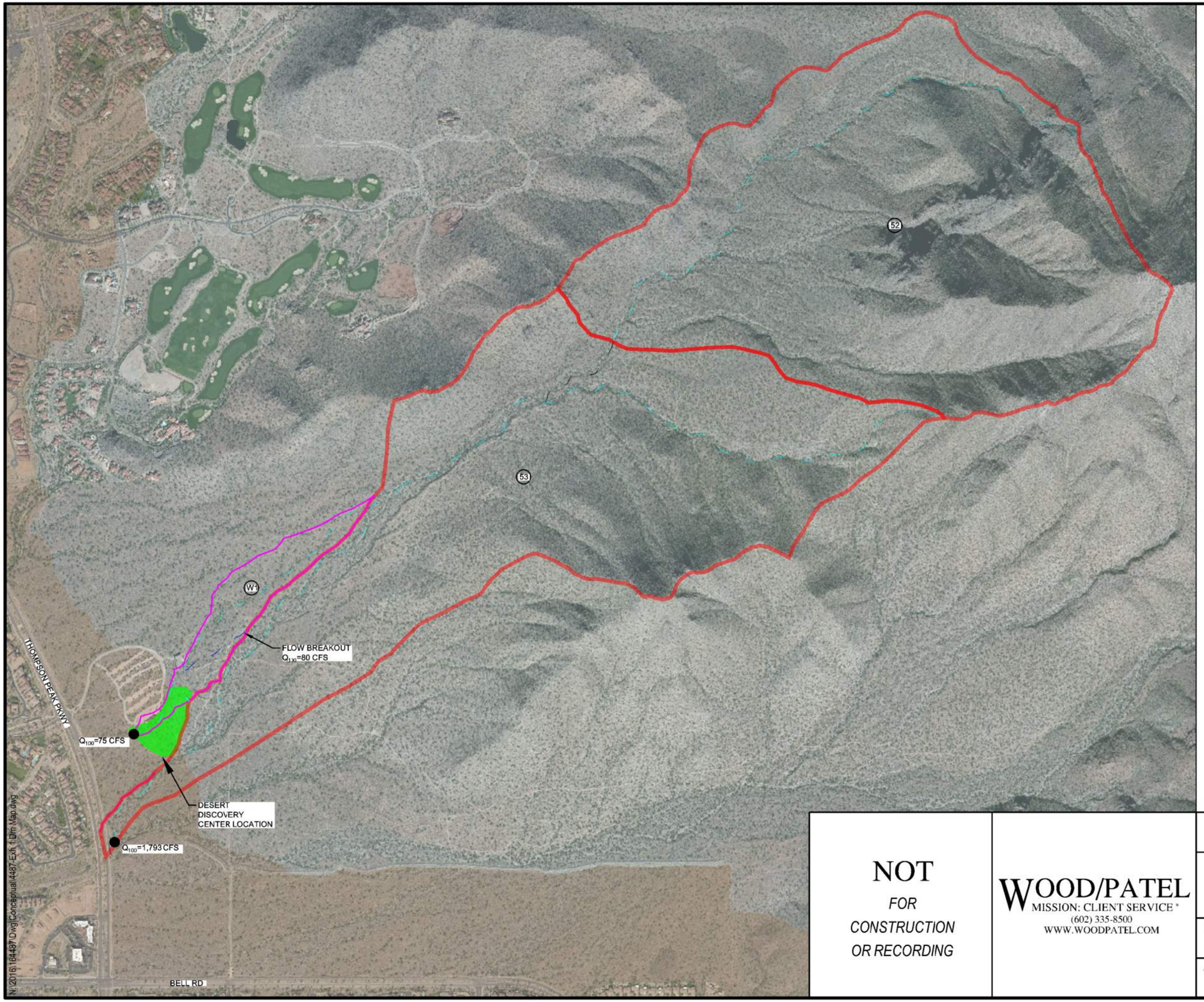
Cutoff walls currently are being discussed to be built at the upstream portion of the project site to provide lateral migration protection. The drainage concepts for the DDC project are shown in Exhibit 2.

5.0 SUMMARY

- The project site is located in the City's ESLO Lower Desert Landform and is bounded on the north by Wash 1 and on the south by the Thompson Peak Wash.
- The design discharge for Wash 1 is 80 cfs. Three crossings are proposed across the wash. The majority of the wash will be left undisturbed.
- Lateral migration protection will be provided by buried structures along Wash 1 and the upstream portion of the project site.

6.0 REFERENCES

- JE Fuller/Wood Patel and Associates, Memorandum: Hydrologic Modeling, Reata Wash Flood Control Improvement Study, August2016.
- Swaback Partners, Desert Discovery Center, Feasibility Study: Phase II, September 2010.
- Kland Consulting Civil Engineers, Final Drainage Report for Gateway Access, May 2006.



