



CITY COUNCIL AGENDA

Tuesday, December 16, 2025, 6:00 PM
1020 E. Pioneer Road
Draper, Utah 84020
Council Chambers

6:00 PM STUDY SESSION

CLOSED MEETING, IF NECESSARY - TO BE ANNOUNCED IN MOTION

The Draper City Council may temporarily recess the meeting and convene in a closed meeting as provided by UCA § 52-4-205.

Discussion: City Newsletter Survey Results - Linda and Alex

Discussion: Timoney Road Sidewalk and Trees - Scott

Report: New Positions - Kellie and Rhett

Council/Manager Reports

7:00 PM BUSINESS SESSION

1. **Call to Order**
2. **Pledge of Allegiance**
3. **Recognition: PD Christmas Card Finalists - Chief Ferguson**

4. **Public Comments**

To be considerate of everyone attending the meeting, public comments will be restricted to items that are not listed on this or a future agenda and limited to three minutes per person. Comments which cannot be made within these limits should be submitted in writing to the City Recorder prior to noon the day before the meeting. Comments pertaining to an item on the agenda should not be given at this time but should be held until that item is called.

5. **Consent Items**

5.a [Approve the December 2, 2025 City Council Meeting Minutes](#)

5.b [Approve Resolution #25-76](#)

A resolution of the Draper City Council adopting a data privacy policy. Staff:
Nicole Smedley

5.c Approve Resolution #25-77

A resolution reappointing David Hales and Jordan Putnam as members of the Draper City Historic Preservation Commission. Staff: Kellie Challburg.

5.d Approve Resolution #25-78

A resolution reappointing John Maack as a member of the Draper City Parks, Trails and Recreation Committee. Staff: Kellie Challburg.

5.e Approve Resolution #25-79

A resolution of the Draper City Council establishing the regular meeting schedule for the City Council, Planning Commission, subordinate bodies, and committees for the year 2026. Staff: Nicole Smedley

5.f Approve Resolution #25-80

A resolution of the Draper City Council approving the City Council Assignments for 2026. Staff: Kellie Challburg

5.g Approve Resolution #25-81

A resolution of the Draper City Council electing Bryn Heather Johnson to serve as the Mayor Pro Tempore for the year 2026. Staff: Kellie Challburg.

6. Items for Council Consideration

6.a Public Hearing: Ordinances #1688 and #1689

An ordinance amending the Official Land Use Map and an ordinance amending the Official Zoning Map of Draper City for approximately 17.88 acres of property located at approximately 13782 S. 300 E. Known as the Bangerter Crossroads Land Use Map and Zoning Map Amendments. Staff report by Todd Draper.

6.b Public Hearing: Ordinances #1690 and #1691

An ordinance amending the Official Land Use Map and an ordinance amending the official Zoning Map of Draper City for approximately 1.44 acres of property located at approximately 231 E. 13800 S. Known as the Openshaw Draper 138 Land Use Map and Zoning Map Amendments. Staff report by Todd Draper.

6.c Public Hearing: Ordinance #1696

An ordinance of Draper City amending the text of Titles 9, 10, 17, and 18 of the Draper City Municipal Code related to the Geologic Hazards Ordinance. Known as the City Initiated Geologic Hazards Ordinance Text Amendment. Staff report by Todd Taylor.

7. Action Items

7.a Approve Resolution #25-74

A resolution of the Draper City Council adopting the Geotechnical Engineering Standards for Draper City. Staff report by Todd Taylor.

7.b Approve Resolution #25-75

A resolution expressing Draper City's intent to adjust its common municipal boundaries with Highland City affecting parcels 11:017:0157 and 35:544:0050, authorizing and scheduling a public hearing, and providing for notice thereof. Staff report by Mike Barker.

7.c Approve Ordinance #1695

An ordinance of the Draper City Council amending Title 7 of the Draper City Municipal Code establishing the Wildland Urban Interface Area. Staff Report by Clint Smith.

8. Adjournment

I, the City Recorder of Draper City, certify that copies of this agenda for the **Draper City Council** meeting to be held **December 16, 2025**, were posted at Draper City Hall, Draper City website www.draperutah.gov, and the Utah Public Notice website at www.utah.gov/pmn.



Nicole Smedley, CMC, City Recorder
Draper City, State of Utah

In compliance with the Americans with Disabilities Act, any individuals needing special accommodations or services during this meeting shall notify Nicole Smedley, City Recorder at (801) 576-6502 or nicole.smedley@draperutah.gov, at least 24 hours prior to the meeting.

MEMO



To: City Council

From:

Date: 2025-12-16

Re: Approve the December 2, 2025 City Council Meeting Minutes

Comments:

ATTACHMENTS:

[12-2-2025 DRAFT City Council Meeting Minutes.pdf](#)

MINUTES OF THE DRAPER CITY COUNCIL MEETING HELD ON TUESDAY, DECEMBER 2, 2025, IN THE DRAPER CITY COUNCIL CHAMBERS, 1020 EAST PIONEER ROAD, DRAPER, UTAH

PRESENT: Mayor Troy K. Walker, and Councilmembers Bryn Heather Johnson, Tasha Lowery, Fred Lowry, and Marsha Vawdrey

EXCUSED: Councilmember Mike Green

STAFF: Mike Barker, City Manager; Kellie Challburg, Assistant City Manager; Scott Cooley, City Engineer and Public Works Director; Spencer DuShane, Assistant City Attorney; Rich Ferguson, Chief of Police; Traci Gundersen, City Attorney; Jennifer Jastremsky, Community Development Director; Rhett Ogden, Parks and Recreation Director; Derek Orth, Human Resource Director; Linda Peterson, Communications Director; Nicole Smedley, City Recorder; Clint Smith, Fire Chief; Jake Sorensen, Network Manager; and John Vuyk, Finance Director

Study Session

Closed Session

None

Discussion: Special Event Arena Committee

Assistant City Manager Kellie Challburg requested Council direction regarding the Special Event Arena Committee. She reported that three current members wished to continue serving, while three members' terms had expired and those individuals might also be interested in continuing. She stated that staff had experienced difficulties with recruitment and reported that the Committee had assisted with the rodeo, horse pull, monster truck event, and holiday market.

Ms. Challburg stated that staff had discussed the possibility of bringing additional events to the arena to provide the Committee with more activity. The Council discussed the importance of ensuring the Committee remained active and felt needed. Councilmember Vawdrey stated that it would not be advisable if the events did not result in a profit. Councilmember T. Lowery suggested combining the Special Event Arena Committee with the Community Engagement Committee. Ms. Challburg reported that the Community

Engagement Committee was limited to a maximum of eleven members under City Code and currently had ten active members.

Councilmembers F. Lowry and T. Lowery stated support for combining the two committees. Councilmember Johnson stated that if a new committee were created, current members of both committees could be asked to reapply. Councilmember T. Lowery added that priority could be given to those currently serving. Councilmember F. Lowry stated that some current Community Engagement Committee members might welcome a new direction.

A majority of the Council indicated support for combining the Special Event Arena Committee and the Community Engagement Committee as one eleven-member committee.

Report: Major Road CIP

Public Works Director Scott Cooley reported completed road capital improvement projects, including: 2025 pavement maintenance; storm drain improvements on 700 East; 13800 South widening; Suncrest guardrail concrete barrier; and the sidewalk gap project.

The Council and staff discussed possible improvements on 700 West. Mayor Walker explained that widening and improvements had been planned in the past, but were put on hold when residents reached out against the improvements. Mr. Cooley reported a major project that had been planned for 2026 would need to be postponed because of UDOT, and suggested improvements on 700 East could be added to the queue for 2026. Mayor Walker suggested reaching out to current residents to see if they now wanted the road widened. Councilmember T. Lowery said she did not think the road had enough traffic to merit widening, but said she believed residents wanted sidewalk for safety.

Responding to a question from Councilmember T. Lowery, Mr. Cooley said despite reports and perception of residents, speed studies had not found a speeding problem on 700 West. Councilmember T. Lowery said she believed a lot of concerns could be alleviated with the addition of sidewalk and a safe crossing to the park. Mr. Cooley explained sidewalk could be added to one side of the street, but addition of sidewalk on the other side would be challenging because of irrigation issues. He said he would support a decision to not widen 700 West.

A majority of the Council indicated support for sidewalk improvements on 700 West (estimated \$450,000 cost).

Mr. Cooley explained upcoming projects: a new pump at Pump Station 3; Zone 4 sidewalk repairs; 1700 East storm drain improvement; Lone Peak Parkway widening (postponed by UDOT); 14600 South/Minuteman intersection improvements, Pioneer Road resurfacing; and 13400 South connection. Members of the Council expressed a desire to tour a pump station.

Report: Mowing Contract Update

Parks and Recreation Director Rhett Ogden thanked the Council for its support in approving a mowing contractor in the previous budget. He reported that the mowing contract approved by the Council freed up at least three full-time staff positions and allowed for the addition of a City Arborist position. He stated that the change was successful and improved staff morale.

Mr. Ogden also reported a change in the holiday lighting contractor for 2025. He stated that holiday lights would now be leased, resulting in cost savings and a reduction in staff time.

Council/Manager Reports

None

Business Session

1. **Call to Order by Mayor Troy K. Walker**

2. **Pledge of Allegiance by Mayor Walker**

3. **Oaths of Office**

Chief of Police Rich Ferguson recognized Ben Ricks and Zach Campbell for promotion to the rank of Master Officer. City Recorder Nicole Smedley administered the Oath of Office.

4. **Recognition**

Brigham City Police Chief Chad Reyes introduced Chief Jeff Simmons with Logan City and Brigham City Mayor DJ Bott. He expressed gratitude for assistance provided by Draper City in dealing with a tragedy that occurred in

Box Elder County. Chief Reyes and Chief Simmons presented Captain Pat Evans with a Medal of Merit for exceptional leadership and support demonstrated by him and the Draper City Police Department during planning and execution of funeral services for Sergeant Lee Sorensen and Officer Eric Estrada. Mayor Bott expressed gratitude for the support from the Draper Police Department and City Council.

Mayor Walker commended and expressed gratitude for Captain Evans. The Council took the opportunity for a photograph.

5. Public Comments

None

6. Consent Items

- 6.a Approve the November 18, 2025 City Council Meeting Minutes
- 6.b Approve Resolution #25-68 appointing Laura Fidler as an alternate member of the Draper City Planning Commission
- 6.c Approve Resolution #25-69 supporting America250 Utah and recognizing and approving the Draper Utah 250 Community Committee
- 6.d Approve Resolution #25-70 disposing of personal property held by the Police Department as lost or mislaid property in accordance with Utah Code Section 77-11d-101
- 6.e Approve Resolution #25-71 approving updated technical specifications and standard drawings for public infrastructure
- 6.f Approve Resolution #25-73 amending previously issued deeds to land that had not yet been recorded for the Warhorse Ranch Development Agreement

Councilmember Vawdrey moved to approve the Consent Agenda. Councilmember Johnson seconded the motion.

A roll call vote was taken. The motion passed unanimously.

	Yes	No	Absent
Councilmember Green			Excused
Councilmember Johnson	X		
Councilmember T. Lowery	X		
Councilmember F. Lowry	X		
Councilmember Vawdrey	X		

7. Items for Council Consideration

7.a Public Hearing: Ordinance #1692 amending the text of the Draper City General Plan to amend the Draper Frontrunner, Kimballs Lane, and Crescent View Station Area Plans, known as the amendment to the Draper Frontrunner, Kimballs Lane, and Crescent View Station Area Plans General Plan Amendment

Planner Todd Taylor reported that the FrontRunner (Vista), Kimballs Lane, and Crescent View Station Area Plans adopted by the Council on September 2, 2025, were certified by the Wasatch Front Regional Council on October 23, 2025. He stated that the next step in the process was certification by the Utah Transit Authority.

Mr. Taylor reported that following Council approval, the Utah Transit Authority requested revisions to figures in the Vista Station Area Plan to include a building at a specific location. He presented the proposed revisions for Council consideration.

Mayor Walker opened the public hearing, and closed the public hearing seeing no one come forward.

Councilmember F. Lowry moved to adopt Ordinance #1692. Councilmember Johnson seconded the motion.

A roll call vote was taken. The motion passed unanimously.

	Yes	No	Absent
Councilmember Green			Excused
Councilmember Johnson	X		
Councilmember T. Lowery	X		
Councilmember F. Lowry	X		
Councilmember Vawdrey	X		

7.b Public Hearing: Ordinance #1693 amending the text of the Land Use and Development Code (Title 9) and the Land Development Code (Title 17) of the Draper City Municipal Code relating to boundary adjustments, known as the City Initiated Boundary Adjustment Text Amendment

Mr. Taylor presented proposed text amendments to Titles 9 and 17 of City Code to comply with 2025 Senate Bill 104 regarding boundary adjustments. He stated that additional amendments were proposed for clarification.

Mayor Walker opened the public hearing, and closed the public hearing seeing no one come forward.

Councilmember Vawdrey moved to adopt Ordinance #1693. Councilmember Johnson seconded the motion.

A roll call vote was taken. The motion passed unanimously.

	Yes	No	Absent
Councilmember Green			Excused
Councilmember Johnson	X		
Councilmember T. Lowery	X		
Councilmember F. Lowry	X		
Councilmember Vawdrey	X		

7.c Public Hearing: Ordinance #1694 amending the Draper City General Plan to add the Water Use and Preservation Element as Chapter 7, known as the Water Use and Preservation Element General Plan Amendment

Mr. Taylor explained that 2022 Senate Bill 110 required adoption of a Water Use and Preservation Element by December 31, 2025. He stated that, as part of the drafting process, a stakeholder group was formed consisting of Planning, Engineering, Public Works, WaterPro, and the Utah Division of Wildlife Resources. He reported that work sessions were held with the Planning Commission and the City Council.

Mr. Taylor presented the proposed Water Use and Preservation Element as Chapter 7 of the General Plan and stated that the existing Chapter 7 would be renumbered as Chapter 8. He reported that the proposed Chapter 7 included six goals and 17 strategies.

Goals:

1. Strengthen the City's water conservation efforts through dedicated leadership, support, and collaboration.
2. Develop additional citywide policies and ordinances that enhance water conservation and efficiency through irrigation restrictions for existing developments.

3. Reduce water demand through water-conserving development patterns that increase development density through mechanisms such as modified lot size and configuration.
4. Increase public awareness of water conservation through educational programming. Consider applying for the Jordan Valley Water Conservancy District (JVWCD) Member Agency Grant to receive funding.
5. Increase public awareness of water conservation through the City's website, social media, and other digital tools.
6. Lead by example and increase water efficiency throughout Draper City's public landscapes.

Mr. Taylor answered questions about further development of the goals for implementation. Councilmember Johnson asked if non-residential, non-commercial water use (e.g., churches, schools) would be addressed. Community Development Director Jen Jastremsky responded the City was limited in what churches could be required to do, and said she did not think the City could require churches to fully comply with Code.

Mayor Walker opened the public hearing, and closed the public hearing seeing no one come forward.

Councilmember Johnson moved to adopt Ordinance #1694. Councilmember Vawdrey seconded the motion.

A roll call vote was taken. The motion passed unanimously.

	Yes	No	Absent
Councilmember Green			Excused
Councilmember Johnson	X		
Councilmember T. Lowery	X		
Councilmember F. Lowry	X		
Councilmember Vawdrey	X		

7.d Public Hearing #25-72 adopting a Water Conservation Plan update for Draper City

Engineering Manager Brien Maxfield presented the proposed 2025 Water Conservation Plan, required by the State to be updated every five years.

Mayor Walker opened the public hearing, and closed the public hearing seeing no one come forward.

Councilmember Johnson moved to approve Resolution #25-72. Councilmember T. Lowery seconded the motion.

A roll call vote was taken. The motion passed unanimously.

	Yes	No	Absent
Councilmember Green			Excused
Councilmember Johnson	X		
Councilmember T. Lowery	X		
Councilmember F. Lowry	X		
Councilmember Vawdrey	X		

7.e Public Hearing: Ordinances #1686 and Ordinance #1687 amending the official Zoning Map of Draper City for approximately 1.38 acres of property located at 11730 S. 700 West, known as the Huber Land Use Map and Zoning Map Amendments

Planner Maryann Pickering presented the subject property on a map. She stated that the current General Plan Land Use Map designation for the property was Residential Low-Medium Density and that the current zoning was RA1 (one-acre minimum). She reported that the applicant requested a Land Use Map amendment to Residential Medium Density and a zone change to R3 (one-third acre minimum) for approximately one-third of the property. She explained that the area proposed for the change would eventually be added to the subdivision to the west, with the remaining portion of the lot continuing to comply with the RA1 zoning requirements.

Tom Spencer, the applicant, stated that one approximately 19,000-square-foot lot would eventually be added to the Fox Landing Subdivision, with access from Osborne Vista Way.

Mayor Walker opened the public hearing, and closed the public hearing seeing no one come forward.

Councilmember F. Lowry moved to adopt Ordinance #1686 and Ordinance #1687. Councilmember T. Lowery seconded the motion.

A roll call vote was taken. The motion passed unanimously.

	Yes	No	Absent
Councilmember Green			Excused
Councilmember Johnson	X		
Councilmember T. Lowery	X		
Councilmember F. Lowry	X		
Councilmember Vawdrey	X		

- 7.f Public Hearing: Ordinances #1688 and #1689 amending the Official Land Use Map and an Ordinance amending the official Zoning Map of Draper City for approximately 17.88 acres of property 13782 S. 300 E, known as the Bangerter Crossroads Land Use Map and Zoning Map Amendments

This item was continued to a date uncertain.

- 7.g Public Hearing: Ordinances #1690 and #1691 amending the Official Land Use Map and amending the official Zoning Map of Draper City for approximately 1.44 acres of property located at approximately 231 E. 13800 S, known as the Openshaw Draper 138 Land Use Map and Zoning Map Amendments

This item was continued to a date uncertain.

8. Adjournment
Councilmember T. Lowery moved to adjourn the meeting. Councilmember Johnson seconded the motion, which passed by unanimous voice vote.

The meeting adjourned at 7:45 pm.

MEMO



To: City Council
From: Nicole Smedley, City Recorder
Date: 2025-12-16
Re: Approve Resolution #25-76

Comments:

Pursuant to Utah Code § 63A-19, a governmental entity is required to initiate a data privacy program before December 31, 2025. Resolution No. 25-76 formally adopts the Data Privacy Policy as the official policy governing the City's handling of personal data. The policy applies to all departments, employees, officials, and contractors. Implementation will occur through existing departmental procedures, required training, and coordination with IT, Records, and Legal functions. No direct fiscal impact is anticipated.

ATTACHMENTS:

[R-25-76 Data Privacy Policy.pdf](#)

RESOLUTION 25-76

A RESOLUTION OF THE DRAPER CITY COUNCIL ADOPTING A DATA PRIVACY POLICY

WHEREAS, Draper City collects, maintains, and processes personal data in the course of providing municipal services to residents, businesses, and the general public; and

WHEREAS, the State of Utah has established a statewide data privacy framework recognizing an individual's inherent expectation of privacy in personal data provided to governmental entities; and

WHEREAS, Draper City seeks to ensure that its collection, use, storage, sharing, and disposal of personal data are conducted responsibly, lawfully, and in a manner consistent with state policy and best practices; and

WHEREAS, adopting a formal data privacy policy supports Draper City's obligations to Utah Code § 63A-19-401.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Adoption. The Draper City data privacy policy, attached hereto as Exhibit A and incorporated by reference, is hereby adopted as the official policy governing the city's collection, use, retention, safeguarding, sharing, and disposal of personal data.

Section 2. Applicability. The data privacy policy shall apply to all city departments, programs, officials, employees, and contractors who collect, maintain, process, access, or store personal data on behalf of Draper City.

Section 3. Effective Date. This resolution shall become effective immediately upon passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON
THE 16TH DAY OF DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

EXHIBIT "A"

(Remainder of page intentionally left blank)



DRAPER CITY

1020 Pioneer Road Draper, UT 84020

Draper City Privacy Program Policy

Policy #

Effective Date: January 1, 2026

Approved By: Mike Barker, City Manager

1. Purpose

This policy establishes Draper City's privacy program, including its policies, practices, and procedures for processing personal data in accordance with the Utah Government Privacy Act, [Utah Code § 63A-19-401\(2\)\(a\)](#), and the annual privacy reporting obligation under [Utah Code § 63A-19-401.3](#). It aligns with records management and data governance requirements under the Government Records Access Management Act (GRAMA, [Utah Code § 63G-2](#)) and the Division of Archives and Records Services (DARS, [Utah Code § 63A-12](#)). Where applicable, this policy references more specific policies, procedures, or guidance developed by the City.

2. Guiding Principles

This policy consolidates privacy practices, defines governance roles and responsibilities, and ensures compliance with generally applicable records management, data protection, and data privacy obligations. It safeguards individual privacy rights, promotes transparency, maintains the integrity and security of personal data, and ensures accountability across the City. This policy guides the City's alignment with the State Data Privacy Policy under [Utah Code § 63A-19-102](#).

3. Scope

This policy applies to all City employees who manage, create, or maintain records, or who access personal data in the course of their job duties. This policy also applies to all City contractors who process or access personal data under an agreement with the City, pursuant to [Utah Code § 63A-19-401.4](#).