N

0 1000 2000

Horz. 1 in. = 1000 ft.

LEGEND

(53)	SUB–BASIN AREA TRIBUTARY TO THOMPSON PEAK WASH
(W1)	SUB–BASIN AREA TRIBUTARY TO WASH 1
	FLOW PATH
●	CONCENTRATION POINT AND 100–YR PEAK DISCHARGE

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EXHIBIT 1
DRAINAGE MAP

DATE: 5-5-2017	SCALE: 1" = 1000'	SHEET 1 OF 1
JOB NO.: 164487	DESIGN: DVD	
	DRAWN: DVD	

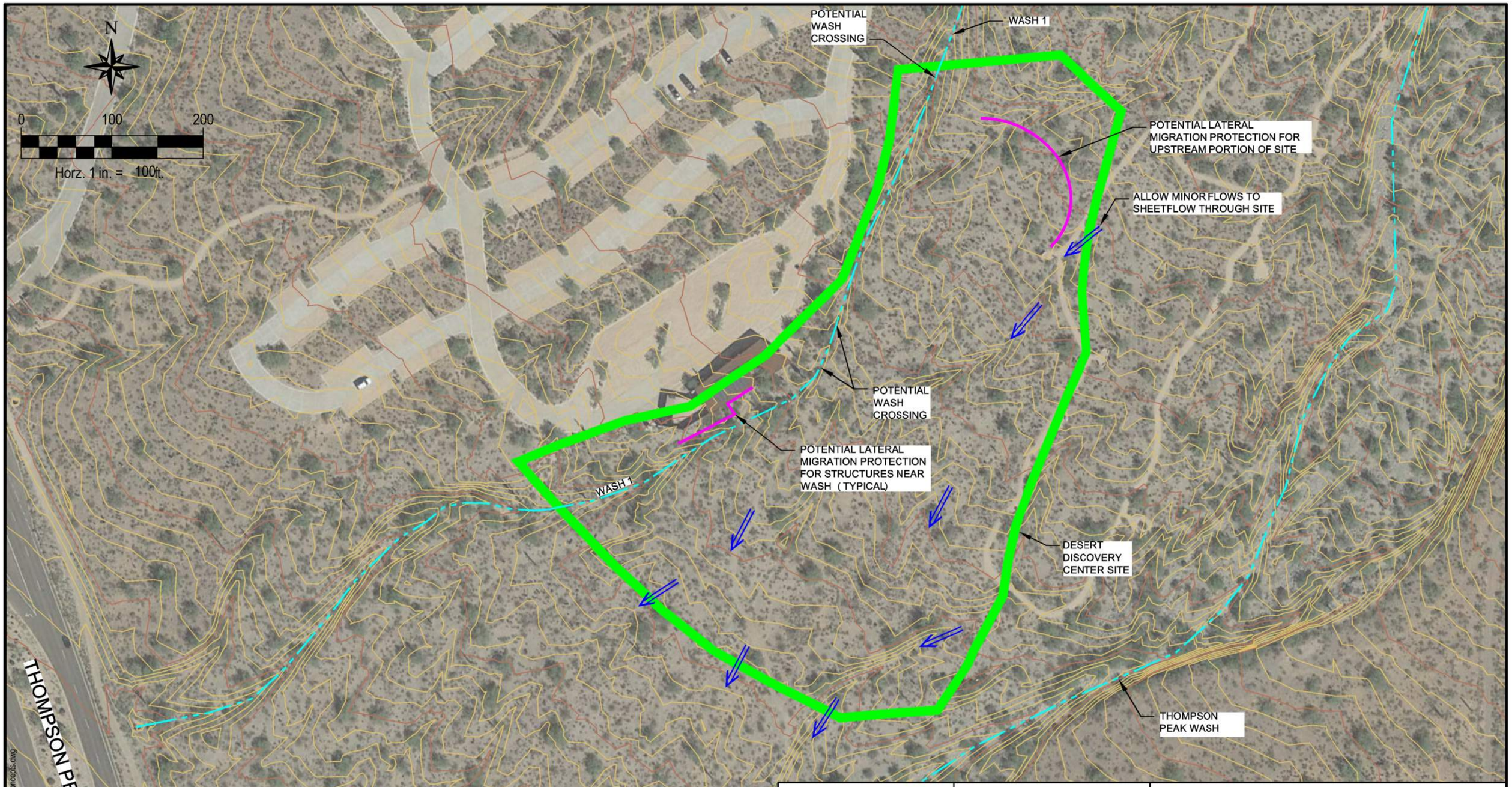

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EXHIBIT 2
DRAINAGE CONCEPTS

DATE: 5-5-2017	SCALE: 1" = 100'	SHEET 1 OF 1
JOB NO.: 164487	DESIGN: DVD DRAWN: DVD	