- *Processing activities implemented on or after May 1, 2024, must be compliant with this policy prior to implementation. Each Department must develop a strategy to*

*inventory and bring pre-existing activities into compliance with this policy by January 1, 2027.*¹

4. Definitions:

"Classification," "classify," and derivative forms mean determining whether a record series, record, or information within a record is public, private, controlled, protected, or exempt from disclosure under [Subsection § 63G-2-201\(3\)\(b\)](#).²

"Cookie" means "Technology that records a user's information and activity when the user accesses websites. Cookies are used by website owners, third parties, and sometimes threat actors to gather user data."³

"Data breach" means— the unauthorized access, acquisition, disclosure, loss of access, or destruction of personal data held by a governmental entity, unless the governmental entity concludes, according to standards established by the Cyber Center, that there is a low probability that personal data has been compromised."⁴

"Designation," "designate," and their derivative forms mean indicating, based on a governmental entity's familiarity with a record series or based on a governmental entity's review of a reasonable sample of a record series, the primary classification that a majority of records in a record series would be given if classified and the classification that other records typically present in the record series would be given if classified.⁵

"Device fingerprinting" means collecting attributes of a user's device configurations to create a trackable profile for the device.

"Individual" means a human being.⁶

¹ [Utah Code § 63A-19-401\(2\)\(e\)](#).

² [Utah Code § 63G-2-103\(3\)](#)

³ Cybersecurity & Infrastructure Security Agency, Project Upskill Glossary. Last visited 1/14/2025 at: <https://www.cisa.gov/resources-tools/resources/project-upskill-glossary>

⁴ Utah Code § 63A-19-101(4)

⁵ [Utah Code § 63G-2-103\(7\)](#)

⁶ [Utah Code § 63G-2-103\(13\)](#)

"Key logger" means "a program designed to record which keys are pressed on a computer keyboard."⁷

"Personal data" means information that is linked or can be reasonably linked to an identified individual or an identifiable individual.⁸

"Processing activity" means any operation or set of operations performed on personal data, including collection, recording, organization, structuring, storage, adaptation, alteration, access, retrieval, consultation, use, disclosure by transmission, transfer, dissemination, alignment, combination, restriction, erasure, or destruction.⁹

"Record" means the same as that term is defined at [Utah Code § 63G-2-103\(25\)](#).¹⁰

"Record series" means a group of records that may be treated as a unit for purposes of designation, description, management, or disposition.¹¹

"Records officer" means the individual appointed by the chief administrative officer of each governmental entity, or the political subdivision to work with state archives in the care, maintenance, scheduling, designation, classification, disposal, and preservation of records.¹²

"Schedule," "scheduling," and derivative forms mean specifying the length of time each record series must be retained by a governmental entity for administrative, legal, fiscal, or historical purposes, and when each record series should be transferred to the state archives or destroyed.¹³

⁷ National Institute of Standards and Technology, Computer Security Resource Center, Glossary. Last visited 1/14/2025, at:

https://csrc.nist.gov/glossary/term/key_logger#:~:text=Definitions%3A,NIST%20SP%20800%2D82r3

⁸ [Utah Code § 63A-19-101\(13\)](#)

⁹ [Utah Code § 63A-19-101\(14\)](#)

¹⁰ Only the citation to the definition of "record" is provided here due to the length of the definition.

¹¹ [Utah Code § 63G-2-103\(26\)](#)

¹² [Utah Code § 63G-2-103\(27\)](#)

¹³ [Utah Code § 63G-2-103\(28\)](#)

5. Governance

5.1. Chief Administrative Officer (CAO)

- A. The City Manager is hereby designated as the chief administrative officer (CAO) of the City, responsible for overseeing and fulfilling the duties outlined in [Utah Code § 63A-12-103](#).
- B. The City Manager is authorized to designate and may assign these duties outlined in [Utah Code § 63A-12-103](#) to one or more additional individuals to serve as supplemental or department-specific CAOs.
- C. All CAO designations shall be reported to the Utah Division of Archives and Records Services (Archives) within 30 days of the designation.
- D. If duties are divided among multiple CAOs, such specification should be reported to Archives along with the designation.
- E. CAO designations and assigned responsibilities shall be reviewed and, if necessary, updated annually by the City Manager.

5.2. Appointed Records Officers (AROs)

- A. Each designated CAO shall appoint one or more individuals to serve as records officers to serve as AROs and work with Archives and the Office of Data Privacy in the care, maintenance, scheduling, disposal, classification, designation, access, privacy, and preservation of records.¹⁴
- B. A CAO may assign these duties to one officer or distribute them among several, as the CAO deems appropriate.
- C. If duties are divided among multiple officers, such specification should be reported to Archives along with the appointment.

¹⁴ [Utah Code § 63A-12-103\(2\)](#)

6. Records Series

6.1. Records and Records Series

- A. Each Department of the City shall create and maintain records and records series in accordance with DARS, and GRAMA.
- B. Each Department shall appropriately designate and classify records and records series in accordance with DARS and GRAMA.

7. Awareness & Training

7.1. Departmental Data Privacy Training

- A. The responsible CAO shall ensure that all employees with access to personal data complete a data privacy training program within 30 days of starting employment and at least annually thereafter.
- B. The Draper City IT Department is responsible for monitoring employee completion of this training.

7.2. Department-Specific Training

- A. City Departments may develop and require additional Department-specific privacy training tailored to their unique needs, practices, and requirements.

7.3. Appointed Records Officer Training and Certification

- A. CAO(s) shall ensure that all appointed records officers (AROs) annually complete online GRAMA training and obtain certification from Archives in accordance with [Utah Code § 63A-12-110](#).
- B. GRAMA Access AROs: AROs handling GRAMA transparency responsibilities must complete GRAMA transparency training and obtain certification from Archives in accordance with [Utah Code § 63A-12-110](#).
- C. Records Management and Privacy AROs: AROs specializing in records management or privacy must complete both records management and GRAMA transparency training and obtain the corresponding certifications.

8. Identify

8.1. Inventorying

A. The Draper City IT Director shall maintain a comprehensive inventory of:

- a. All Data Processing Systems that may process state or federal data owned or managed by the City, using the standard process that DTS provides.¹⁵
- b. All records and record series containing personal data, including the types of personal data included in the records and record series.¹⁶
- c. All processing activities, including:
 - i. Non-compliant processing activities (under the GDPR) implemented prior to May 1, 2024, with a strategy to achieve compliance by January 1, 2027;¹⁷ and
 - ii. All processing activities implemented on or after May 1, 2024, with documentation confirming compliance.

9. Transparency

9.1. Website Privacy Policy

- A. The CAO shall create and maintain website privacy policies in accordance with [Utah Code § 63D-2-103](#) and [Utah Admin. Code R895-8](#).
- B. The CAO shall ensure that no personal data is collected via City website unless the website complies with [Utah Code § 63D-2-103\(2\)](#).
- C. The CAO shall ensure that all Department websites include a privacy policy statement disclosing:
 - a. The identity of the governmental website operator;
 - b. How the operator may be contacted;
 - c. The personal data collected;

¹⁵ DTS [Information Security Policy 5000-0002](#), section 2.4.2.1

¹⁶ Utah Code §§ [63A-12-104](#) and [63A-12-115](#)

¹⁷ [Utah Code § 63A-19-401](#)

- d. The practices related to disclosure of collected personal data
- e. The procedures, if any, for a user to request:
 - i. Access to the user's personal data; and
 - ii. Correction of the user's personal data; and
- f. A general description of security measures protecting user personal data from unintended disclosure.

9.2. Privacy Notice

- A. Employees shall collect personal data from individuals only if, on the collection date, the City has provided a privacy notice complying with Utah Code §§ [63G-2-601\(2\)](#), [63A-19-402](#), [63D-2-103\(2\)-\(3\)](#), or other applicable law.
- B. The privacy notice shall generally include¹⁸:
 - a. the record series into which the personal data will be placed;
 - b. the reasons the individual is asked to provide the information;
 - c. the intended purposes and uses of the information;
 - d. the consequences of refusing to provide the information; and
 - e. the classes of persons and entities that currently:
 - i. share the information with the City; or
 - ii. receive the information from the City on a regular or contractual basis.

10. Individual Requests

- A. Each CAO shall ensure that processes and procedures are in place to comply with applicable governing law for handling:
 - a. Individual requests to access their personal data;
 - b. Individual requests to amend or correct their personal data;
 - c. Individual requests for an explanation of the purposes and uses of their personal data; and
 - d. At-risk governmental employee requests to restrict access to their personal data.
- B. CAO(s) shall ensure processes exist for public GRAMA requests to inspect or copy the City's records that are not individual personal data access requests.

¹⁸ Utah Code §§ [63G-2-601\(2\)](#) and [63A-19-402](#).

- C. CAO(s) shall ensure employees follow established GRAMA business practices.¹⁹

11. Processing

11.1. Minimum Data Necessary

- A. CAO(s) shall ensure that all programs obtain and process only the minimum personal data reasonably necessary to achieve a specified purpose.²⁰
- B. CAO(s) shall ensure regular review of data collection practices to confirm compliance with data minimization.

11.2. Record and Data Sharing or Selling Policy

- A. The City shall share or disclose personal data only when there authorized by law. The sale of personal data is prohibited unless required by law.
- B. Data sharing must comply with GRAMA or other applicable law and may include sharing with governmental entities, contractors, private providers, or researchers. Compliance with GRAMA or other governing law is contingent upon the purpose of the sharing, the parties involved, and the nature of the records.
- C. Each CAO shall report annually to the Chief Privacy Officer on personal data sharing and selling activities, including data types, legal basis, and recipient entities.
- D. All contracts involving personal data must include appropriate privacy protections. Written data-sharing agreements are recommended to ensure compliance.

11.3. Retention and Disposition of Records Containing Personal Data

- A. Employees shall maintain, archive, and dispose of records—including all personal data—in accordance with an approved retention schedule.²¹
- B. Employees shall comply with all other applicable laws or regulations governing retention or disposition of specific personal data held by the City or its operating units or programs.

¹⁹ Dept. of Government Operations Internal Policy 01. Code of Conduct. Section 3.2 Managing Records and Information.

²⁰ [Utah Code § 63A-19-401\(2\)\(c\)](#).

²¹ Utah Code §§ [63G-2-604\(1\)\(b\)](#) and [63A-19-404](#).

12. Information Security

12.1. Incident Response

- A. The City adopts the **DTS Cybersecurity Incident Response Plan** to manage security incidents, data breaches, and privacy violations.
- B. Employees shall report all suspected security incidents, including non-IT incidents such as unauthorized access to physical records, to the **Enterprise Information Security Office (EISO)**. Each CAO is responsible for developing and implementing any additional Department-specific response measures for non-IT incidents .
- C. The CAO of each Department shall ensure compliance with all other applicable laws or regulations related to incident response and breach notification for specific personal data held by the City.

12.2. Breach Notification

- A. The City shall notify affected individuals or their legal guardians of a data breach in accordance with [Utah Code § 63A-19-406](#).²²
- B. The City shall notify the Cyber Center and the state attorney general of a data breach affecting 500 or more individuals, pursuant to [Utah Code § 63A-19-405](#). Departments that experience a data breach affecting fewer than 500 individuals must create and file an internal incident report in accordance with [Utah Code § 63A-19-405\(5\)](#). These requirements are in addition to any other reporting requirement that the Department may be subject to.
- C. The CAO of each Department that is subject to other breach notification requirements, such as those required for compliance with federal regulations, laws or other governing requirements (e.g., HIPAA or 42 CFR Part 2) are currently required to create and maintain their own Department specific breach notification policies and procedures that meet the requirements of the applicable governing laws and regulations.

13. Surveillance

²² [Utah Code § 63A-19-401\(2\)\(b\)](#).

13.1. Covert Surveillance

- A. Employees shall not establish, maintain, or use undisclosed or covert surveillance of individuals unless permitted by law.²³
- B. Employees must consult with appropriate leadership, including legal counsel where relevant, before engaging in any activity that constitute surveillance.
- C. The CAO of each Department shall ensure that surveillance activities are documented.

13.2. Cookies, Fingerprinting, Key Loggers, and Tracking Technologies

The City is committed to transparency and privacy protection regarding tracking technologies on its website and digital services, including cookies, device fingerprinting, key loggers, and other similar methods.

A. Cookies

The use of cookies on City websites and digital services must comply with applicable privacy and security policies. Cookies must be limited to essential operational purposes. Any use of tracking or third-party cookies for analytics or similar functions must be clearly disclosed, with an option to consent where required by law.

B. Device Fingerprinting

Device fingerprinting is prohibited unless explicitly authorized by the CAO, with legal basis and justification documented in a PIA. Purpose and extent must be clearly defined, documented, and disclosed in a compliant privacy notice or statement.

C. Key Loggers

Key loggers are prohibited without specific CAO authorization and documented justification in the activity's PIA. Key loggers may be used only for a clearly defined operational need that meets security standards and legal requirements, including user notice where required.

²³ [Utah Code § 63A-19-401\(2\)\(f\)](#).

D. Other Tracking Technologies

Use of web beacons, pixel tags, or similar tools is prohibited unless explicitly authorized by the CAO, with legal basis documented in a PIA. Disclosure must be included in user-facing privacy statements, with consent obtained when required by law.

E. User Notification and Consent

Users must be informed about tracking technologies via a clear website privacy statement explaining data collected, purpose, and preferential management options. Updates to tracking practices must be promptly reflected in the privacy statement.

F. Data Security and Retention

Data collected through authorized tracking technologies must be securely stored with access limited to authorized personnel. Retention must align with approved schedules and be limited to the defined operational purpose.

14. Related Documents

- Department of Government Operations Internal Policy 01. Code of Conduct. Section 3.2 Managing Records and Information.
- DTS Cybersecurity Incident Response Plan
- Dept. of Government Operations Internal Policy 01.
- Draper City Department policy on handling public records requests under GRAMA
- Draper City Incident Response Plan v2 12.9.25

References/Authority:

Division of Archives and Records Services (DARS) at [Utah Code § 63A-12-100 et seq.](#); Government Data Privacy Act (GDPA) at [Utah Code § 63A-19-101 et seq.](#);

Government Records Access and Management Act (GRAMA) at [Utah Code § 63G-2-101 et seq.](#); and [Management of Records and Access to Records at [Utah Administrative Code R13-2.](#)]

[Division of Technology Services (DTS) [Information Security Policy 5000-0002](#)]

MEMO



To: City Council
From: Kellie Challburg, Assistant City Manager
Date: 2025-12-16
Re: Approve Resolution #25-77

Comments:

ATTACHMENTS:

[Resolution #25-77 HPC Reappointment.pdf](#)

RESOLUTION NO. 25-77

A RESOLUTION OF THE DRAPER CITY COUNCIL REAPPOINTING DAVID HALES AND JORDAN PUTNAM AS MEMBERS OF THE DRAPER CITY HISTORIC PRESERVATION COMMISSION

WHEREAS, the Draper City Council established the Draper City Historic Preservation Commission for the purpose of preserving the historical heritage of the city; and

WHEREAS, the Council recognizes the importance of preserving the history of the community for future residents; and

WHEREAS, David Hales and Jordan Putnam have expressed a willingness to continue serving as members of the Draper City Historic Preservation Commission; and

WHEREAS, the Mayor desires to reappoint and the City Council hereby consents to the reappointments of David Hales and Jordan Putnam to serve new terms on the Draper City Historic Preservation Commission.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Reappointments. The following individuals are hereby reappointed to serve as members of the Draper City Historic Preservation Commission according to the laws, ordinances, and regulations governing the Commission and its members, for the terms specified below:

- David Hales: December 16, 2025 – December 31, 2029
- Jordan Putnam: December 16, 2025 – December 31, 2029

Section 2. Severability. If any section, part, or provision of this resolution is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Resolution, and all sections, parts, and provisions shall be severable.

Section 3. Effective Date. This resolution shall become effective immediately upon its passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THIS 16TH DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

MEMO



To: City Council

From: Kellie Challburg, Assistant City Manager

Date: 2025-12-16

Re: Approve Resolution #25-78

Comments:

ATTACHMENTS:

[R-25-78, PTRC Reappointment.pdf](#)

RESOLUTION NO. 25-78

A RESOLUTION OF THE DRAPER CITY COUNCIL
REAPPOINTING JOHN MAACK AS A MEMBER OF THE
DRAPER CITY PARKS, TRAILS AND RECREATION COMMITTEE

WHEREAS, the City is authorized to establish boards, commissions and committees within the City as deemed appropriate by the City Council; and

WHEREAS, the City has created a Parks, Trails and Recreation Committee within the City for the purpose of providing a framework for the management of City parks, trails and recreation assets; and

WHEREAS, the duties of this Committee are to recommend and monitor the establishment of facilities, programs and policies to meet the recreational and aesthetic needs of the citizens and Draper City; and

WHEREAS, the term served by John Maack has expired and he has expressed his desire to continue service as a board member.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Appointment. John Maack is hereby appointed to serve as a member of the Draper City Parks, Trails and Recreation Committee according to the laws, ordinances and regulations governing the Committee and its members for the term of December 16, 2025 through December 31, 2029.

Section 2. Severability. If any section, part, or provision of this resolution is held invalid, or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Resolution, and all sections, parts, and provisions of this Resolution shall be severable.

Section 3. Effective Date. This resolution shall become effective immediately upon its passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH,
ON THIS THE 16TH DAY OF DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:	YES	NO	ABSENT
Councilmember Green	_____	_____	_____
Councilmember Johnson	_____	_____	_____
Councilmember T. Lowery	_____	_____	_____
Councilmember F. Lowry	_____	_____	_____
Councilmember Vawdrey	_____	_____	_____
Mayor Walker	_____	_____	_____

MEMO



To: City Council
From: Nicole Smedley, City Recorder
Date: 2025-12-16
Re: Approve Resolution #25-79

Comments:

ATTACHMENTS:

[R-25-79, 2026 Annual Meeting Schedule.pdf](#)

RESOLUTION NO. 25-79

A RESOLUTION OF THE DRAPER CITY COUNCIL ESTABLISHING THE REGULAR MEETING SCHEDULE FOR THE CITY COUNCIL, PLANNING COMMISSION, SUBORDINATE BODIES, AND COMMITTEES FOR THE YEAR 2026

WHEREAS, the Draper City Council is required to establish an annual schedule of regular meetings for the City Council; and

WHEREAS, pursuant to Draper City Code §§ 3-5-010 and 3-5-020, the City Council may create subordinate bodies and committees,

WHEREAS, the City Council finds it appropriate and in the public interest to adopt the 2026 regular meeting schedules for the City Council, Planning Commission, subordinate bodies, and committees, as included in Exhibit A.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Regular Meetings. The regular meeting schedules for the Draper City Council, Planning Commission, subordinate bodies, and committees for the 2026 calendar year are hereby adopted as set forth in Exhibit A. The annual meeting schedule may be amended as necessary in accordance with applicable law.

Section 2. Severability. If any section, part, or provision of this resolution is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this resolution, and all sections, parts, and provisions of this resolution shall be severable.

Section 3. Effective Date. This resolution shall become effective immediately upon its passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THIS 16TH DAY OF DECEMBER, 2025.

ATTEST:

DRAPER CITY

Nicole Smedley, City Recorder

Troy K. Walker, Mayor

VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

2026 Meeting Schedule

Meetings will be held at Draper City Hall 1020 E. Pioneer Road Draper, Utah

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
CITY COUNCIL	1st Tuesday	6	3	3	7	5	2	7	4	1	6	3	1
Study Session at 5:30 pm, Business Session at 7 pm	3rd Tuesday	20	17	17	21	19	16	21	18	15	20	17	15
PLANNING COMMISSION	2nd Thursday	8	12	12	9	14	11	9	13	10	8	12	10
Business Meeting at 6:30 pm	4th Thursday	22	26	26	23	28	25	30	27	24	22	19	17
COMMUNITY ENGAGEMENT	3rd Wednesday	21	18	18	15	none	17	none	19	none	21	18	none
7:30 PM													
HISTORIC PRESERVATION	3rd Wednesday	21	18	18	15	20	17	none	19	16	21	18	none
6:00 PM													
PARKS, TRAILS & RECREATION	1st Wednesday	7	none	4	none	6	none	1	none	2	7	4	none
7:00 PM													
TREE COMMITTEE	1st Tuesday	none	3	3	7	5	none	none	none	1	6	3	none
8:00 AM													

Audit Committee	Meetings as needed
Community Reinvestment Agency	Meetings as needed
Municipal Building Authority	Meetings as needed
Traverse Ridge Special Service District Administrative	
Control Board (TRSSD)	Meetings as needed
Truth in Taxation Public Hearing if needed - August 12, 2026	

****Dates in red have been changed or may be changed due to holidays or events.**

****Meeting Dates and locations may be changed as needed.**

Approved on 12-16-2025 by Resolution #25-79

MEMO



To: City Council
From: Kellie Challburg, Assistant City Manager
Date: 2025-12-16
Re: Approve Resolution #25-80

Comments:

ATTACHMENTS:

[R-25-80, 2026 Council Assignments.pdf](#)

RESOLUTION NO. 25-80

A RESOLUTION OF THE DRAPER CITY COUNCIL APPROVING THE
CITY COUNCIL ASSIGNMENTS FOR 2026

WHEREAS, the City Council reviews and updates the Council Assignments on an annual basis; and

WHEREAS, it is the desire of the City Council to approve the Council Assignments for 2026.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Approval. The Draper City Council hereby approves the Council Assignments for 2026 hereto attached as Exhibit A.

Section 2. Severability. If any section, part, or provision of this resolution is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this resolution, and all sections, parts, and provisions of this Resolution shall be severable.

Section 3. Effective Date. This resolution shall become effective immediately upon its passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, THE 16th DAY OF DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:	YES	NO	ABSENT
Councilmember Green	_____	_____	_____
Councilmember Johnson	_____	_____	_____
Councilmember T. Lowery	_____	_____	_____
Councilmember F. Lowry	_____	_____	_____
Councilmember Vawdrey	_____	_____	_____
Mayor Walker	_____	_____	_____

	Mayor Walker	Mike Green	Bryn Heather Johnson	Tasha Lowery	Kathryn Dahlin	Fred Lowry	
Draper City Council Assignments 2026							Exhibit A
City Boards/Commissions							Meeting Location and Times
Tree Committee			X				1st Tuesday of every month at City Hall at 8:00 am (Administration Conference Room)
Parks, Trails and Recreation Committee						X	1st Wednesday of every month at City Hall at 7:00 pm (Administration Conference Room)
Historic Preservation Commission				X			3rd Wednesday of every month at City Hall at 6:00 pm (Administration Conference Room)
Community Engagement & Events Committee					X		3rd Wednesday of every month at City Hall at 7:30 pm (Administration Conference Room)
Audit Committee				X			Meets as needed.
City Agencies:							
Municipal Building Authority President	X						Meets as needed- same time as Council Meeting
Municipal Building Authority Vice President			X				Meets as needed- same time as Council Meeting
Community Reinvestment Agency Chair	X						Meets as needed- same time as Council Meeting
Community Reinvestment Agency Vice Chair			X				Meets as needed- same time as Council Meeting
Special Assignments:							
Association of Municipal Councils					X		Meets the 2nd Tuesday at noon of every month at Murray City Hall. (similar to COG or COM)
South Valley Chamber				X			Meets as needed. Support the Chamber and attend lunches/events when possible.
Mountainland Association of Governments-MAG					X		Meets the 1st Thursday of the month at 5:30 pm- Utah County location
Legislative Policy Committee (LPC)			X		X		Every Monday at noon during the Legislative session, various Mondays throughout the year. Mayor, City Manager plus two council members while Mayor is part of the board.
Canyons Education Foundation						X	Meets every month on the 3rd Thursday at 7:30 am- Canyons District Office 9361 South 300 East
Mayor Pro Tem			X				
Emergency Preparedness						X	
Senior Center					X		
CTAA South District Committee				X			
Jordan River Commission			X				Staff representative is Rick Anton
America 250 Committee						X	Meet monthly January-July to plan activities for America 250
Mayor Assignments:							
Utah Transit Authority Board	X						
S.L. County Council of Governments (COG)	X						
The Conference of Mayors (COM)	X						
Trans Com (Mayor Appointed through COG)	X						
JPAC (Mayor appointed through COG)	X						
WFRC- ATC (Mayor appointed through COG)	X						
WFRC- RGC (Mayor appointed through COG)	X						
POM Development Commission	X						
POM State Land Development Authority	X						

MEMO



To: City Council
From: Kellie Challburg, Assistant City Manager
Date: 2025-12-16
Re: Approve Resolution #25-81

Comments:

ATTACHMENTS:

[R-25-81, Mayor Pro Tempore.pdf](#)

RESOLUTION NO. 25-81

A RESOLUTION OF THE DRAPER CITY COUNCIL ELECTING BRYN HEATHER JOHNSON TO SERVE AS THE MAYOR PRO TEMPORE FOR THE YEAR 2026

WHEREAS, Draper City Municipal Code § 2-2-020 (D) provides the election of a Mayor Pro Tempore to preside in the mayor's absence; and

WHEREAS, the City Council desires to elect a Mayor Pro Tempore to act in the absence of the mayor.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Election. The Draper City Council has elected Bryn Heather Johnson to serve as the Mayor Pro Tempore for the year 2026.

Section 2. Severability. If any section, part, or provision of this resolution is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this resolution, and all sections, parts, and provisions of this resolution shall be severable.

Section 3. Effective Date. This resolution shall become effective immediately upon its passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE 16TH DAY OF DECEMBER 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

MEMO



To: City Council
From: Todd A. Draper, AICP
Date: 2025-12-16
Re: Public Hearing: Ordinances #1688 and #1689

Comments:

This application is a request for approval of a Land Use Map Amendment and a Zoning Map Amendment for approximately 17.88 acres located on the west side of Bangerter Highway, north of 13800 South, and west of 300 East, at approximately 13782 S. 300 E. The property is currently zoned RA1 (Residential Agricultural). The applicant is requesting that the Land Use Map and Zoning Map Amendments be approved to allow for the future development of the overall site as a commercial center.

The Planning Commission at their November 20, 2025 meeting forwarded negative recommendations for both applications on unanimous 4-0 votes.

Land Use Map Amendment

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will not adversely affect adjacent property.
4. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The proposed land use map amendment complies with DCMC Section 9-2-020(F).
6. The legislative body may adopt any amendment to the general plan land use map that the legislative body considers appropriate.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject

property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

5. The legislative body may reject any amendment to the general plan land use map that the legislative body considers appropriate.

Zoning Map Amendment

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment is consistent with the standards of any applicable overlay zone.
4. The proposed map amendment will not adversely affect adjacent property.
5. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

ATTACHMENTS:

[Ordinance 1688 - LUMA v3 CLEAN.pdf](#)

ATTACHMENTS:

[Ordinance 1689 - ZMA v3 CLEAN.pdf](#)

ATTACHMENTS:

[Bangerter Crossroads LUMA and ZMA PC Staff Report.pdf](#)

ATTACHMENTS:

[PC-Public Comments.pdf](#)

ATTACHMENTS:

[CC-Public Comment.pdf](#)

ORDINANCE NO. 1688

AN ORDINANCE AMENDING THE OFFICIAL LAND USE MAP OF DRAPER CITY FOR APPROXIMATELY 17.88 ACRES LOCATED AT APPROXIMATELY 13782 SOUTH 300 EAST (BANGERTER CROSSROADS) FROM RESIDENTIAL MEDIUM DENSITY, RESIDENTIAL LOW/MEDIUM DENSITY, AND OFFICE SERVICE TO REGIONAL COMMERCIAL, OTHERWISE KNOWN AS THE BANGERTER CROSSROADS LAND USE MAP AMENDMENT.

WHEREAS, pursuant to State law, Draper City has adopted a General Plan and Land Use Map to guide future growth and development within the City; and

WHEREAS, from time to time it is necessary to review and amend the Land Use Map to keep pace with development within the City and to ensure the provision of a variety of economic uses; and

WHEREAS, the City Council finds the redesignation of the subject property to Regional Commercial is consistent with the General Plan provided that appropriate infrastructure improvements, traffic mitigation measures, funding commitments, and other public benefits are secured through a development agreement; and

WHEREAS, the City Council expects the applicant to submit, process, and obtain City Council approval of a development agreement that addresses traffic impacts, infrastructure funding and construction, phasing, and other conditions prior to any development on the property; and

WHEREAS, the proposed Land Use Map change set forth herein has been reviewed by the Planning Commission and the City Council, and all appropriate public hearings have been held in accordance with Utah law to obtain public input regarding the proposed revisions to the Land Use Map; and

WHEREAS, the Planning Commission has reviewed and made a recommendation to the City Council concerning the proposed amendment to the official Land Use Map of Draper City, and the City Council has found the proposed land use change, subject to the contingency and effectiveness provisions herein, to be in the best interest of the health, safety, and welfare of the citizens of Draper City and consistent with the City's General Plan

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH:

Section 1. Findings and Contingent Approval. The City Council finds that the amendment of the official Land Use Map as described in Section 2 below is in the best

interest of the health, safety, and welfare of the citizens of Draper City and is consistent with the City's General Plan, provided that appropriate infrastructure improvements, traffic mitigation measures, funding commitments, and other public benefits are secured through a development agreement. The approval granted by this ordinance is contingent upon the conditions set forth in Section 3 and is not intended to presently create any vested rights in the applicant.

Section 2. Land Use Map Amendment. Subject to the contingency and effectiveness provisions in Section 3, the official Land Use Map of Draper City is hereby amended to change the land use designation of the following described real property located at approximately 13782 South 300 East within Draper City, Salt Lake County, State of Utah, (containing approximately 17.88 acres), previously designated as Residential Medium Density, Residential Low/Medium Density, and Office Service as shown on the Draper City Land Use Map, as depicted in Exhibit "A" hereto, to the Regional Commercial land use designation:

Beginning at a point on the northerly right-of-way line of 13800 South Street, said point being South 89°48'02" West 373.33 feet along the section line and North 64.64 feet from the Center of Section 6, Township 4 South, Range 1 East, Salt Lake Base and Meridian (said Center being South 2,630.21 feet from the North Quarter corner of said Section 6); and running

thence North 87°18'03" West 85.23 feet along said northerly right-of-way line;
thence North 00°03'37" West 188.56 feet;
thence South 89°56'40" West 219.33 feet;
thence South 00°02'56" East 1.49 feet;
thence South 89°14'32" West 144.65 feet to the easterly right-of-way line of

Bangerter Highway;

thence along said easterly right-of-way line the following five (5) courses:

(1) Northwesterly 37.87 feet along the arc of a 704.07 foot radius curve to the left (center bears South 75°58'21" West and the chord bears North 15°34'06" West 37.86 feet with a central angle of 03°04'53");

(2) North 16°51'17" West 237.42 feet;

(3) Northwesterly 121.17 feet along the arc of a 608.26 foot radius curve to the right (center bears North 73°08'50" East and the chord bears North 11°08'45" West 120.97 feet with a central angle of 11°24'50");

(4) North 16°51'11" West 32.56 feet;

(5) Northwesterly 217.52 feet along the arc of a 1,044.25 foot radius curve to the left (center bears South 73°08'58" West and the chord bears North 22°49'05" West 217.13 feet with a central angle of 11°56'06");

thence North 63°41'58" East 67.53 feet;

thence North 00°00'27" West 272.97 feet;

thence North 60°10'45" West 64.45 feet to the southerly right-of-way line of 150 East Street;

thence Northeasterly 119.45 feet along the arc of a 498.03 foot radius curve to the left (center bears North 58°39'44" West and the chord bears North 24°28'00" East 119.17 feet with a central angle of 13°44'33");

thence North 89°57'04" East 440.38 feet along said southerly right-of-way line;

thence South 20°17'44" East 26.33 feet;

thence South 89°35'24" West 2.63 feet;

thence South 20°14'05" East 483.17 feet;

thence South 04°17'07" East 72.20 feet;

thence North 89°57'04" East 310.46 feet to the westerly right-of-way line of 300 East Street;

thence South 00°02'35" East 586.14 feet along said westerly right-of-way line;

thence South 89°56'40" West 339.01 feet;

thence South 00°02'56" East 110.15 feet to the point of beginning.

Contains 778,848 Square Feet or 17.880 Acres

Section 3. Contingent Effectiveness; Expiration if Conditions Not Met. This ordinance shall not take effect unless and until a development agreement between Draper City and the applicant that adequately addresses traffic mitigation, roadway improvements, infrastructure funding and construction, phasing, and other conditions deemed necessary by the City Council has been fully executed by all parties and recorded with the Salt Lake County Recorder. The City Recorder is hereby instructed not to publish this ordinance until the development agreement has been fully executed and recorded. Publication shall occur within ten (10) calendar days after recordation.

All activities undertaken by the applicant prior to the effective date of this ordinance are at the sole risk of the applicant, and no vested rights shall accrue until this ordinance becomes effective. If the development agreement has not been executed by all parties and recorded with the Salt Lake County Recorder on or before May 7, 2026, this ordinance shall, on May 8, 2026, automatically become null and void without further action by the City Council, and the prior land use designations shall remain in full force and effect. The City Recorder is instructed not to publish the ordinance in such event.

Section 4. Expectation of Development Agreement. The City Council expects the applicant to submit a complete development agreement application no later than December 29, 2025, to allow processing, any required public hearings, and City Council consideration and approval prior to May 7, 2026.

Section 5. Severability Clause. If any part or provision of this Ordinance is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion

of this Ordinance and all provisions, clauses and words of this Ordinance shall be severable.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE _____ DAY OF _____, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

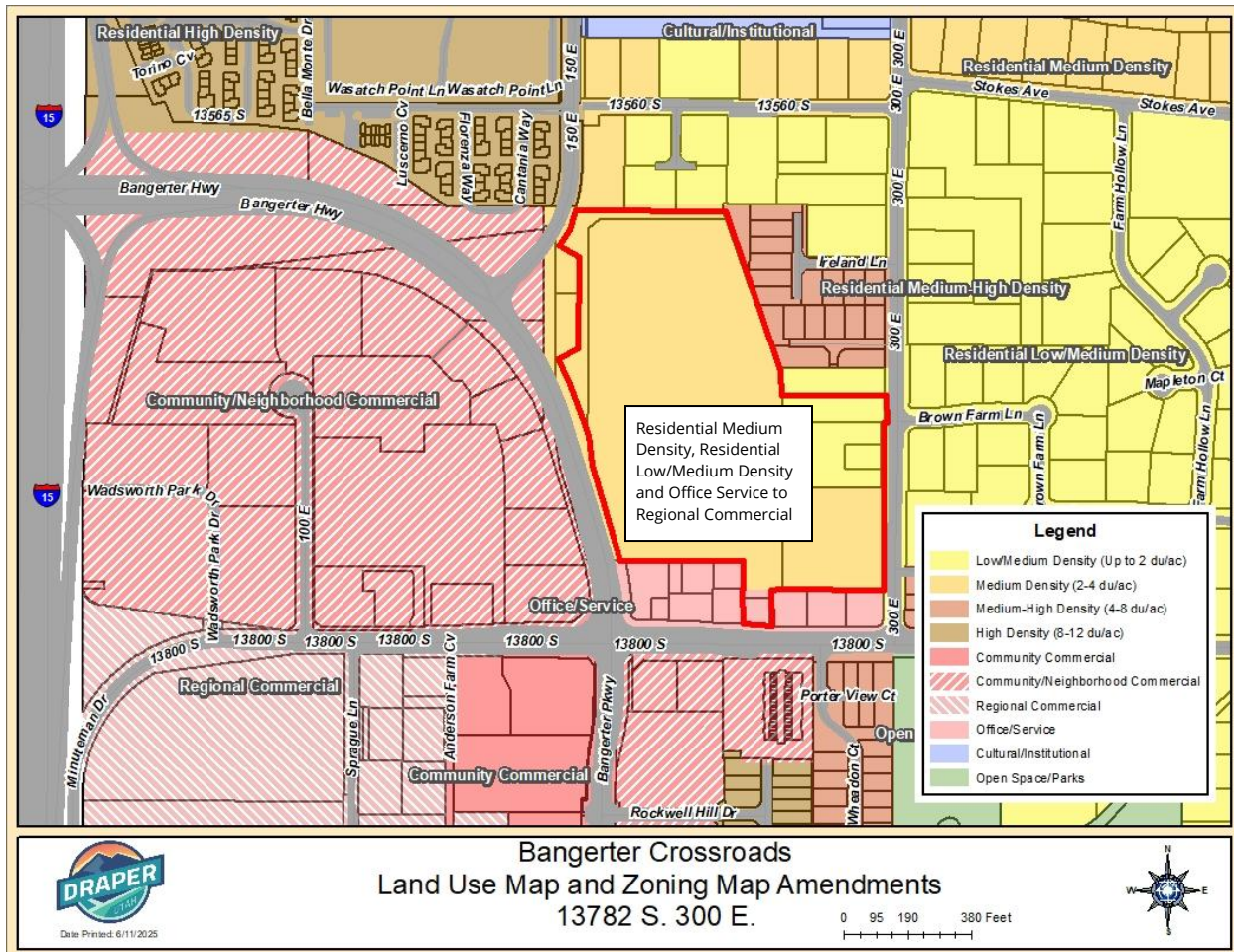
VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

EXHIBIT A

BANGERTER CROSSROADS LAND USE MAP AMENDMENT



ORDINANCE NO. 1689

AN ORDINANCE AMENDING THE OFFICIAL ZONING MAP OF DRAPER CITY FOR APPROXIMATELY 17.88 ACRES LOCATED AT APPROXIMATELY 13782 SOUTH 300 EAST (BANGERTER CROSSROADS) FROM RA1 (RESIDENTIAL AGRICULTURAL) TO CR (REGIONAL COMMERCIAL), OTHERWISE KNOWN AS THE BANGERTER CROSSROADS ZONING MAP AMENDMENT.

WHEREAS, pursuant to State law, Draper City has adopted a Zoning Ordinance and Zoning Map to guide the orderly development and use of property within the City; and

WHEREAS, from time to time it is necessary to review and amend the Zoning Map to keep pace with development within the City and to ensure the provision of a variety of economic uses; and

WHEREAS, the City Council finds that rezoning the subject property to CR (Regional Commercial) is consistent with the General Plan and the concurrently adopted amendment to the Land Use Map only if appropriate infrastructure improvements, traffic mitigation measures, funding commitments, and other public benefits are secured through a development agreement; and

WHEREAS, the City Council expects the applicant to submit and obtain approval of a development agreement that addresses traffic impacts, roadway improvements, infrastructure funding and construction, phasing, and other conditions prior to or concurrently with any development on the property; and

WHEREAS, the proposed zone change set forth herein has been reviewed by the Planning Commission and the City Council, and all appropriate public hearings have been held in accordance with Utah law to obtain public input regarding the proposed revisions to the Zoning Map; and

WHEREAS, the Planning Commission has reviewed and made a recommendation to the City Council concerning the proposed amendment to the official Zoning Map of Draper City, and the City Council has found the proposed zone change, subject to the contingency and effectiveness provisions herein, to be in the best interest of the health, safety, and welfare of the citizens of Draper City and consistent with the City's General Plan.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH:

Section 1. Findings and Contingent Approval. The City Council finds that the amendment of the official Zoning Map as described in Section 2 below is in the best interest of the health, safety, and welfare of the citizens of Draper City and is consistent with the City's

General Plan, provided that appropriate infrastructure improvements, traffic mitigation measures, funding commitments, and other public benefits are secured through a development agreement. The approval granted by this ordinance is contingent upon the conditions set forth in Section 3 and is not intended to presently create any vested rights in the applicant.

Section 2. Zoning Map Amendment. Subject to the contingency and effectiveness provisions in Section 3, the official Zoning Map of Draper City is hereby amended to change the zoning designation of the following described real property located at approximately 13782 South 300 East within Draper City, Salt Lake County, State of Utah, (containing approximately 17.88 acres), previously zoned RA1 as shown on the Draper City Zoning Map, as depicted in Exhibit "A" hereto, to CR (Regional Commercial):

Beginning at a point on the northerly right-of-way line of 13800 South Street, said point being South 89°48'02" West 373.33 feet along the section line and North 64.64 feet from the Center of Section 6, Township 4 South, Range 1 East, Salt Lake Base and Meridian (said Center being South 2,630.21 feet from the North Quarter corner of said Section 6); and running

thence North 87°18'03" West 85.23 feet along said northerly right-of-way line;
thence North 00°03'37" West 188.56 feet;
thence South 89°56'40" West 219.33 feet;
thence South 00°02'56" East 1.49 feet;
thence South 89°14'32" West 144.65 feet to the easterly right-of-way line of

Bangerter Highway;

thence along said easterly right-of-way line the following five (5) courses:

(1) Northwesterly 37.87 feet along the arc of a 704.07 foot radius curve to the left (center bears South 75°58'21" West and the chord bears North 15°34'06" West 37.86 feet with a central angle of 03°04'53");

(2) North 16°51'17" West 237.42 feet;

(3) Northwesterly 121.17 feet along the arc of a 608.26 foot radius curve to the right (center bears North 73°08'50" East and the chord bears North 11°08'45" West 120.97 feet with a central angle of 11°24'50");

(4) North 16°51'11" West 32.56 feet;

(5) Northwesterly 217.52 feet along the arc of a 1,044.25 foot radius curve to the left (center bears South 73°08'58" West and the chord bears North 22°49'05" West 217.13 feet with a central angle of 11°56'06");

thence North 63°41'58" East 67.53 feet;

thence North 00°00'27" West 272.97 feet;

thence North 60°10'45" West 64.45 feet to the southerly right-of-way line of 150 East Street;

thence Northeasterly 119.45 feet along the arc of a 498.03 foot radius curve to the left (center bears North 58°39'44" West and the chord bears North 24°28'00" East 119.17

feet with a central angle of 13°44'33");
thence North 89°57'04" East 440.38 feet along said southerly right-of-way line;
thence South 20°17'44" East 26.33 feet;
thence South 89°35'24" West 2.63 feet;
thence South 20°14'05" East 483.17 feet;
thence South 04°17'07" East 72.20 feet;
thence North 89°57'04" East 310.46 feet to the westerly right-of-way line of 300 East Street;
thence South 00°02'35" East 586.14 feet along said westerly right-of-way line;
thence South 89°56'40" West 339.01 feet;
thence South 00°02'56" East 110.15 feet to the point of beginning.

Contains 778,848 Square Feet or 17.880 Acres

Section 3. Contingent Effectiveness; Expiration if Conditions Not Met. This ordinance shall not take effect unless and until a development agreement between Draper City and the applicant that adequately addresses traffic mitigation, roadway improvements, infrastructure funding and construction, phasing, and other conditions deemed necessary by the City Council has been fully executed by all parties and recorded with the Salt Lake County Recorder. The City Recorder is hereby instructed not to publish this ordinance until the development agreement has been fully executed and recorded. Publication shall occur within ten (10) calendar days after recordation.

All activities undertaken by the applicant prior to the effective date of this ordinance are at the sole risk of the applicant, and no vested rights shall accrue until this ordinance becomes effective. If the development agreement has not been fully executed by all parties and recorded with the Salt Lake County Recorder on or before May 7, 2026, this ordinance shall automatically become null and void on May 8, 2026, without further action by the City Council, and the prior zoning designation (RA1) shall remain in full force and effect. In such event, the City Recorder is instructed not to publish the ordinance.

Section 4. Expectation of Development Agreement. The City Council expects the applicant to submit a complete development agreement application no later than December 29, 2025, to allow sufficient time for processing, any required public hearings, and City Council consideration and approval prior to May 7, 2026.

Section 5. Severability Clause. If any part or provision of this Ordinance is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Ordinance and all provisions, clauses and words of this Ordinance shall be severable.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE _____ DAY OF _____, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

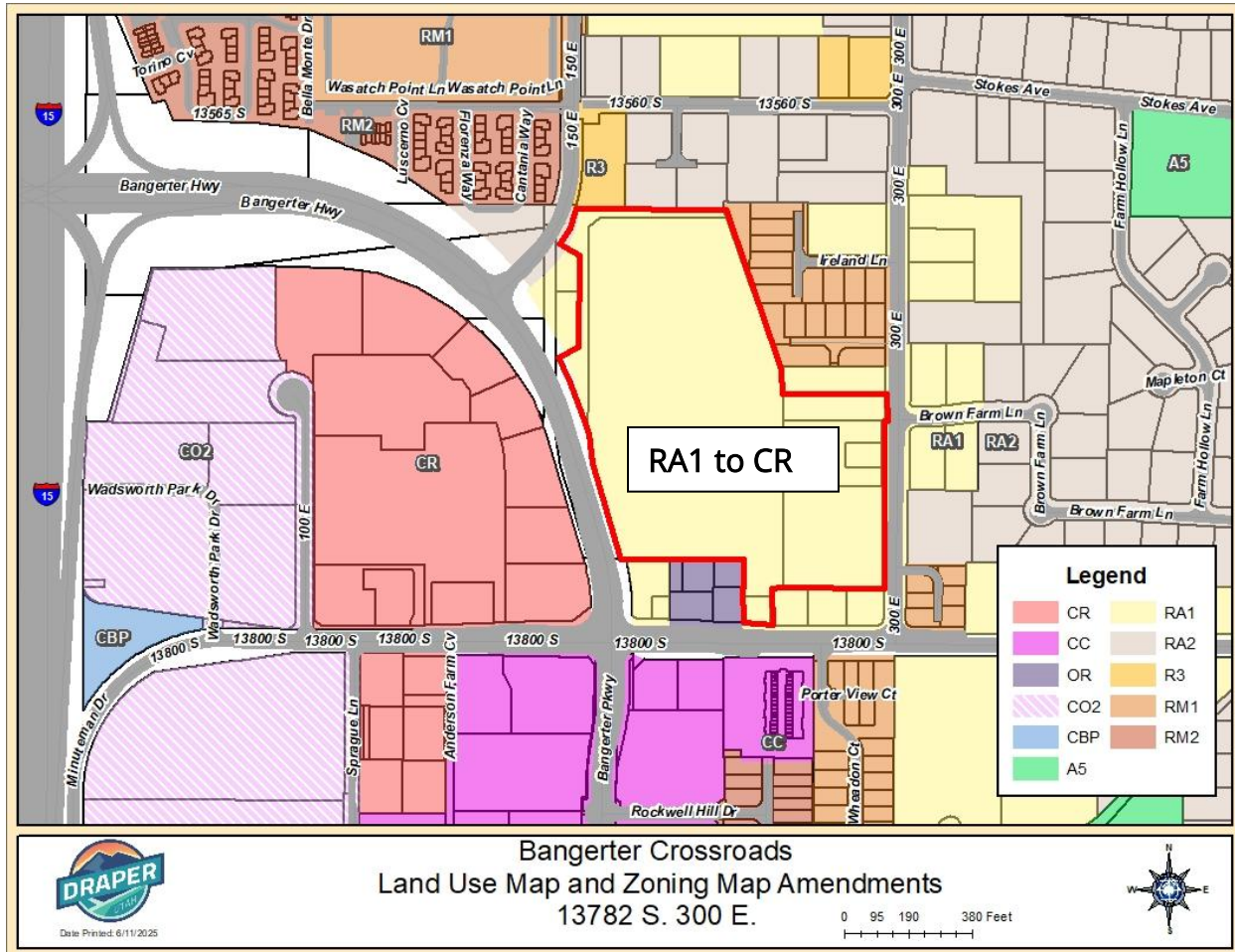
VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

EXHIBIT A

BANGERTER CROSSROADS ZONING MAP AMENDMENT





Development Review Committee

1020 East Pioneer Road

Draper, UT 84020

October 28, 2025

To: Draper City Planning Commission
Business Date: November 20, 2025

From: Development Review Committee

Prepared By: Todd A. Draper, AICP, Planning Manager
Planning Division
Community Development Department
801-576-6335, todd.draper@draperutah.gov

Re: Bangerter Crossroads – Land Use Map and Zoning Map Amendment Requests

Application No.: 2025-0064-MA and 2025-0065-MA

Applicant: Duaine Rasmussen, representing Tom Lloyd and Lloyd's TLC Limited

Project Location: Approximately 13782 S. 300 E.

Current Zoning: RA1 (Residential Agricultural, 40,000 ft² min. lot size) Zone

Acreage: Approximately 17.88 Acres (Approximately 778,853 ft²)

Request: Request for approval of a Land Use Map Amendment from the Residential Medium Density, Residential Low-Medium Density, and Office/Service land use designations to the Regional Commercial land use designation and from the RA1 zone to the CR (Regional Commercial) zone regarding future potential development of the property as a commercial center.

BACKGROUND AND SUMMARY

This application is a request for approval of a Land Use Map Amendment and a Zoning Map Amendment for approximately 17.88 acres located on the west side of Bangerter Highway, north of 13800 South, and west of 300 East, at approximately 13782 S. 300 E. (Exhibit C & D). The property is currently zoned RA1. The applicant is requesting that the Land Use Map and Zoning Map Amendments be approved to allow for the future development of the overall site as a commercial center.

The overall subject property consists of seven (7) parcels ranging in size from approximately 0.16 acres to 12.82 acres. Four (4) of the parcels previously had single family



dwellings on them that dated back prior to the incorporation of the city in 1978, however these dwellings were removed from the properties in about 2018, and the land has been vacant since that time.

ANALYSIS

General Plan and Zoning.

Table 1	General Plan and Zoning Designations	Exhibit
Existing Land Use	Residential Medium Density, Residential Low-Medium Density, and Office/Service	Exhibit E
Current Zoning	RA1	Exhibit F
Proposed Use	Commercial Center	
Adjacent Zoning		
East	RA1, RA2 (Residential Agricultural, 20,000 ft ² min. lot size), RM1(Residential Multiple-Family)	
West	RM2, CR	
North	RA1, RA2, R3 (Single-Family Residential, 15,000 ft ² min. lot size), RM1	
South	RA1, OR (Office Residential), CC (Community Commercial)	

The Residential Medium Density, Residential Low-Medium Density, and Office/Service land use designations are characterized as follows:

Residential Medium Density

LAND USE DESCRIPTION		
CHARACTERISTICS	• Preservation of large tracts of open space, rather than open space contained primarily in individual subdivision lots • Variations and mixing of lot sizes, setbacks, and residential development forms • Minimal fronting of homes on major streets • Provision for trails that allow interconnectivity to other existing or proposed trails • Discourage "piecemeal" infrastructure installation • Trees and abundant landscaping, encouraging low water use and native plants	
LAND USE MIX	Primary • Single-family detached homes	Secondary • Parks • Churches • Schools • Open Space
DENSITY	• Density range: 2-4 dwelling units per acre	
COMPATIBLE ZONING	• Residential Agricultural (RA2) • Single-family Residential (R3) • Single-family Residential (R4) • Master Planned Community (MPC)	
OTHER CRITERIA	• Preservation of environmental features usually requires a master-planned or cluster development. Increased densities within these areas would be allowed only with compliance to specified performance standards and impact mitigation measures	

Residential Low-Medium Density

LAND USE DESCRIPTION		
CHARACTERISTICS	• Very large lot single-family neighborhoods or ranchettes allows for enhancement of Draper's rural character • Environmentally designed clustered housing with the Suncrest and South Mountain projects being the exceptions • Some natural features and cultivated vegetation is apparent and special care is required in order to preserve those features and areas • Equestrian uses and privileges may exist in certain areas	
LAND USE MIX	Primary • Single-family detached homes	Secondary • Parks • Open space • Churches • Schools
DENSITY	• Density range: up to 2 dwelling units per acre • Reduction for non-buildable areas	
COMPATIBLE ZONING	• Residential Agricultural (RA1) • Residential Agricultural (RA2) • Single-family Residential Hillside (RH) • Master Planned Community (MPC)	
OTHER CRITERIA	• Increased densities within equestrian areas may be allowed only with compliance to specified performance standards and impact mitigation measures • Buffers and transitions around existing low-density single-family residences may consist of open space/retention areas, lots that are pie-shaped or otherwise larger than standard sized lots or a combination of these and other appropriate design techniques	

Office/Service

LAND USE DESCRIPTION	
CHARACTERISTICS	• Includes a variety of office and service uses that range from residential scale and character to major offices that have multiple stories and underground parking, which generate moderate traffic volumes • Development and landscaping standards vary, depending upon the location of the use, and underlying zoning regulations • For minor offices strict development and landscaping requirements will protect adjacent residential uses • For major offices and services, arterial access is desirable and should be located around the central business district, other major commercial cores, or freeway interchanges and away from residential areas
LAND USE MIX	• Small-scale commercial • Planned retail • Office buildings
DENSITY	• Up to 12 dwelling units per acre for residential
COMPATIBLE ZONING	• Professional Office (CO2) • Professional Office (CO1) • Office Residential (OR)
LOCATION	• Near retail centers, offices, or other compatible uses

The Regional Commercial land use designation is characterized as follows:

Regional Commercial

LAND USE DESCRIPTION	
CHARACTERISTICS	• Include a wide range of commercial uses that combine destination oriented businesses, retail commercial, entertainment and related uses • Include uses that serve both residents and nonresidents of the City • Uniform design standards and aesthetics • Well landscaped street frontages • Limited traffic access points for the site
LAND USE MIX	• Large-scale master-planned commercial centers • Big box centers • Upscale office buildings
COMPATIBLE ZONING	• Regional Commercial (CR)
LOCATION	• Excellent transportation access to major highways • Strategically placed along high-traffic corridors

According to Draper City Municipal Code (DCMC) Section 9-8-020 the purpose of the RA1 zone is to *“foster low density development with little impact on its surroundings and municipal services; to generally preserve the character of the city's semirural areas; and to promote and preserve conditions favorable to large lot family life, including the keeping of limited numbers of animals and fowl. The predominant use in these zones is intended to be detached single-family dwellings, protected from encroachment by commercial and industrial uses.”*

The purpose of the CR zone is to, *“foster low density development with little impact on its surroundings and municipal services; to generally preserve the character of the city's semirural areas; and to promote and preserve conditions favorable to large lot family life, including the keeping of limited numbers of animals and fowl. The predominant use in these zones is intended to be detached single-family dwellings, protected from encroachment by commercial and industrial uses.”*

The applicant's responses and addition documentation submitted regarding their request for review and approval of the Land Use Map Amendment and the Zoning Map Amendment requests are provided in Exhibit G of this report.

Criteria For Approval.

The Land Use Map amendment request falls under DCMC Section 9-2-020(F) because the Land Use Map is part of Draper City's General Plan. That section lists the following criteria for a General Plan amendment as:

Plan Amendment: All plan amendments shall be in accordance with Utah Code Annotated 10-9a-404, as amended and, unless requested by the city's legislative

body, shall follow the procedures as outlined in Draper City Municipal Code 9-5-060(D).” That section is noted as follows:

- D. Procedure: Zoning text and map amendments shall be considered and processed as provided in this subsection:*
- 1. A complete application shall be submitted to the office of the zoning administrator in a form established by the administrator along with any fee established by the city’s schedule of fees. The application shall include at least the following information:*
 - a. The name, address and telephone number of the applicant and the applicant’s agent, if any.*
 - b. The name and address of every person or company the applicant represents.*
 - c. The requested amendment and reasons supporting the request.*
 - d. If the proposed amendment requires a change in the zoning map, the application shall include:*
 - (1) An accurate property map showing present and proposed zoning classifications;*
 - (2) All abutting properties showing present zoning classifications; and*
 - (3) An accurate legal description and an approximate common address of the area proposed to be rezoned.*
 - e. If the proposed amendment requires a change in the text of this title, the application shall include chapter and section references and a draft of the proposed text.*
 - 2. After the application is determined to be complete, the zoning administrator shall prepare a staff report evaluating the application.*
 - 3. The planning commission shall schedule and hold a public hearing on the application as provided in sections 9-5-040 and 9-5-045 of this chapter. Following the public meeting, the planning commission shall recommend approval, approval with modifications, or denial of the proposed amendment and shall submit its recommendation to the city council for review and decision.*
 - 4. The city council shall schedule and hold a public hearing on the application as provided in sections 9-5-040 and 9-5-045 of this chapter. Following the public hearing, the city council may approve, approve with modifications, or deny the proposed amendment.*

A Map Amendment is a matter committed to the legislative discretion of the City Council and is not controlled by any one standard. However, in making a recommendation to the City Council, the Planning Commission should consider the following factors in Section 9-5-060(E) of the DCMC:

1. Map Amendments:

- a. Whether the proposed amendment is consistent with goals, objectives and policies of the city's general plan;*
- b. Whether the proposed amendment is harmonious with the overall character of existing development in the vicinity of the subject property;*
- c. Whether the proposed amendment is consistent with the standards of any applicable overlay zone;*
- d. The extent to which the proposed amendment may adversely affect adjacent property; and*
- e. The adequacy of facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.*

REVIEWS

Planning Division Review. The Draper City Planning Division has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Engineering and Public Works Divisions Review. The Draper City Engineering and Public Works Divisions have completed their reviews of the Land Use Map and Zoning Map Amendment submissions. Comments from these divisions, if any, can be found in Exhibit A.

Building Division Review. The Draper City Building Division has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

GIS Division Review. The Draper City GIS Division has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Fire Division Review. The Draper City Fire Marshal has completed his review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Legal Division Review. The Draper City Attorney has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Noticing. Notice has been properly issued in the manner outlined in the City and State Codes.

STAFF RECOMMENDATION

Staff recommends that the Planning Commission review the requests, receive public comment, and make decisions based on the findings listed below and the criteria for approval, or denial, as listed within the staff report.

MODEL MOTIONS

Land Use Map Amendment

Sample Motion for Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Land Use Map Amendment, as requested by Duaine Rasmussen, representing Tom Lloyd and Lloyd’s TLC Limited, application 2025-0064-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025.

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will not adversely affect adjacent property.
4. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The proposed land use map amendment complies with DCMC Section 9-2-020(F).
6. The legislative body may adopt any amendment to the general plan land use map that the legislative body considers appropriate.

Sample Motion for Modified Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Land Use Map Amendment, as requested by Duaine Rasmussen, representing Tom Lloyd and Lloyd’s TLC Limited, application 2025-0064-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025, and as modified by the following additional findings:

1. (List any additional findings ...)

Sample Motion for Negative Recommendation – I move that we forward a negative recommendation to the City Council for the Land Use Map Amendment, as requested by Duaine Rasmussen, representing Tom Lloyd and Lloyd’s TLC Limited, application 2025-0064-MA, based on the findings and criteria for denial listed in the Staff Report dated October 28, 2025.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The legislative body may reject any amendment to the general plan land use map that the legislative body considers appropriate.

Zoning Map Amendment

Sample Motion for Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Zoning Map Amendment, as requested by Duaine Rasmussen, representing Tom Lloyd and Lloyd's TLC Limited, application 2025-0065-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025.

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment is consistent with the standards of any applicable overlay zone.
4. The proposed map amendment will not adversely affect adjacent property.
5. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

Sample Motion for Modified Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Zoning Map Amendment, as requested by Duaine Rasmussen, representing Tom Lloyd and Lloyd's TLC Limited, application 2025-0065-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025, and as modified by the following additional findings:

1. (List any additional findings ...)

Sample Motion for Negative Recommendation – I move that we forward a negative recommendation to the City Council for the Zoning Map Amendment, as requested by Duaine Rasmussen, representing Tom Lloyd and Lloyd's TLC Limited, application 2025-0065-MA, based on the findings and criteria for denial listed in the Staff Report dated October 28, 2025.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

DEVELOPMENT REVIEW COMMITTEE ACKNOWLEDGEMENT

We, the undersigned, as duly appointed members of the Draper City Development Review Committee, do acknowledge that the application which provides the subject for this staff report has been reviewed by the Committee and has been found to be appropriate for review by the Draper City Planning Commission and/or City Council.

Brien Maxfield

Digitally signed by Brien Maxfield
DN: C=US, E=brien.maxfield@draperutah.gov,
O=Draper, OU=Public Works - Engineering,
CN=Brien Maxfield
Date: 2025.06.20 08:56:41-06'00'

Draper City Public Works Department

Don Buckley

Digitally signed by Don Buckley
DN: C=US,
E=don.buckley@draper.ut.us, O=Draper
City Fire Department, OU=Fire Marshal,
CN=Don Buckley
Date: 2025.06.10 15:36:55-06'00'

Draper City Fire Department

Matthew Symes

Digitally signed by Matthew Symes
DN: C=US,
E=matt.symes@draperutah.gov,
O=Draper City Corp., CN=Matthew Symes
Date: 2025.10.29 06:03:10-06'00'

Draper City Building Division

Todd A. Draper

Digitally signed by Todd A.
Draper
DN: C=US,
E=todd.draper@draper.ut.us,
O=Draper City Planning,
CN=Todd A. Draper
Date: 2025.06.10
16:00:52-06'00'

Draper City Planning Division



Draper City Legal Counsel

EXHIBIT A DEPARTMENT REVIEWS

REVIEWS ARE NOT MEANT TO BE AN ALL-INCLUSIVE LIST OF POSSIBLE COMMENTS OR CONDITIONS.

Planning Division Review.

1. No additional Comments

Engineering and Public Works Divisions Review.

1. We have reviewed the subject zone map amendment application, proposing approximately 18 acres to be zoned from Residential/Agricultural one acre (RA1) to Regional Commercial (CR) in accordance with the provisions of Section 9-5-060(E)(1)(e) of the Draper City Municipal Code (DCMC). We speak primarily to the adequacy of facilities and services intended to serve the subject property. In making an amendment, the City Council should consider the following factors. Accordingly, the following comments are recommended for your consideration:
2. The adequacy of facilities and services intended to serve the subject property, including but not limited to roadways, parks and recreation facilities, police and fire protection, schools, storm water drainage systems, water supplies, and waste water and refuse collection; Other than noted below, we are not aware of any inadequacies of the facilities intended to serve this property.
 - A. The change in zone from residential / agricultural one acre (RA1) to a commercial zoning, Regional Commercial (CR), represents a significant increase in traffic based on the density potential of the proposed zone. The proposed zone would increase traffic based on any of the potential proposed uses allowed in the zone and the intensity of those uses within the subject area. That being said, the fronting streets are 300 East, 13800 South, and Bangerter Hwy which are classified as major collector or arterial streets with significant traffic capacity. There are peak-time commuter and school congestion in the area, along 150 East and at each of the intersections surrounding the subject parcel. The size of the subject parcel and the potential number of trips generated from the subject area require mitigation measures, where mitigation is typically contemplated around 100 peak hour trips. A traffic impact study (TIS) has been completed, analyzing the intensity for traffic generation of the subject area based on the probable land uses and development density. The TIS report outlines both city deficiencies,

which the city is addressing, and project mitigation requirements. The project mitigation improvements will be a requirement of any site development or subdivision approval by the city. Those improvements will be completed as part of the development construction. There are incomplete public frontage improvements existing on the subject site and the missing improvements, park strips and sidewalks, will be required of any project.

- B. Connectivity with the subject area to public rights-of-way are established based the city's access management plan, as analyzed in a traffic impact study (TIS), and an existing agreement between the applicant and UDOT, for an access on Bangerter Hwy. Access onto 300 East, 13800 South, and Bangerter Hwy are controlled in order to limit impacts from the commercial development to the existing and future traffic on the surrounding streets. Development within the subject area will be required to share accesses and have cross-access agreements in place for each site due to the limited access locations available. Accesses are be required to meet Draper City standards as outlined in our Master Transportation Plan. Access is evaluated at the time of a site plan or subdivision application and will follow the requirements of the TIS.
 - C. There are existing storm drainage facilities fronting the subject parcel that are feasible to connect to from the existing site. Any future site drainage will be required to be addressed with any subdivision or site plan application and shall comply with the rules and regulations pertaining to site drainage and the provisions of the development requirements within the Draper City Municipal Code.
 - D. Sanitary sewer facilities will be provided by Jordan Basin Improvement District, formally South Valley Sewer District. Any subdivision or site plan application will require a commitment to serve from the sewer district that facilities are adequate to provide service for the proposed uses.
 - E. Drinking water is provided by WaterPro to the subject parcel. Any subdivision or site plan application will require a commitment to serve from WaterPro that facilities are adequate to provide service for the proposed uses.
3. Accordingly, we will provide comments relative to the potential construction activities when the appropriate application is received.

Building Division Review.

- 1. No additional Comments

Fire Division Review.

1. No additional Comments

GIS Division Review.

1. No additional Comments

Legal Division Review.

1. No additional Comments

EXHIBIT B LEGAL DESCRIPTION

Lloyd Property – Rezoning Parcel

Beginning at a point on the northerly right-of-way line of 13800 South Street, said point being South 89°48'02" West 373.33 feet along the section line and North 64.64 feet from the Center of Section 6, Township 4 South, Range 1 East, Salt Lake Base and Meridian (said Center being South 2,630.21 feet from the North Quarter corner of said Section 6); and running

thence North 87°18'03" West 85.23 feet along said northerly right-of-way line;
thence North 00°03'37" West 188.56 feet;
thence South 89°56'40" West 219.33 feet;
thence South 00°02'56" East 1.49 feet;
thence South 89°14'32" West 144.65 feet to the easterly right-of-way line of Bangerter Highway;
thence along said easterly right-of-way line the following five (5) courses:
(1) Northwesterly 37.87 feet along the arc of a 704.07 foot radius curve to the left (center bears South 75°58'21" West and the chord bears North 15°34'06" West 37.86 feet with a central angle of 03°04'53");
(2) North 16°51'17" West 237.42 feet;
(3) Northwesterly 121.17 feet along the arc of a 608.26 foot radius curve to the right (center bears North 73°08'50" East and the chord bears North 11°08'45" West 120.97 feet with a central angle of 11°24'50");
(4) North 16°51'11" West 32.56 feet;
(5) Northwesterly 217.52 feet along the arc of a 1,044.25 foot radius curve to the left (center bears South 73°08'58" West and the chord bears North 22°49'05" West 217.13 feet with a central angle of 11°56'06");
thence North 63°41'58" East 67.53 feet;
thence North 00°00'27" West 272.97 feet;
thence North 60°10'45" West 64.45 feet to the southerly right-of-way line of 150 East Street;
thence Northeasterly 119.45 feet along the arc of a 498.03 foot radius curve to the left (center bears North 58°39'44" West and the chord bears North 24°28'00" East 119.17 feet with a central angle of 13°44'33");
thence North 89°57'04" East 440.38 feet along said southerly right-of-way line;
thence South 20°17'44" East 26.33 feet;
thence South 89°35'24" West 2.63 feet;
thence South 20°14'05" East 483.17 feet;
thence South 04°17'07" East 72.20 feet;
thence North 89°57'04" East 310.46 feet to the westerly right-of-way line of 300 East Street;
thence South 00°02'35" East 586.14 feet along said westerly right-of-way line;
thence South 89°56'40" West 339.01 feet;
thence South 00°02'56" East 110.15 feet to the point of beginning.

Contains 778,848 Square Feet or 17.880 Acres

EXHIBIT C VICINITY MAP

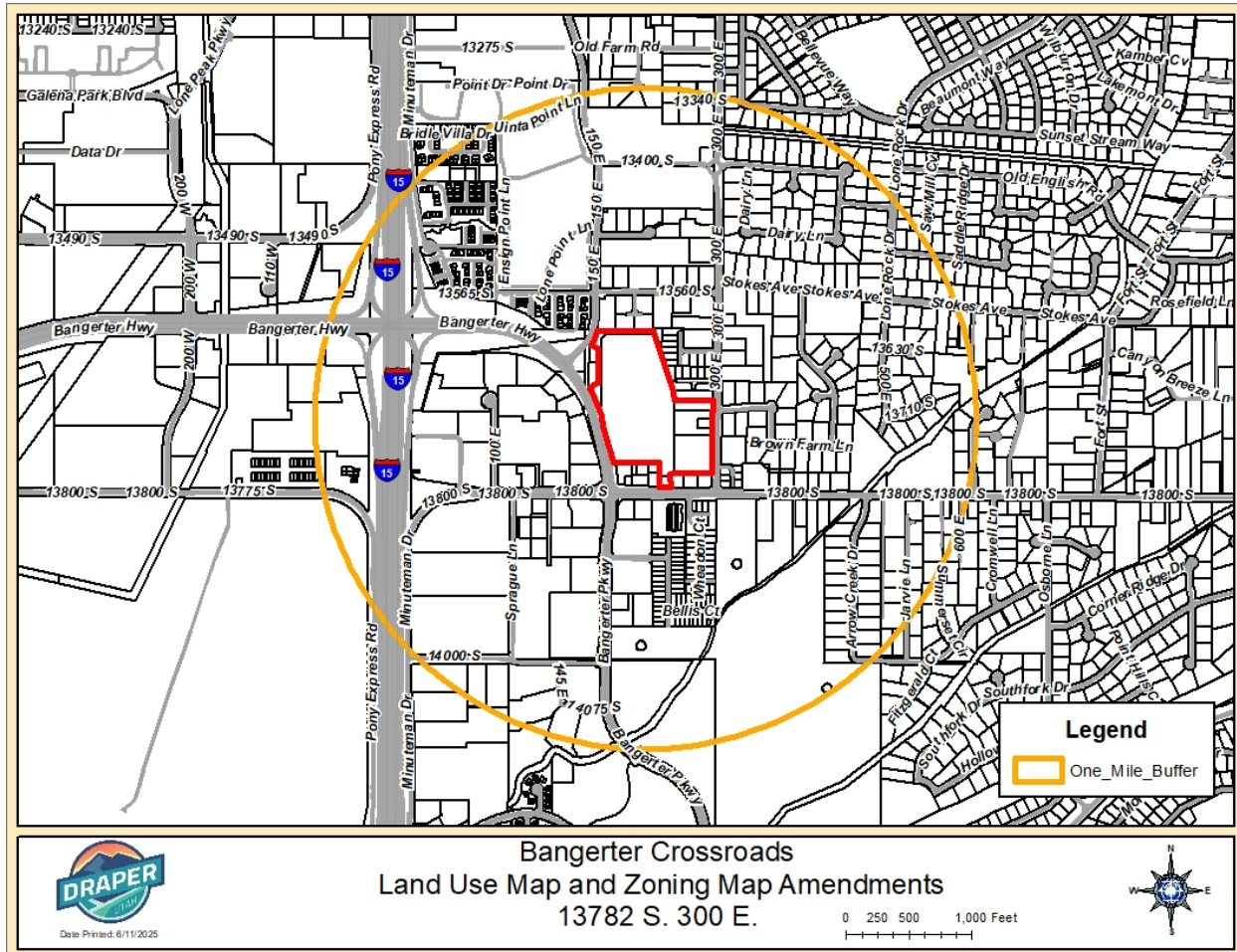
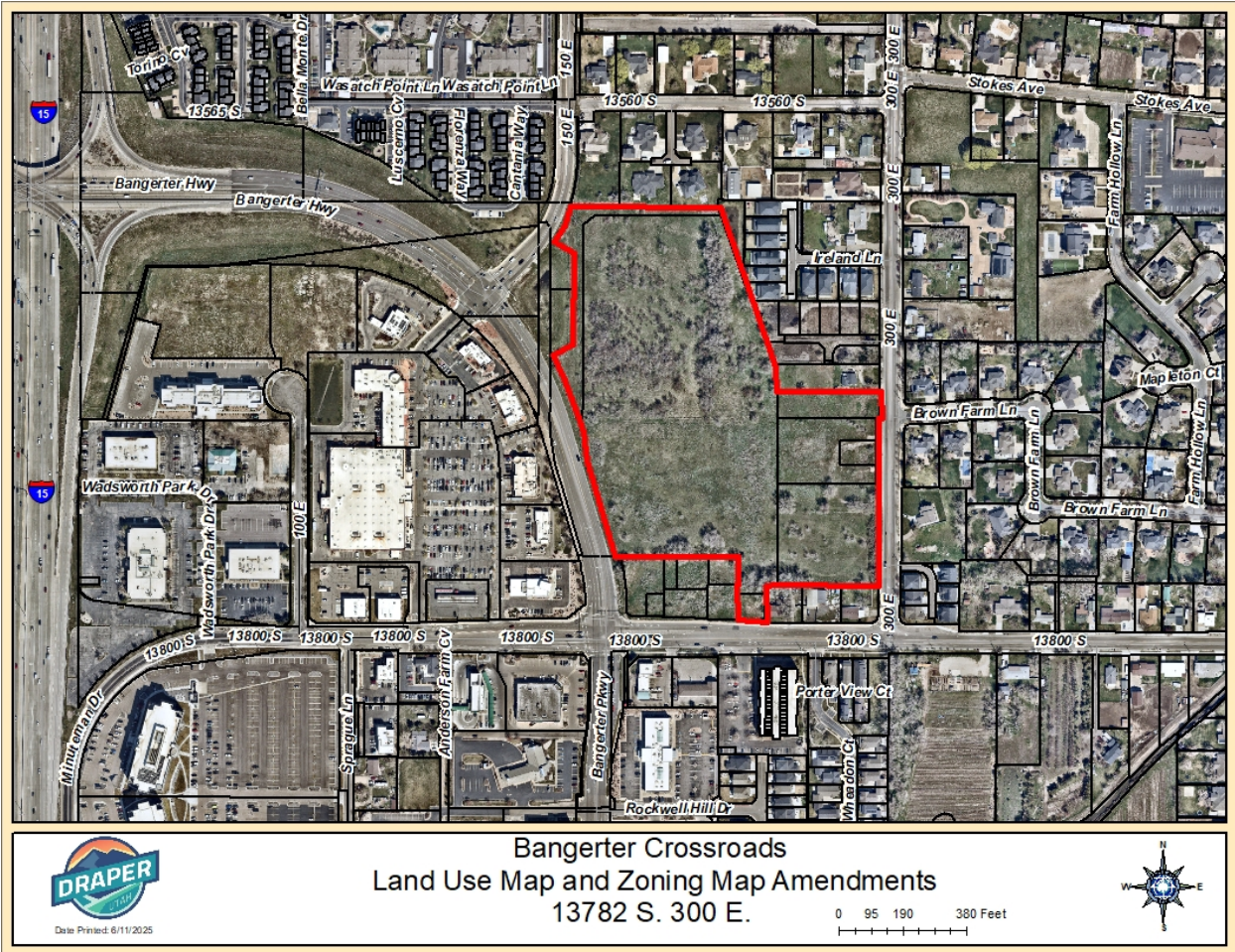


EXHIBIT D
AERIAL MAP



Legend

- Low/Medium Density (Up to 2 du/ac)
- Medium Density (2-4 du/ac)
- Medium-High Density (4-8 du/ac)
- High Density (8-12 du/ac)
- Community/Neighborhood Commercial
- Regional Commercial
- Office/Service
- Cultural/Institutional
- Open Space/Parks

Bangarter Crossroads
Land Use Map and Zoning Map Amendments
13782 S. 300 E.

0 95 190 380 Feet

EXHIBIT F ZONING MAP

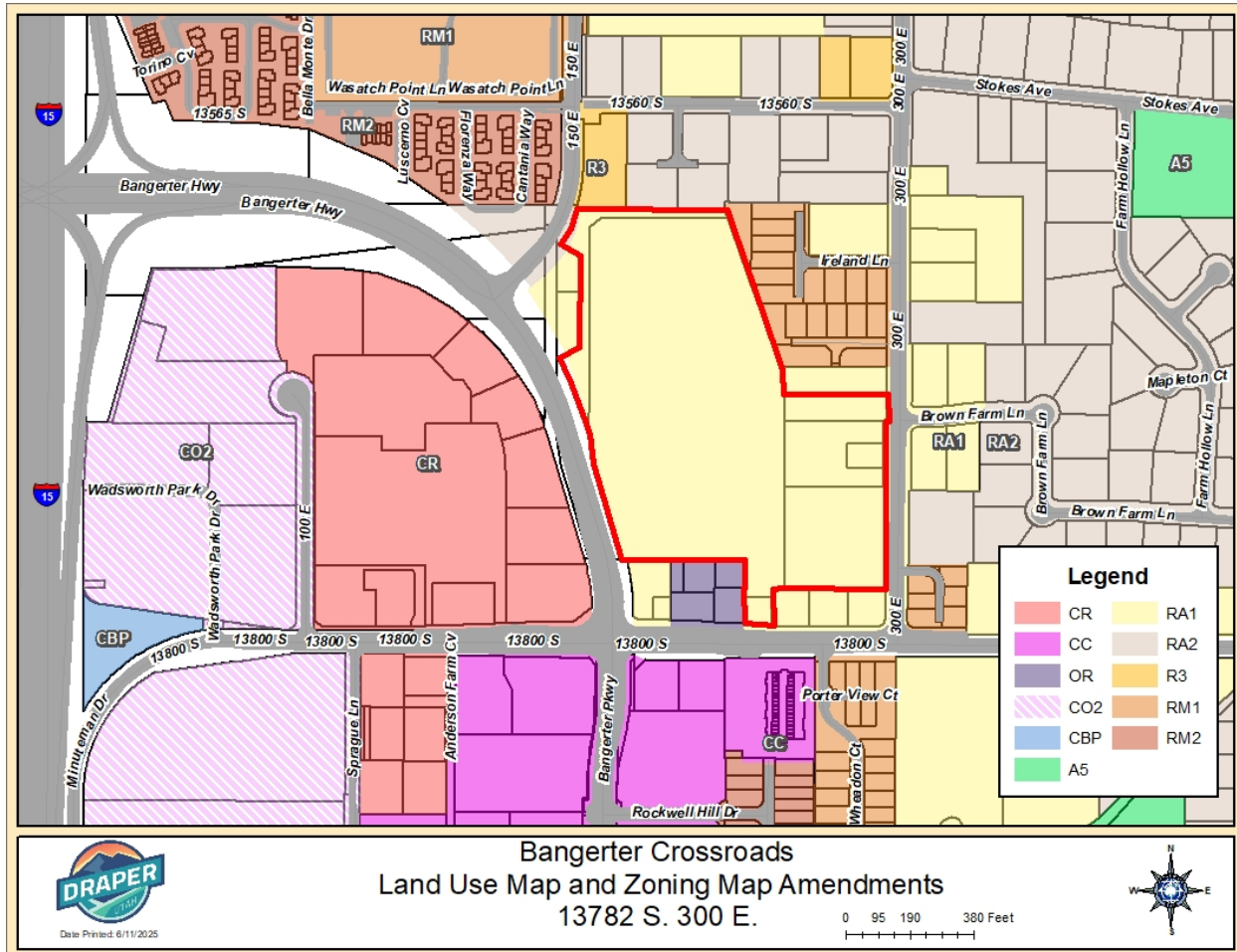


EXHIBIT G
APPLICANTS RESPONSES

Land Use Map Amendment Questionnaire

1. What is the requested land use designation?
 - a. Regional Commercial (CR)
2. Please explain the reason for the request and the justification for approval.
 - a. We are requesting this change to allow for the construction of a shopping center that we believe will provide local residents with greater shopping options near where they live and as one of the last remaining larger parcels create an opportunity for a strong anchor tenant.
3. How is the requested land use designation harmonious with the overall character of the existing development in the vicinity of the subject property? Explain.
 - a. The property is positioned at the intersection of two major traffic corridors – Bangerter Highway and 13800 South with existing shopping to the west as well as similar commercial uses to the south, there are existing residential neighborhoods to the north and east and our intent is to create a shopping experience that would help capitalize on “pass -by” trips from the larger transportation corridors, while also serving the needs of our immediate neighbors.
4. Is the proposed land use designation consistent with the goals, objectives, and policies of the City’s General Plan? Explain.
 - a. We believe the proposed land use aligns with the City’s General Plan in a number of ways:
 - i. Economic Vitality Goals:
 1. Goal EV-1 – *Foster new and existing economic opportunities* – The proposed zone will allow for an anchor tenant that will expand the economic base while also providing pads surrounding the anchor for small businesses.
 2. Goal EV-2 – *Encourage and support a diversity of businesses* – Providing an opportunity for a larger anchor tenant will assist in attracting a variety of business types that rely on an anchor for increased traffic in the shopping center. Adding this additional shopping strengthens the draw for residents who may already visit the shopping center to the west while allowing them additional opportunities in the same area and attracting a variety of smaller boutique style businesses and services.
 - ii. Land Use & Character Goals:
 1. Goal LUC-6 – *Provide a broad variety of land uses that create a high level of synergy and a sense of community among those who work, live, and play within mixed use neighborhoods* – We believe the proposed land use enhances retail offerings to those residents who reside in the surrounding neighborhoods allowing them to live, shop, and utilize local services in the same area.

Zoning Map Amendment Questionnaire

1. What is the requested zoning designation?
 - a. Regional Commercial (CR)
2. Please explain the reason for the request and the justification for approval.
 - a. We are requesting this change to allow for the construction of a shopping center that we believe will provide local residents with greater shopping options near where they live and as one of the last remaining larger parcels create an opportunity for a strong anchor tenant.
3. How is the requested land use designation harmonious with the overall character of the existing development in the vicinity of the subject property? Explain.
 - a. The property is positioned at the intersection of two major traffic corridors – Bangerter Highway and 13800 South with existing shopping to the west as well as similar commercial uses to the south, there are existing residential neighborhoods to the north and east and our intent is to create a shopping experience that would help capitalize on “pass -by” trips from the larger transportation corridors, while also serving the needs of our immediate neighbors.
4. Are facilities and services, such as roadways and utilities, sufficient to serve the property under the proposed zoning? Explain.
 - a. Based on conversations with the city, we understand that the water and storm drain systems are adequate for the property. We have worked with the city to develop a detention system that will accommodate the property and address some downstream deficiencies in the city’s drainage outfall for the larger area.

A traffic study was commissioned to evaluate current and future conditions to help identify any needed improvements. The improvements outlined in the study will not only accommodate the proposed development, but improve traffic flow in the immediate area. The developer, in collaboration with the city has also worked to secure funding for essential roadway improvements in the area from the Utah Department of Transportation and are working together to finalize design and construction of said improvements.

Sewer will be provided by the Jordan Basin Improvement District; sewer main lines exist in some of the surrounding streets and a main line runs through a portion of the property on the west. We understand that these various lines are capable of serving the proposed project.

5. Is the proposed land use designation consistent with the goals, objectives, and policies of the City’s General Plan? Explain.
 - a. We believe the proposed land use aligns with the City’s General Plan in a number of ways:
 - i. Economic Vitality Goals:

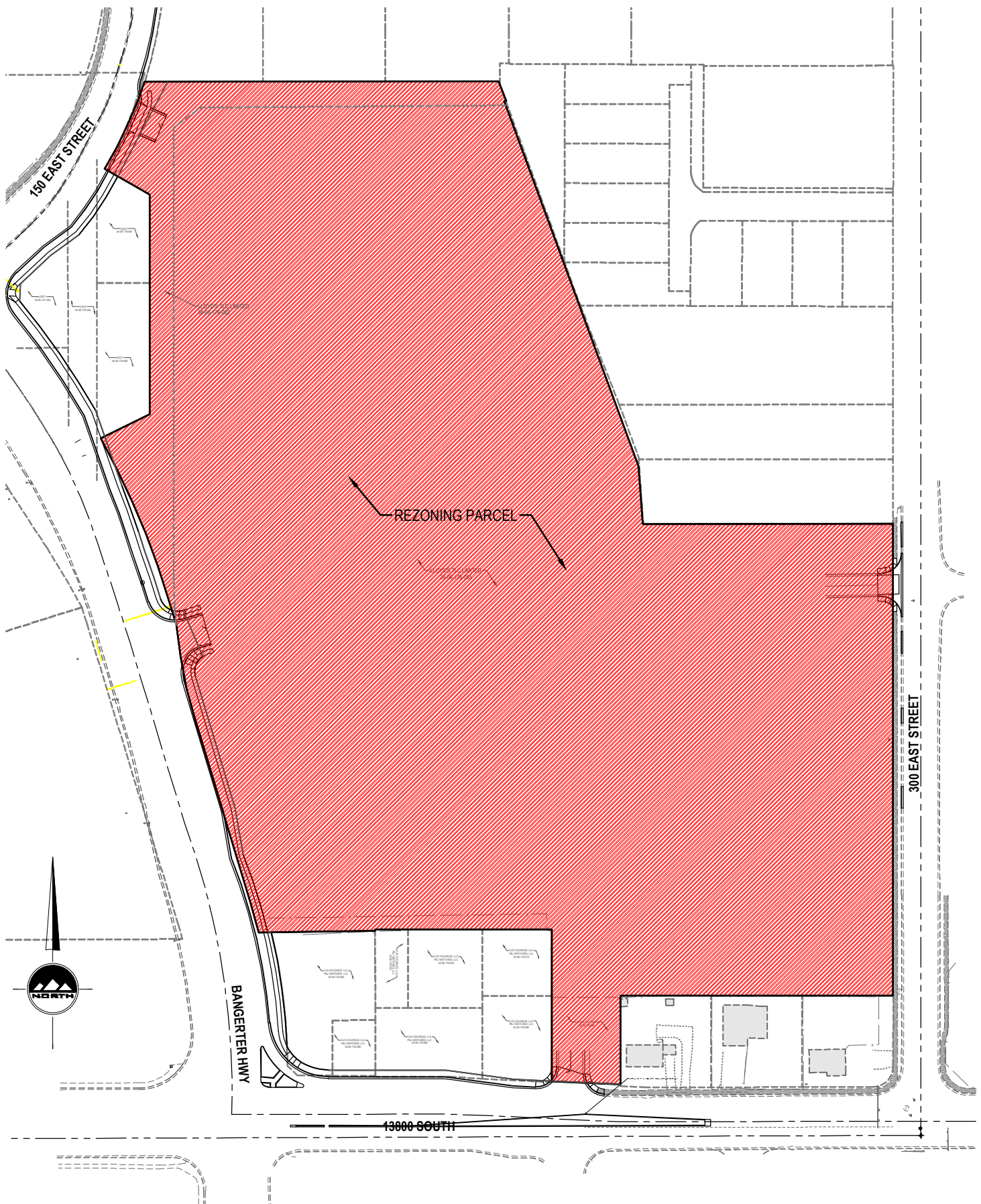
1. Goal EV-1 – *Foster new and existing economic opportunities* – The proposed zone will allow for an anchor tenant that will expand the economic base while also providing pads surrounding the anchor for small businesses.
 2. Goal EV-2 – *Encourage and support a diversity of businesses* – Providing an opportunity for a larger anchor tenant will assist in attracting a variety of business types that rely on an anchor for increased traffic in the shopping center. Adding this additional shopping strengthens the draw for residents who may already visit the shopping center to the west while allowing them additional opportunities in the same area and attracting a variety of smaller boutique style businesses and services.
- ii. Land Use & Character Goals:
1. Goal LUC-6 – *Provide a broad variety of land uses that create a high level of synergy and a sense of community among those who work, live, and play within mixed use neighborhoods* – We believe the proposed land use enhances retail offerings to those residents who reside in the surrounding neighborhoods allowing them to live, shop, and utilize local services in the same area.

We would like to express our appreciation to Draper City for considering our request for rezoning and land use amendments for approximately 18 acres located at the intersection of 13800 South and Bangerter Highway. The property is situated across from a shopping center on the west side of Bangerter Highway, which includes a Harmons grocery store and various retail outlets. We look forward to engaging with our neighbors, the Planning Commission, and the City Council to discuss this project further.

We are requesting a rezone to CR (Regional Commercial) for the property, as well as the same designation for the land use amendment. This zoning request is appropriate given the property's strategic location within the City of Draper. It is positioned at the intersection of two major traffic corridors—Bangerter Highway and 13800 South. The proposed development will serve as a shopping district, capitalizing on "pass-by" trips from people already traveling on these roads for other purposes. The developer, in collaboration with the city, has worked to secure funding for essential roadway improvements from the Utah Department of Transportation. A traffic study was commissioned to evaluate current conditions and analyze the additional traffic generated by the proposed development. The improvements outlined in the study are not only necessary for the development but will also improve traffic flow in the area immediately.

From a community development perspective, this site represents one of the last remaining large parcels within Draper City that can accommodate an anchor tenant. This will provide local residents with greater shopping options nearby, while stimulating economic growth within the City.

Currently, most of the property is zoned RA-1, and the City's Master Land Use Plan designates it for medium-density residential, low/medium-density residential, and office/service uses on a small parcel fronting 13800 South. We are requesting a land use designation of CR (Regional Commercial), which aligns with the property's unique location and potential. This rezoning offers an opportunity for Draper City to enhance its retail offerings, expand its commercial base, and bring additional convenience to residents without introducing multi-story buildings. Given its position along a major arterial road and across from an existing shopping center, this development will serve as a valuable asset to the area.



PROJECT NUMBER
7172C

PRINT DATE
3/6/25

PROJECT MANAGER
JKF

DESIGNED BY
KFW

1 OF 1

LLOYD PROPERTY

13800 SOUTH BANGERTER HIGHWAY
DRAPER, UTAH
REZONING EXHIBIT



LAYTON
Phone: 801.547.1100

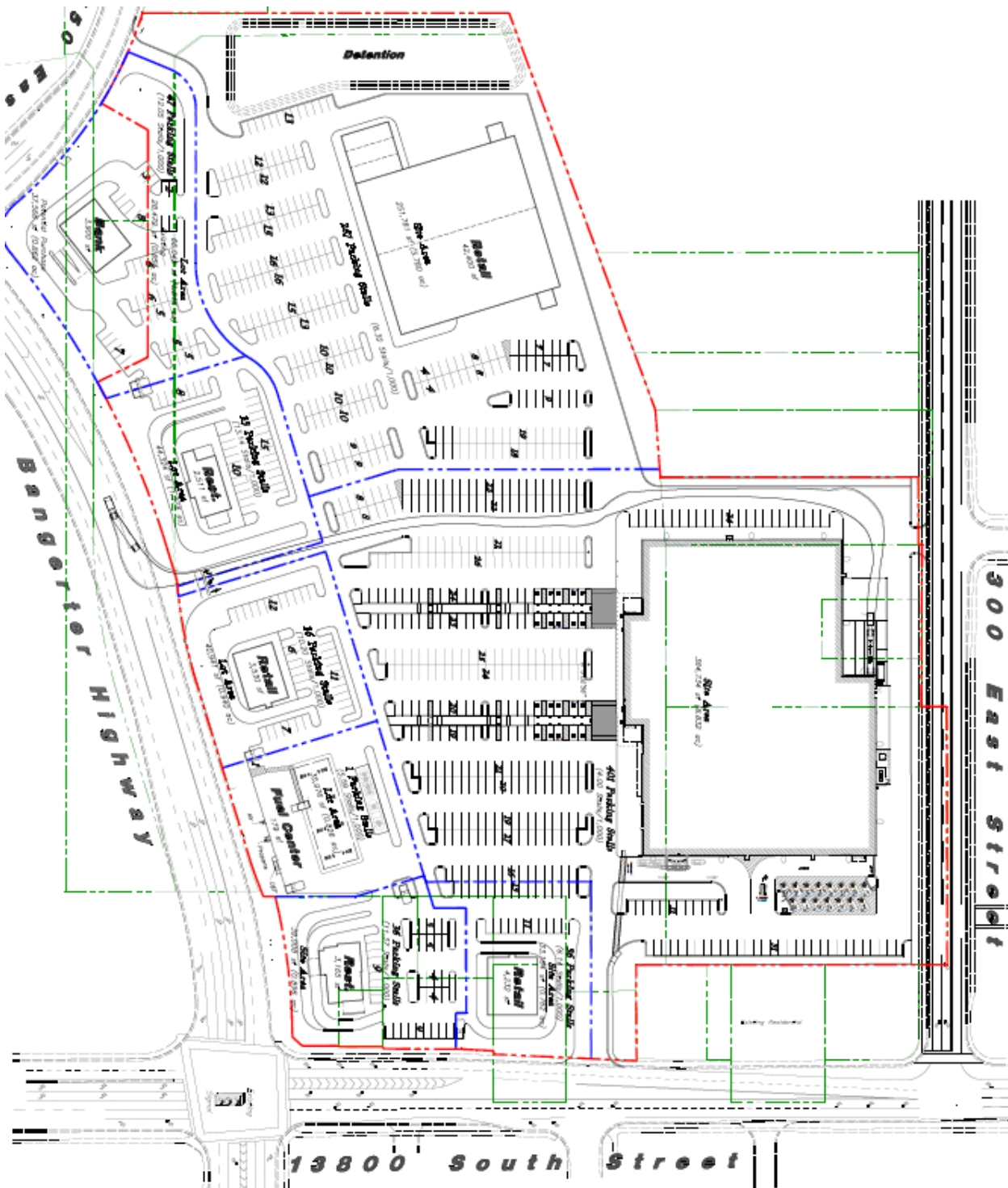
TOOELE
Phone: 435.843.3590

CEDAR CITY
Phone: 435.865.1453

RICHFIELD
Phone: 435.896.2963

SANDY
45 W 10000 S, Suite 500
Sandy, UT 84070
Phone: 801.255.0529
WWW.ENSIGNENG.COM

Exhibit A



From: Brandon T
To: [Todd Draper](#)
Subject: [EXT] Public Hearing Comments for property at 13782 S. 300 E
Date: Wednesday, November 19, 2025 9:07:04 AM

[EXTERNAL SENDER! Only open attachments/links you know are safe.]

Hello Todd & Planning Commission Members,

I am writing to present my comments regarding the change in zoning for App. # 2025-0064-MA and 2025-0065-MA located at approximately 13782 S. 300 E. in Draper.

My name is Brandon Thomas and I live at [REDACTED] Draper. I strongly object to changing the zoning for this property. For me it is a simple question. If you were drawing up a city plan from scratch would you put two grocery stores across the street from each other? Would you build two fire stations or two post offices across the street from each other? My point is simple, let's stick with the city plan. We need more housing and in past meetings I've attended the planning commission was consistent in arguments to keep both sides of 300 East for housing, if not more. New housing is going in and selling quickly in the same area. 300 East already backs up tremendously due to commuter traffic headed to Alpine and Utah County trying to avoid I-15 and driving on 300 east and/or 13800 South. A grocery store only congests the area further. As I said, let's stick with the city plan. I strongly recommend the planning commission reject the proposal to build a grocery store next to a grocery store. Not mention we have a Smith's a mile or two away.

If my objection is overruled, can you at least stick with the plan to keep housing all the way along the 300 east road on the west and east side? Please, please do not create a back entrance to the shopping center along 300 East. Is that where all the semi-trucks will enter and exit? That back entrance along 300 East will mean endless traffic and noise directly into the entrance to our neighborhood.

Regards,

Brandon Thomas

From: Chloe Wardle
To: [Todd Draper](#)
Subject: [EXT] RE: APP# 202-0064-MA and 22025-0065-MA
Date: Sunday, November 16, 2025 10:38:31 AM

[EXTERNAL SENDER! Only open attachments/links you know are safe.]

Hi Todd,

I'm writing to express my strong opposition to the proposed rezoning of parcel 34061760550000 at 13782 S 300 E from residential to commercial for a potential Smith's Marketplace grocery store.

1. Traffic Impact:

According to ITE trip generation data, a store of this size would generate over 7,000–10,000 vehicle trips per day, with 800–950 during the evening peak hour alone. In contrast, 100 single-family attached homes (such as townhomes) would generate around 650 daily trips and just 58 during peak hour. This level of traffic would place significant strain on local roads like 300 East and negatively impact nearby neighborhoods.

2. Tax Revenue Cannibalization:

Multiple studies show that large-format retail stores often do not increase net local tax revenue. Up to 84% of a new store's sales typically come from existing businesses. In cases where stores are built near competitors, the revenue is simply redistributed, not expanded — and struggling nearby stores may even close, leading to vacant storefronts and reduced long-term value.

3. Support for Denser Housing:

We support responsible growth, including higher-density residential options like townhomes. These bring needed housing while minimizing traffic and infrastructure burden. It's a more compatible use for this parcel and better aligned with Draper's long-term livability goals.

We urge you to preserve the current residential zoning and prioritize smart, sustainable development for Draper.

Thank you for your time and service.

Chloe Wardle

--

Chloe Wardle
chloe@fjpsupply.com
O: 801.561.3108

From: Tallen Wardle
To: [Todd Draper](#)
Subject: [EXT] Bangerter Crossroads – Land Use Map and Zoning Map Amendment Requests
Date: Wednesday, November 19, 2025 12:01:43 PM

[EXTERNAL SENDER! Only open attachments/links you know are safe.]

Hello Todd,

I am submitting this letter as a formal written public comment regarding the proposed rezone of approximately 17.88 acres located near the intersection of 13800 South and 300 East, immediately adjacent to my home located at [REDACTED].

My home has been in my family for decades. I purchased it 3 years ago from my Grandparents and have since invested tens of thousands of dollars in renovations and restoration. I also share ownership with a close friend who is a direct descendent of William Draper Jr., which underscores our longstanding ties and deep commitment to this community.

As the owner/operator of a commercial construction company, I have worked directly on large commercial developments. I support responsible commercial growth where it is appropriate. However, my professional background gives me firsthand knowledge of the noise, lighting, HVAC equipment, delivery schedules, traffic, and late-night activity that accompany Regional Commercial districts long after construction is complete. These impacts are substantial and unavoidable. From my experience there also tends to be consistent tenant turnover in these developments which results in a never-ending cycle of construction and demolition of tenant unit interiors. There are already several examples of this occurring at Bangerter Crossing and various other high density commercial developments within Draper's City limits. Below is an outline of the remainder of my concerns:

Zoning & General Plan Conflicts

The Draper City General Plan designates this area for:

- Residential Medium Density
- Residential Low–Medium Density
- Office/Service uses

These categories were intentionally assigned to serve as a low-intensity transitional buffer between Bangerter Highway and the adjacent residential neighborhood. A shift to Regional Commercial (CR) is a significant departure from the General Plan and does not meet Draper's standard of compatibility with surrounding uses.

Impacts to Adjacent Properties

As an adjacent property owner, I would be directly and significantly affected. Regional Commercial uses introduce impacts that cannot be mitigated adequately, including:

- late-night and early-morning lighting
- rooftop mechanical noise
- delivery and service truck activity
- increased customer traffic
- extended operating hours

These impacts will negatively affect the quiet enjoyment, privacy, and residential character of my property and the surrounding homes.

Traffic Concerns

Traffic conditions on 300 East are already failing during peak hours. Many days, the congestion is so severe that I cannot exit my own driveway without triggering frustration or honking from commuters. The City's own engineering review acknowledges significant traffic issues in this corridor.

Adding a Regional Commercial center will further burden an over-capacity roadway and materially reduce the safety and functionality of the neighborhood's transportation network.

Property Value Impacts

Locating a high-intensity regional commercial district directly adjacent to a long-established single-family residence will have a negative impact on property values. The combination of increased traffic, commercial lighting, noise, and late-night activity will materially diminish the desirability of the surrounding residential area.

For these reasons, I respectfully request that the Planning Commission recommend denial of the proposed rezone from RA1 to CR.

If redevelopment must occur on this parcel, I encourage the City to consider zoning classifications that align with the General Plan and maintain neighborhood compatibility, such as **Community Commercial (CC)** or **Office/Residential (OR)**.

Thank you for your time, consideration, and commitment to responsible planning for Draper's future.

Thank you,

Tallen Wardle

Project Manager

T&G Construction



[REDACTED]



[REDACTED]



tandgconstructionllc.com



[REDACTED]

Draper, UT, 84020

From: Susan Niemann Knapp
To: [Todd Draper](#); planning.comment@draper.ut.us; [Tasha Lowery](#)
Subject: [EXT] Public Comment Opposing the Bangerter Crossroads Land Use & Zoning Map Amendments
Date: Thursday, November 20, 2025 11:43:42 AM

[EXTERNAL SENDER! Only open attachments/links you know are safe.]

Dear Planning Commission Members,

I am writing to submit my public comment regarding the proposed **Bangerter Crossroads Land Use Map Amendment and Zoning Map Amendment** for approximately **17.88 acres located near 13782 S. 300 E.** After reviewing the staff memo and the criteria listed for approval and denial of such amendments, as well as the agenda documentation noting this item as a legislative request, **I respectfully request that the Commission deny this proposal.**

Below are the key reasons, grounded in Draper City's own standards:

1. The Amendment Is Not Consistent With the General Plan

This proposal is not a small refinement—it is a fundamental redirection of the long-standing land-use vision for our neighborhood. Draper's own findings for denial state that amendments should be rejected when they are **not consistent with the goals, objectives, and policies of the General Plan.**

The General Plan calls for **thoughtful transitions** between commercial and residential areas. This amendment would place a **large commercial center directly adjacent to established single-family neighborhoods**, with no transitional buffer.

The site is currently zoned **RA1 (Residential Agricultural)**, which exists to preserve larger lots, open space, and low-impact development patterns. A Regional Commercial designation is a **complete departure** from that intent.

This drastic shift contradicts core General Plan principles, including neighborhood integrity, compatible land-use transitions, and preservation of existing low-density residential environments.

2. The Proposal Is Not Harmonious With Surrounding Development

This amendment creates an abrupt and incompatible land-use mismatch that would disrupt the established character of the neighborhood. Draper's denial criteria clearly state that amendments should be harmonious with existing development.

Homes in this area were purchased with the expectation of **low-density residential**

zoning, not adjacency to a commercial center.

A commercial development of this scale introduces **noise, lighting, increased nighttime activity, delivery operations, and significant vehicle traffic**—all incompatible with a quiet, semi rural residential setting.

3. Adjacent Properties Will Be Adversely Affected

Draper City's criteria require denial of an amendment when it would adversely affect adjacent properties. This proposal would have **direct and immediate negative impacts** on homeowners that cannot be fully mitigated by conditions.

Residents would experience:

- Increased congestion and cut-through traffic
- Loss of privacy
- Increased noise and nighttime lighting
- Negative impacts on home values
- Reduced safety and walkability

These concerns are not hypothetical—they are inevitable consequences of siting a regional commercial center next to existing homes.

4. Infrastructure Is Not Adequate for Commercial Intensity

The infrastructure required to support a commercial center does not currently exist in this location and would require **major taxpayer-funded upgrades** that have not been addressed in the proposal.

Residents already experience:

-

Significant congestion at Bangerter/13800 S during peak hours

- Insufficient road width and lack of turn lanes
- Stormwater issues that would be worsened by additional impervious surfaces
- Increased demands on police and fire services

Local roads—including 13800 S and 300 E—were never designed to carry commercial-level traffic volumes, and retrofitting them would be costly, disruptive, and potentially infeasible.

5. The Amendment Does Not Advance the City's Planning Principles

There is **no planning basis** to justify converting a residential/agricultural pocket into a regional commercial node.

This site:

- Borders long-established, stable residential neighborhoods
- Lacks natural or planned transitional areas
- Is not identified in the General Plan as a commercial expansion zone

Draper already has established commercial corridors—such as Draper Peaks, the Bangerter/12300 S commercial area, and the Town Center redevelopment zone—where commercial growth is intended and appropriate.

6. Residents Are Not Requesting This Change

This change is **developer-driven**, not community-driven. Residents will bear the burden through:

- Increased traffic
- More noise and lighting
- Reduced property values
- Lower neighborhood safety
- Strain on residential streets
- Loss of the semirural character protected by RA1 zoning

This proposal benefits a private developer while imposing significant quality-of-life costs on the families who already live here.

7. Better Locations Already Exist for Commercial Development

Commercial growth should occur **where the city has already planned for it**, not by sacrificing stable residential zones. Draper has multiple designated areas for commercial development, making this rezoning unnecessary and poorly located.

Closing Request

Under Draper City's own criteria, this amendment fails multiple required findings, including **consistency with the General Plan, harmony with surrounding development, and avoiding adverse impacts to adjacent properties.**

For these reasons, **I urge the Planning Commission to recommend denial** of the Bangerter Crossroads Land Use Map Amendment and Zoning Map Amendment. The proposal poses significant long-term negative impacts to neighboring residents and does not align with Draper's established land-use vision.

Thank you for considering my comments. I appreciate your service and your careful review of this important issue.

Sincerely,

Ryan & Susan Knapp

Draper, UT 84020

From: Susan Niemann Knapp
To: [Troy Walker](#); [Tasha Lowery](#); [Mike Green](#); [Fred Lowry](#); [Marsha Vawdrey](#); [BrynHeather Johnson](#); planning.comment@draper.ut.us; [Todd Draper](#)
Subject: [EXT] Fwd: Public Comment Opposing the Bangerter Crossroads Land Use & Zoning Map Amendments
Date: Thursday, November 20, 2025 12:03:27 PM

[EXTERNAL SENDER! Only open attachments/links you know are safe.]

Dear Planning Commission Members,

I am writing to submit my public comment regarding the proposed **Bangerter Crossroads Land Use Map Amendment and Zoning Map Amendment** for approximately **17.88 acres** located near **13782 S. 300 E.** By way of introduction, my husband and I built a home in the Rockwell Park community. We are walking distance to this location.

After reviewing the staff memo and the criteria listed for approval and denial of such amendments, as well as the agenda documentation noting this item as a legislative request, **I respectfully request that the Commission deny this proposal.**

Below are the key reasons, grounded in Draper City's own standards:

1. The Amendment Is Not Consistent With the General Plan

This proposal is not a small refinement—it is a fundamental redirection of the long-standing land-use vision for our neighborhood. Draper's own findings for denial state that amendments should be rejected when they are **not consistent with the goals, objectives, and policies of the General Plan.**

The General Plan calls for **thoughtful transitions** between commercial and residential areas. This amendment would place a **large commercial center directly adjacent to established single-family neighborhoods**, with no transitional buffer.

The site is currently zoned **RA1 (Residential Agricultural)**, which exists to preserve larger lots, open space, and low-impact development patterns. A Regional Commercial designation is a **complete departure** from that intent.

This drastic shift contradicts core General Plan principles, including neighborhood integrity, compatible land-use transitions, and preservation of existing low-density residential environments.

2. The Proposal Is Not Harmonious With Surrounding Development

This amendment creates an abrupt and incompatible land-use mismatch that would disrupt the established character of the neighborhood. Draper's denial criteria clearly state that amendments should be harmonious with existing development.

Homes in this area were purchased with the expectation of **low-density residential zoning**, not adjacency to a commercial center.

A commercial development of this scale introduces **noise, lighting, increased nighttime activity, delivery operations, and significant vehicle traffic**—all incompatible with a quiet, semi rural residential setting.

3. Adjacent Properties Will Be Adversely Affected

Draper City's criteria require denial of an amendment when it would adversely affect adjacent properties. This proposal would have **direct and immediate negative impacts** on homeowners that cannot be fully mitigated by conditions.

Residents would experience:

- Increased congestion and cut-through traffic
- Loss of privacy
- Increased noise and nighttime lighting
- Negative impacts on home values
- Reduced safety and walkability

These concerns are not hypothetical—they are inevitable consequences of siting a regional commercial center next to existing homes.

4. Infrastructure Is Not Adequate for Commercial Intensity

The infrastructure required to support a commercial center does not currently exist in this location and would require **major taxpayer-funded upgrades** that have not been addressed in the proposal.

Residents already experience:

- Significant congestion at Bangerter/13800 S during peak hours
- Insufficient road width and lack of turn lanes
- Stormwater issues that would be worsened by additional impervious surfaces
- Increased demands on police and fire services

Local roads—including 13800 S and 300 E—were never designed to carry commercial-level traffic volumes, and retrofitting them would be costly, disruptive, and potentially infeasible.

5. The Amendment Does Not Advance the City's Planning Principles

There is **no planning basis** to justify converting a residential/agricultural pocket into a regional commercial node.

This site:

- Borders long-established, stable residential neighborhoods
- Lacks natural or planned transitional areas
- Is not identified in the General Plan as a commercial expansion zone

Draper already has established commercial corridors—such as Draper Peaks, the Bangerter/12300 S commercial area, and the Town Center redevelopment zone—where commercial growth is intended and appropriate.

6. Residents Are Not Requesting This Change

This change is **developer-driven**, not community-driven. Residents will bear the burden through:

- Increased traffic
- More noise and lighting
- Reduced property values
- Lower neighborhood safety
- Strain on residential streets
- Loss of the semirural character protected by RA1 zoning

This proposal benefits a private developer while imposing significant quality-of-life costs on the families who already live here.

7. Better Locations Already Exist for Commercial Development

Commercial growth should occur **where the city has already planned for it**, not by sacrificing stable residential zones. Draper has multiple designated areas for commercial development, making this rezoning unnecessary and poorly located.

Closing Request

Under Draper City's own criteria, this amendment fails multiple required findings, including **consistency with the General Plan, harmony with surrounding development, and avoiding adverse impacts to adjacent properties.**

For these reasons, **I urge the Planning Commission to recommend denial** of the Bangerter Crossroads Land Use Map Amendment and Zoning Map Amendment. The proposal poses significant long-term negative impacts to neighboring residents and does

not align with Draper's established land-use vision.

Thank you for considering my comments. I appreciate your service and your careful review of this important issue. For your consideration, we are walking distance from this lot.

Sincerely,

Ryan & Susan Knapp

Draper, UT 84020

From: [REDACTED]
To: [Todd Draper](#)
Cc: [M Thorn](#)
Subject: [EXT] Bangerter Crossroads Proposed Zone change
Date: Monday, November 24, 2025 4:38:09 PM

[EXTERNAL SENDER! Only open attachments/links you know are safe.]

Todd,

I am writing with my concern tied to a proposed Lowe's or Smith's in the property mentioned in Item #2, under review. I see there is a negative recommendation but also see the zone review signs are up so I wanted to give feedback against rezoning to allow a box store. I'd love to have a Lowe's closer but not at that intersection. Traffic is already a problem there and a box store doesn't fit in with what else is going on in the area. A box store can be on the other side of the freeway over by Ikea area where there is more open ground to support something like that. A grocery store wouldn't be terrible but Harmon's is already there and again I think it will create additional unwanted traffic congestion.

I don't know the zonings but something with affordable housing a part of it should be considered so we can keep young families in the area. Professional space for offices would not be a huge traffic generator either.

I'm not sure how to provide public input and couldn't see from the website how to submit. You can't really read the sign as you're driving to know when the meeting will be held either. I've been to Daybreak and Draper has the opportunity to create something similar to that in the space if it needs to all be commercial. The new development in Highland is another example of building something with some character and charm. If the zoning is changed, then do it for something that supports that type of environment.

Thank you for your time,
MaryLu Thorn
[REDACTED]

MEMO



To: City Council
From: Todd A. Draper, AICP
Date: 2025-12-16
Re: Public Hearing: Ordinances #1690 and #1691

Comments:

This application is a request for approval of a Land Use Map Amendment and a Zoning Map Amendment for approximately 1.44 acres located at the northeast corner of 13800 South and the Bangerter Highway, at approximately 231 E. 13800 S. The subject properties are currently zoned either RA1 (Residential Agricultural) or OR (Office Residential). The applicant is requesting that the Land Use Map and Zoning Map Amendments be approved to allow for the development of the overall site as a part of a commercial center.

The Planning Commission at their November 20, 2025 meeting forwarded negative recommendations for both applications on unanimous 4-0 votes.

Land Use Map Amendment

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will not adversely affect adjacent property.
4. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The proposed land use map amendment complies with DCMC Section 9-2-020(F).
6. The legislative body may adopt any amendment to the general plan land use map that the legislative body considers appropriate.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.

4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The legislative body may reject any amendment to the general plan land use map that the legislative body considers appropriate.

Zoning Map Amendment

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment is consistent with the standards of any applicable overlay zone.
4. The proposed map amendment will not adversely affect adjacent property.
5. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

ATTACHMENTS:

[Ordinance 1690 - LUMA v3 CLEAN.pdf](#)

ATTACHMENTS:

[Ordinance 1691 - ZMA v3 CLEAN.pdf](#)

ATTACHMENTS:

[Openshaw Draper 138 LUMA and ZMA PC Staff Report -Final.pdf](#)

ORDINANCE NO. 1690

AN ORDINANCE AMENDING THE OFFICIAL LAND USE MAP OF DRAPER CITY FOR APPROXIMATELY 1.44 ACRES LOCATED AT 231 EAST 13800 SOUTH FROM OFFICE SERVICE TO REGIONAL COMMERCIAL LAND USE DESIGNATION, OTHERWISE KNOWN AS THE OPENSHAW DRAPER 138 LAND USE MAP AMENDMENT.

WHEREAS, pursuant to State law, Draper City has adopted a General Plan and Land Use Map to guide future growth and development within the City; and

WHEREAS, from time to time it is necessary to review and amend the Land Use Map to keep pace with development within the City and to ensure the provision of a variety of economic uses; and

WHEREAS, the City Council finds that redesignation of the subject 1.44-acre parcel to Regional Commercial is consistent with the General Plan only if the owner dedicates necessary additional right-of-way along 13800 South and/or Bangerter Highway to allow the City to widen and improve those roadways in conjunction with the Bangerter Crossroads project; and

WHEREAS, the applicant seeks to avoid the need for eminent domain proceedings and the City desires to secure voluntary dedications through a development agreement; and

WHEREAS, the proposed Land Use Map change set forth herein has been reviewed by the Planning Commission and the City Council, and all appropriate public hearings have been held in accordance with Utah law to obtain public input regarding the proposed revisions to the Land Use Map; and

WHEREAS, the Planning Commission has reviewed and made a recommendation to the City Council concerning the proposed amendment to the official Land Use Map of Draper City, and the City Council has found the proposed land use change, subject to the contingency and effectiveness provisions herein, to be in the best interest of the health, safety, and welfare of the citizens of Draper City and consistent with the City's General Plan.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH:

Section 1. Findings and Contingent Approval. The City Council finds that the amendment of the official Land Use Map as described in Section 2 below is in the best interest of the health, safety, and welfare of the citizens of Draper City and is consistent with the City's General Plan, provided that appropriate infrastructure improvements, traffic mitigation measures, voluntary dedication of all rights-of-way determined by the City

Engineer to be necessary for the widening and improvement of 13800 South and Bangerter Highway, and other public benefits are secured through a development agreement. The approval granted by this ordinance is contingent upon the conditions set forth in Section 3 and is not intended to presently create any vested rights in the applicant.

Section 2. Land Use Map Amendment. Subject to the contingency and effectiveness provisions in Section 3, the official Land use Map of Draper City is hereby amended to change the land use designation of the following described real property located at approximately 231 East 13800 South within Draper City, Salt Lake County, State of Utah, (containing approximately 1.44 acres), previously designated as Office Service as shown on the Draper City Land Use Map, as depicted in Exhibit "A" hereto, to the Regional Commercial land use designation:

BEGINNING AT AN EXISTING REBAR AND CAP LOCATED BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET, SAID POINT BEING LOCATED NORTH 00°39'30" WEST 8.57 FEET TO THE FOUND STANDARD COUNTY MONUMENT FOR THE CENTER OF SECTION 6 AND WEST 458.01 FEET AND NORTH 55.10 FROM THE CALCULATED TRUE CENTER OF SECTION 6 AT THE INTERSECTION OF 13800 SOUTH AND 300 EAST (MONUMENT WAS NOT FOUND), TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE ALONG THE NORTHERLY RIGHT OF WAY OF 13800 SOUTH STREET THE FOLLOWING TWO (2) CALLS: NORTH 86°52'26" WEST 99.40 FEET, NORTH 89°40'40" WEST 217.33 FEET TO AN EXISTING REBAR AND CAP BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET; THENCE ALONG THE EASTERLY RIGHT OF WAY OF BANGATER HIGHWAY THE FOLLOWING THREE (3) CALLS: NORTH 47°30'37" WEST 16.24 FEET TO AN EXISTING REBAR AND CAP, NORTH 00°12'30" WEST 9.31 FEET, ALONG AN ARC OF A 719.17 FOOT RADIUS CURVE TO THE LEFT 165.41 FEET (CHORD BEARS NORTH 06°47'49" WEST 165.04 FEET) TO AN EXISTING REBAR AND CAP; THENCE NORTH 89°26'42" EAST ALONG AN EXISTING FENCE LINE 348.15 FEET TO AN EXISTING FENCE; THENCE SOUTH ALONG AN EXISTING FENCE LINE 194.18 FEET TO THE POINT OF BEGINNING.

AREA = 62,635.54 SQ.FT. / 1.44 ACRES

Section 3. Contingent Effectiveness; Expiration if Conditions Not Met. This ordinance shall not take effect unless and until a development agreement between Draper City and the applicant that adequately addresses traffic mitigation, roadway improvements, voluntary dedication of all rights-of-way determined by the City Engineer to be necessary for the widening and improvement of 13800 South and Bangerter Highway, and other conditions deemed necessary by the City Council has been fully executed by all parties and recorded with the Salt Lake County Recorder. The City Recorder is hereby instructed not to publish this ordinance until the development agreement has been fully executed and recorded. Publication shall occur within ten (10) calendar days after recordation.

All activities undertaken by the applicant prior to the effective date of this ordinance

are at the sole risk of the applicant, and no vested rights shall accrue until this ordinance becomes effective. If the development agreement has not been executed by all parties and recorded with the Salt Lake County Recorder on or before May 7, 2026, this ordinance shall, on May 8, 2026, automatically become null and void without further action by the City Council, and the prior land use designations shall remain in full force and effect. The City Recorder is instructed not to publish the ordinance in such event.

Section 4. Requirement of Development Agreement. This land use map amendment is granted in express reliance upon the applicant's commitment to enter into a development agreement with Draper City that includes, at a minimum, the voluntary dedication of all rights-of-way determined by the City Engineer to be necessary for the widening and improvement of 13800 South and Bangerter Highway, together with any additional mitigation or conditions deemed appropriate. The applicant is expected to submit a complete development agreement application no later than December 29, 2025, to allow processing and City Council consideration on or before May 7, 2026.

Section 5. Severability Clause. If any part or provision of this Ordinance is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Ordinance and all provisions, clauses and words of this Ordinance shall be severable.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE _____ DAY OF _____, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

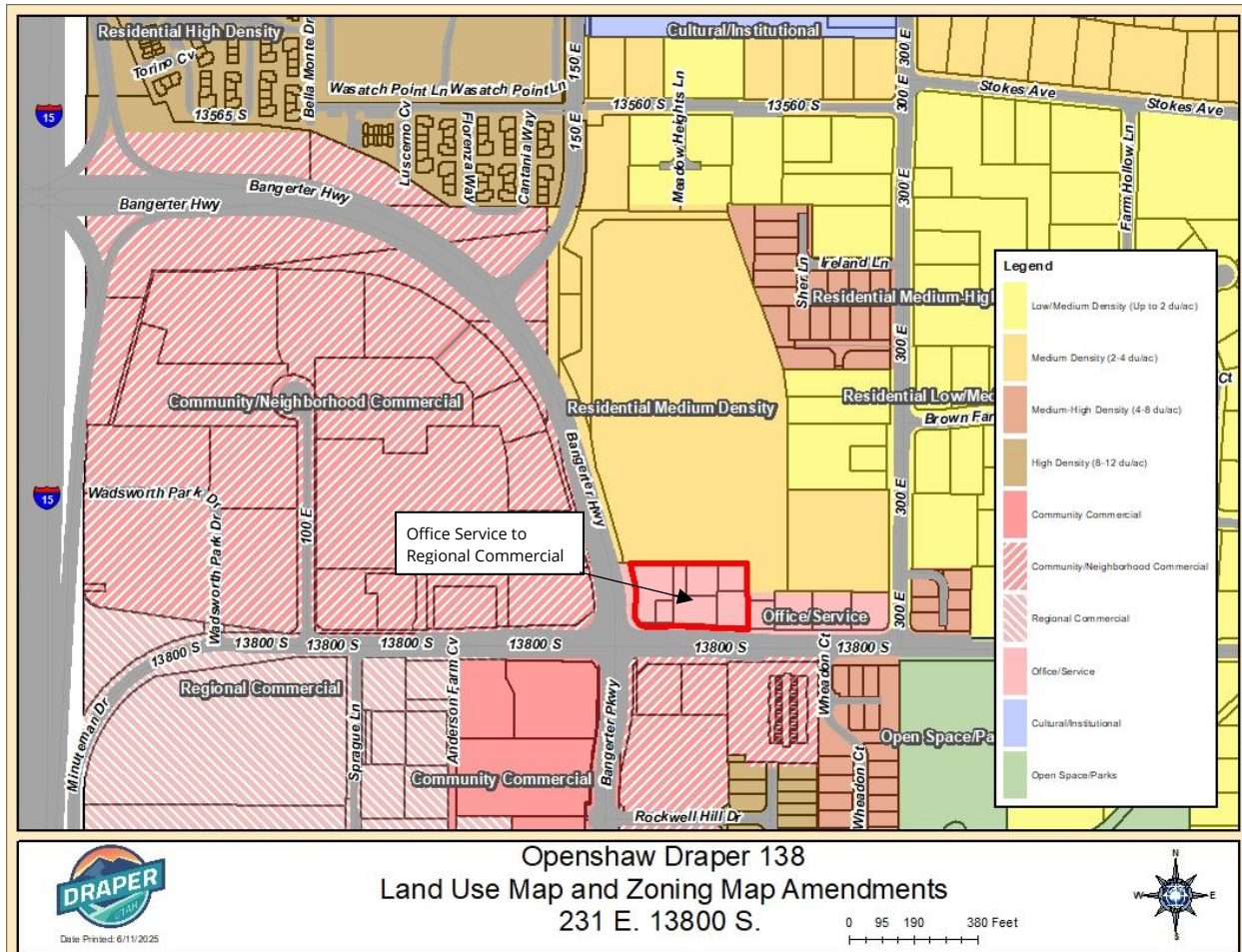
VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

EXHIBIT A

OPENSHAW DRAPER 138 LAND USE MAP AMENDMENT



ORDINANCE NO. 1691

AN ORDINANCE AMENDING THE OFFICIAL ZONING MAP OF DRAPER CITY FOR APPROXIMATELY 1.44 ACRES LOCATED AT 231 EAST 13800 SOUTH FROM RA1 (RESIDENTIAL, AGRICULTURAL) AND OR (OFFICE RESIDENTIAL) TO CR - (REGIONAL COMMERCIAL), OTHERWISE KNOWN AS THE OPENSHAW DRAPER 138 ZONING MAP AMENDMENT.

WHEREAS, pursuant to State law, Draper City has adopted a Zoning Ordinance and Zoning Map to guide the orderly development and use of property within the City; and

WHEREAS, from time to time it is necessary to review and amend the Zoning Map to keep pace with development within the City and to ensure the provision of a variety of economic uses; and

WHEREAS, the City Council finds that rezoning the subject 1.44-acre parcel to CR (Regional Commercial) is consistent with the General Plan and the concurrently adopted Land Use Map amendment only if the applicant voluntarily dedicates all additional rights-of-way required by the City Engineer for the widening and improvement of 13800 South and Bangerter Highway in conjunction with the Bangerter Crossroads project; and

WHEREAS, the City seeks to secure these dedications through a development agreement rather than through eminent domain; and

WHEREAS, the proposed zone change set forth herein has been reviewed by the Planning Commission and the City Council, and all appropriate public hearings have been held in accordance with Utah law to obtain public input regarding the proposed revisions to the Zoning Map; and

WHEREAS, the Planning Commission has reviewed and made a recommendation to the City Council concerning the proposed amendment to the official Zoning Map of Draper City, and the City Council has found the proposed zone change, subject to the contingency and effectiveness provisions herein, to be in the best interest of the health, safety, and welfare of the citizens of Draper City and consistent with the City's General Plan.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH:

Section 1. Findings and Contingent Approval. The City Council finds that the amendment of the official Zoning Map as described in Section 2 below is in the best interest of the health, safety, and welfare of the citizens of Draper City and is consistent with the City's General Plan, provided that appropriate infrastructure improvements, traffic mitigation measures, voluntary dedication of all rights-of-way determined by the City

Engineer to be necessary for the widening and improvement of 13800 South and Bangerter Highway, and other public benefits are secured through a development agreement. The approval granted by this ordinance is contingent upon the conditions set forth in Section 3 and is not intended to presently create any vested rights in the applicant.

Section 2. Zoning Map Amendment. Subject to the contingency and effectiveness provisions in Section 3, the official Zoning Map of Draper City is hereby amended to change the zoning designation of the following described real property located at approximately 231 East 13800 South within Draper City, Salt Lake County, State of Utah, (containing approximately 1.44 acres), previously zoned RA1 and OR as shown on the Draper City Zoning Map, as depicted in Exhibit "A" hereto, to CR (Regional Commercial):

BEGINNING AT AN EXISTING REBAR AND CAP LOCATED BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET, SAID POINT BEING LOCATED NORTH 00°39'30" WEST 8.57 FEET TO THE FOUND STANDARD COUNTY MONUMENT FOR THE CENTER OF SECTION 6 AND WEST 458.01 FEET AND NORTH 55.10 FROM THE CALCULATED TRUE CENTER OF SECTION 6 AT THE INTERSECTION OF 13800 SOUTH AND 300 EAST (MONUMENT WAS NOT FOUND), TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE ALONG THE NORTHERLY RIGHT OF WAY OF 13800 SOUTH STREET THE FOLLOWING TWO (2) CALLS: NORTH 86°52'26" WEST 99.40 FEET, NORTH 89°40'40" WEST 217.33 FEET TO AN EXISTING REBAR AND CAP BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET; THENCE ALONG THE EASTERLY RIGHT OF WAY OF BANGATER HIGHWAY THE FOLLOWING THREE (3) CALLS: NORTH 47°30'37" WEST 16.24 FEET TO AN EXISTING REBAR AND CAP, NORTH 00°12'30" WEST 9.31 FEET, ALONG AN ARC OF A 719.17 FOOT RADIUS CURVE TO THE LEFT 165.41 FEET (CHORD BEARS NORTH 06°47'49" WEST 165.04 FEET) TO AN EXISTING REBAR AND CAP; THENCE NORTH 89°26'42" EAST ALONG AN EXISTING FENCE LINE 348.15 FEET TO AN EXISTING FENCE; THENCE SOUTH ALONG AN EXISTING FENCE LINE 194.18 FEET TO THE POINT OF BEGINNING.

AREA = 62,635.54 SQ.FT. / 1.44 ACRES

Section 3. Contingent Effectiveness; Expiration if Conditions Not Met. This ordinance shall not take effect unless and until a development agreement between Draper City and the applicant that adequately addresses traffic mitigation, roadway improvements, voluntary dedication of all rights-of-way determined by the City Engineer to be necessary for the widening and improvement of 13800 South and Bangerter Highway, and other conditions deemed necessary by the City Council has been fully executed by all parties and recorded with the Salt Lake County Recorder. The City Recorder is hereby instructed not to publish this ordinance until the development agreement has been fully executed and recorded. Publication shall occur within ten (10) calendar days after recordation.

All activities undertaken by the applicant prior to the effective date of this ordinance are at the sole risk of the applicant, and no vested rights shall accrue until this ordinance

becomes effective. If the development agreement has not been executed by all parties and recorded with the Salt Lake County Recorder on or before May 7, 2026, this ordinance shall, on May 8, 2026, automatically become null and void without further action by the City Council, and the zoning designations (RA1 and OR) shall remain in full force and effect. The City Recorder is instructed not to publish the ordinance in such event.

Section 4. Requirement of Development Agreement. This zone change is granted in express reliance upon the property owner's commitment to enter into a development agreement with Draper City that includes, at a minimum, the voluntary dedication of all rights-of-way determined by the City Engineer to be necessary for the widening and improvement of 13800 South and Bangerter Highway, together with any additional conditions deemed appropriate. The owner is expected to submit a complete development agreement application no later than December 29, 2025, to allow processing and City Council consideration on or before May 7, 2026.

Section 5. Severability Clause. If any part or provision of this Ordinance is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Ordinance and all provisions, clauses and words of this Ordinance shall be severable.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE _____ DAY OF _____, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:	YES	NO	ABSENT
Councilmember Green	_____	_____	_____
Councilmember Johnson	_____	_____	_____
Councilmember T. Lowery	_____	_____	_____
Councilmember F. Lowry	_____	_____	_____
Councilmember Vawdrey	_____	_____	_____
Mayor Walker	_____	_____	_____

OPENSHAW DRAPER 138 ZONING MAP AMENDMENT





Development Review Committee

1020 East Pioneer Road

Draper, UT 84020

October 28, 2025

To: Draper City Planning Commission
Business Date: November 20, 2025

From: Development Review Committee

Prepared By: Todd A. Draper, AICP, Planning Manager
Planning Division
Community Development Department
801-576-6335, todd.draper@draperutah.gov

Re: Openshaw Draper 138 – Land Use Map and Zoning Map Amendment Requests

Application No.: 2025-0080-MA and 2025-0074-MA

Applicant: Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC.

Project Location: Approximately 231 E. 13800 S.

Current Zoning: RA1 (Residential Agricultural, 40,000 ft² min. lot size) and OR (Office Residential) Zones

Acreage: Approximately 1.44 Acres (Approximately 62,636 ft²)

Request: Request for approval of a Land Use Map Amendment from the Office/Service land use designation to the Regional Commercial land use designation and from the RA1 and OR zones to the CR (Regional Commercial) zone regarding future potential development of the property as part of a commercial center.

BACKGROUND AND SUMMARY

This application is a request for approval of a Land Use Map Amendment and a Zoning Map Amendment for approximately 1.44 acres located at the northeast corner of 13800 South and the Bangerter Highway, at approximately 231 E. 13800 S. (Exhibit C & D). The subject properties are currently zoned either RA1 or OR. The applicant is requesting that the Land Use Map and Zoning Map Amendments be approved to allow for the development of the overall site as a part of a commercial center.

The overall subject property consists of seven (7) parcels ranging in size from approximately 0.09 acres to 0.39 acres. Five (5) single-family dwellings that dated back



prior to the incorporation of the city in 1978 previously existed on the properties. Two of these dwellings were removed in about 2006 and the remaining structures were removed from the property in approximately 2018. The subject properties have been vacant since that time.

ANALYSIS

General Plan and Zoning.

Table 1	General Plan and Zoning Designations	Exhibit
Existing Land Use	Office/Service	Exhibit E
Current Zoning	RA1, OR	Exhibit F
Proposed Use	Commercial Center	
Adjacent Zoning		
East	RA1	
West	CR	
North	RA1	
South	CC (Community Commercial)	

The Office/Service land use designation is characterized as follows:

Office/Service

LAND USE DESCRIPTION	
CHARACTERISTICS	- Includes a variety of office and service uses that range from residential scale and character to major offices that have multiple stories and underground parking, which generate moderate traffic volumes - Development and landscaping standards vary, depending upon the location of the use, and underlying zoning regulations - For minor offices strict development and landscaping requirements will protect adjacent residential uses - For major offices and services, arterial access is desirable and should be located around the central business district, other major commercial cores, or freeway interchanges and away from residential areas
LAND USE MIX	- Small-scale commercial - Planned retail - Office buildings
DENSITY	Up to 12 dwelling units per acre for residential
COMPATIBLE ZONING	- Professional Office (CO2) - Professional Office (CO1) - Office Residential (OR)
LOCATION	Near retail centers, offices, or other compatible uses

The Regional Commercial land use designation is characterized as follows:

Regional Commercial

LAND USE DESCRIPTION	
CHARACTERISTICS	• Include a wide range of commercial uses that combine destination oriented businesses, retail commercial, entertainment and related uses • Include uses that serve both residents and nonresidents of the City • Uniform design standards and aesthetics • Well landscaped street frontages • Limited traffic access points for the site
LAND USE MIX	• Large-scale master-planned commercial centers • Big box centers • Upscale office buildings
COMPATIBLE ZONING	• Regional Commercial (CR)
LOCATION	• Excellent transportation access to major highways • Strategically placed along high-traffic corridors

According to Draper City Municipal Code (DCMC) Section 9-8-020 the purpose of the RA1 zone is to *“foster low density development with little impact on its surroundings and municipal services; to generally preserve the character of the city's semirural areas; and to promote and preserve conditions favorable to large lot family life, including the keeping of limited numbers of animals and fowl. The predominant use in these zones is intended to be detached single-family dwellings, protected from encroachment by commercial and industrial uses.”*

The purpose of the OR zone is listed in DCMC Section 9-11-080 as, *“A district composed of certain land and structures used primarily to provide administrative, clerical, and professional offices, of a residential scale and character, to serve nearby residential and commercial areas, as well as the city as a whole. These uses are characterized by low volume, direct daily customer contact. This district also provides for accessory medium-high density residential (0 to 12 du/ac). This district is designed to be a transitional zone, and should be used to buffer low density residential uses from more intense land uses, districts, and heavily traveled transportation routes. The property development standards, while strict in order to protect adjacent low density residential uses, are designed to be flexible enough to allow experimentation in office and housing design, and to allow housing constructed within this district to incorporate its own protection from more intense adjacent uses.”*

The purpose of the CR zone as listed in DCMC Section 9-8-020 is to, *“foster low density development with little impact on its surroundings and municipal services; to generally preserve the character of the city's semirural areas; and to promote and preserve conditions favorable to large lot family life, including the keeping of limited numbers of animals and fowl. The predominant use in these zones is intended to be detached single-*

family dwellings, protected from encroachment by commercial and industrial uses.”

The applicant’s responses and additional documentation submitted regarding their request for review and approval of the Land Use Map Amendment and the Zoning Map Amendment requests are provided in Exhibit G of this report.

Criteria For Approval.

The Land Use Map amendment request falls under DCMC Section 9-2-020(F) because the Land Use Map is part of Draper City’s General Plan. That section lists the following criteria for a General Plan amendment as:

Plan Amendment: All plan amendments shall be in accordance with Utah Code Annotated 10-9a-404, as amended and, unless requested by the city's legislative body, shall follow the procedures as outlined in Draper City Municipal Code 9-5-060(D).” That section is noted as follows:

- D. Procedure: Zoning text and map amendments shall be considered and processed as provided in this subsection:*
- 1. A complete application shall be submitted to the office of the zoning administrator in a form established by the administrator along with any fee established by the city's schedule of fees. The application shall include at least the following information:*
 - a. The name, address and telephone number of the applicant and the applicant's agent, if any.*
 - b. The name and address of every person or company the applicant represents.*
 - c. The requested amendment and reasons supporting the request.*
 - d. If the proposed amendment requires a change in the zoning map, the application shall include:*
 - (1) An accurate property map showing present and proposed zoning classifications;*
 - (2) All abutting properties showing present zoning classifications; and*
 - (3) An accurate legal description and an approximate common address of the area proposed to be rezoned.*
 - e. If the proposed amendment requires a change in the text of this title, the application shall include chapter and section references and a draft of the proposed text.*
 - 2. After the application is determined to be complete, the zoning administrator shall prepare a staff report evaluating the application.*
 - 3. The planning commission shall schedule and hold a public hearing on the application as provided in sections 9-5-040 and 9-5-045 of this*

chapter. Following the public meeting, the planning commission shall recommend approval, approval with modifications, or denial of the proposed amendment and shall submit its recommendation to the city council for review and decision.

4. *The city council shall schedule and hold a public hearing on the application as provided in sections 9-5-040 and 9-5-045 of this chapter. Following the public hearing, the city council may approve, approve with modifications, or deny the proposed amendment.*

A Map Amendment is a matter committed to the legislative discretion of the City Council and is not controlled by any one standard. However, in making a recommendation to the City Council, the Planning Commission should consider the following factors in Section 9-5-060(E) of the DCMC:

1. Map Amendments:

- a. Whether the proposed amendment is consistent with goals, objectives and policies of the city's general plan;*
- b. Whether the proposed amendment is harmonious with the overall character of existing development in the vicinity of the subject property;*
- c. Whether the proposed amendment is consistent with the standards of any applicable overlay zone;*
- d. The extent to which the proposed amendment may adversely affect adjacent property; and*
- e. The adequacy of facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.*

REVIEWS

Planning Division Review. The Draper City Planning Division has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Engineering and Public Works Divisions Review. The Draper City Engineering and Public Works Divisions have completed their reviews of the Land Use Map and Zoning Map Amendment submissions. Comments from these divisions, if any, can be found in Exhibit A.

Building Division Review. The Draper City Building Division has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

GIS Division Review. The Draper City GIS Division has completed their review of the Land

Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Fire Division Review. The Draper City Fire Marshal has completed his review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Legal Division Review. The Draper City Attorney has completed their review of the Land Use Map and Zoning Map Amendment submissions. Comments from this division, if any, can be found in Exhibit A.

Noticing. Notice has been properly issued in the manner outlined in the City and State Codes.

STAFF RECOMMENDATION

Staff recommends that the Planning Commission review the requests, receive public comment, and make decisions based on the findings listed below and the criteria for approval, or denial, as listed within the staff report.

MODEL MOTIONS

Land Use Map Amendment

Sample Motion for Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Land Use Map Amendment, as requested by Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC., application 2025-0080-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025.

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will not adversely affect adjacent property.
4. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The proposed land use map amendment complies with DCMC Section 9-2-020(F).
6. The legislative body may adopt any amendment to the general plan land use map that the legislative body considers appropriate.

Sample Motion for Modified Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Land Use Map Amendment, as requested by Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC., application 2025-0080-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025, and as modified by the following additional findings:

1. (List any additional findings ...)

Sample Motion for Negative Recommendation – I move that we forward a negative recommendation to the City Council for the Land Use Map Amendment, as requested by Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC., application 2025-0080-MA, based on the findings and criteria for denial listed in the Staff Report dated October 28, 2025.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.
5. The legislative body may reject any amendment to the general plan land use map that the legislative body considers appropriate.

Zoning Map Amendment

Sample Motion for Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Zoning Map Amendment, as requested by Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC., application 2025-0074-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025.

Findings for Approval:

1. The proposed map amendment is consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment is consistent with the standards of any applicable overlay zone.

4. The proposed map amendment will not adversely affect adjacent property.
5. There are adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

Sample Motion for Modified Positive Recommendation – I move that we forward a positive recommendation to the City Council for the Zoning Map Amendment, as requested by Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC., application 2025-0074-MA, based on the following findings and the criteria for approval listed in the Staff Report dated October 28, 2025, and as modified by the following additional findings:

1. (List any additional findings ...)

Sample Motion for Negative Recommendation – I move that we forward a negative recommendation to the City Council for the Zoning Map Amendment, as requested by Charlie Openshaw and Porter Openshaw, representing CJO Holdings, LLC and P&J Ventures, LLC., application 2025-0074-MA, based on the findings and criteria for denial listed in the Staff Report dated October 28, 2025.

Findings for Denial:

1. The proposed map amendment is not consistent with goals, objectives, and policies of the city's general plan.
2. The proposed map amendment is not harmonious with the overall character of existing development in the vicinity of the subject property.
3. The proposed map amendment will adversely affect adjacent property.
4. There are not adequate facilities and services intended to serve the subject property, including, but not limited to, roadways, parks and recreation facilities, police and fire protection, schools, stormwater drainage systems, water supplies, and wastewater and refuse collection.

DEVELOPMENT REVIEW COMMITTEE ACKNOWLEDGEMENT

We, the undersigned, as duly appointed members of the Draper City Development Review Committee, do acknowledge that the application which provides the subject for this staff report has been reviewed by the Committee and has been found to be appropriate for review by the Draper City Planning Commission and/or City Council.

Brien Maxfield

Digitally signed by Brien Maxfield
DN: C=US, E=brien.maxfield@draperutah.gov,
O=Draper, OU=Public Works - Engineering,
CN=Brien Maxfield
Date: 2025.10.28 15:24:49-06'00'

Draper City Public Works Department

Todd A. Draper

Digitally signed by Todd A.
Draper
DN: C=US,
E=todd.draper@draper.ut.us,
O=Draper City Planning,
CN=Todd A. Draper
Date: 2025.06.10
16:00:27-06'00'

Draper City Planning Division

Don Buckley

Digitally signed by Don Buckley
DN: C=US, E=don.buckley@draper.ut.us,
O=Draper City Fire Department, OU=Fire
Marshal, CN=Don Buckley
Date: 2025.06.10 15:35:57-06'00'

Draper City Fire Department

Draper City Legal Counsel

Matthew Symes

Digitally signed by Matthew Symes
DN: C=US,
E=matt.symes@draperutah.gov,
O=Draper City Corp., CN=Matthew Symes
Date: 2025.10.29 06:03:37-06'00'

Draper City Building Division

EXHIBIT A DEPARTMENT REVIEWS

REVIEWS ARE NOT MEANT TO BE AN ALL-INCLUSIVE LIST OF POSSIBLE COMMENTS OR CONDITIONS.

Planning Division Review.

1. No additional Comments

Engineering and Public Works Divisions Review.

1. We have reviewed the subject zone map amendment application, proposing approximately 1.44 acres to be zoned from Residential/Agricultural one acre (RA1) and Office Residential (OR) to Regional Commercial (CR) in accordance with the provisions of Section 9-5-060(E)(1)(e) of the Draper City Municipal Code (DCMC). We speak primarily to the adequacy of facilities and services intended to serve the subject property. In making an amendment, the City Council should consider the following factors. Accordingly, the following comments are recommended for your consideration:
2. The adequacy of facilities and services intended to serve the subject property, including but not limited to roadways, parks and recreation facilities, police and fire protection, schools, storm water drainage systems, water supplies, and waste water and refuse collection; Other than noted below, we are not aware of any inadequacies of the facilities intended to serve this property.
 - A. The change in zone from residential / agricultural one acre (RA1) and Office / Residential (OR) to a commercial zoning, Regional Commercial (CR), represents a significant increase in traffic based on the density potential of the proposed zone. The proposed zone would increase traffic based on any of the potential proposed uses allowed in the zone and the intensity of those uses within the subject area. That being said, the fronting streets are 13800 South, and Bangerter Hwy which are classified as arterial streets with significant traffic capacity. There are peak-time commuter congestion in the area. The size of the subject parcel and the potential number of trips generated from the subject area require mitigation to traffic impacts, where mitigation is typically contemplated around 100 peak hour trips. However, this area was included in a traffic impact study (TIS) that analyzed the surrounding area contained within 300 East, 13800 South, and Bangerter Highway. The TIS analyzed the intensity for traffic generation of the subject area and adjacent area based on the probable land uses and development

density. The TIS report outlines both city deficiencies, which the city is addressing, and project mitigation requirements for the greater area. The project mitigation improvements will be a requirement of any site development or subdivision approval by the city. Those improvements will be completed as part of the development construction. There are incomplete public frontage improvements existing on the subject site and the missing improvements, park strips and sidewalks, will be required of any project.

- B. Connectivity with the subject area to public rights-of-way are established based the city's access management plan and as analyzed in a traffic impact study (TIS) for the subject area and adjacent area bounded by 300 East, 13800 South, and Bangerter Hwy. Access onto 300 East, 13800 South, and Bangerter Hwy are controlled in order to limit impacts from the potential commercial development to the existing and future traffic on the surrounding streets. Development within the subject area will be required to share accesses and have cross-access agreements in place for each site due to the limited access locations available. Accesses are be required to meet Draper City standards as outlined in our Master Transportation Plan. Access is evaluated at the time of a site plan or subdivision application and will follow the requirements of the TIS.
 - C. There are existing storm drainage facilities fronting the subject parcel that are feasible to connect to from the existing site. Any future site drainage will be required to be addressed with any subdivision or site plan application and shall comply with the rules and regulations pertaining to site drainage and the provisions of the development requirements within the Draper City Municipal Code.
 - D. Sanitary sewer facilities will be provided by Jordan Basin Improvement District, formally South Valley Sewer District. Any subdivision or site plan application will require a commitment to serve from the sewer district that facilities are adequate to provide service for the proposed uses.
 - E. Drinking water is provided by WaterPro to the subject parcel. Any subdivision or site plan application will require a commitment to serve from WaterPro that facilities are adequate to provide service for the proposed uses.
3. Accordingly, we will provide comments relative to the potential construction activities when the appropriate application is received.

Building Division Review.

- 1. No additional Comments

Fire Division Review.

1. No additional Comments

GIS Division Review.

1. No additional Comments

Legal Division Review.

1. No additional Comments

EXHIBIT B
PERIMETER MEETS AND BOUNDS DESCRIPTION

BEGINNING AT AN EXISTING REBAR AND CAP LOCATED BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET, SAID POINT BEING LOCATED NORTH 00°39'30" WEST 8.57 FEET TO THE FOUND STANDARD COUNTY MONUMENT FOR THE CENTER OF SECTION 6 AND WEST 458.01 FEET AND NORTH 55.10 FROM THE CALCULATED TRUE CENTER OF SECTION 6 AT THE INTERSECTION OF 13800 SOUTH AND 300 EAST (MONUMENT WAS NOT FOUND), TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN;

THENCE ALONG THE NORTHERLY RIGHT OF WAY OF 13800 SOUTH STREET THE FOLLOWING TWO (2) CALLS: NORTH 86°52'26" WEST 99.40 FEET, NORTH 89°40'40" WEST 217.33 FEET TO AN EXISTING REBAR AND CAP BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET;

THENCE ALONG THE EASTERLY RIGHT OF WAY OF BANGATER HIGHWAY THE FOLLOWING THREE (3) CALLS: NORTH 47°30'37" WEST 16.24 FEET TO AN EXISTING REBAR AND CAP, NORTH 00°12'30" WEST 9.31 FEET, ALONG AN ARC OF A 719.17 FOOT RADIUS CURVE TO THE LEFT 165.41 FEET (CHORD BEARS NORTH 06°47'49" WEST 165.04 FEET) TO AN EXISTING REBAR AND CAP;

THENCE NORTH 89°26'42" EAST ALONG AN EXISTING FENCE LINE 348.15 FEET TO AN EXISTING FENCE; THENCE SOUTH ALONG AN EXISTING FENCE LINE 194.18 FEET TO THE POINT OF BEGINNING.

AREA = 62,635.54 SQ.FT. / 1.44 ACRES

EXHIBIT C

VICINITY MAP

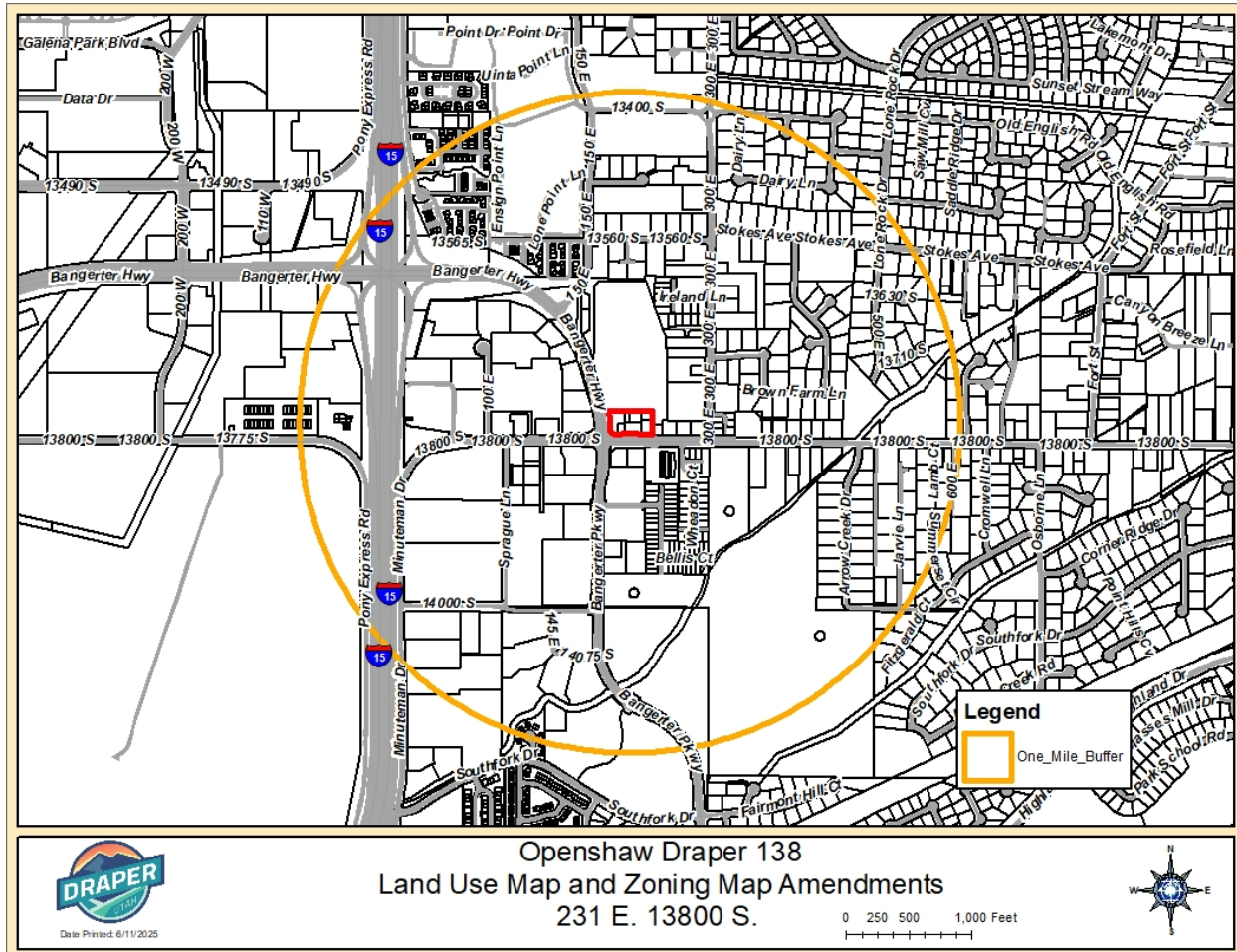


EXHIBIT D
AERIAL MAP

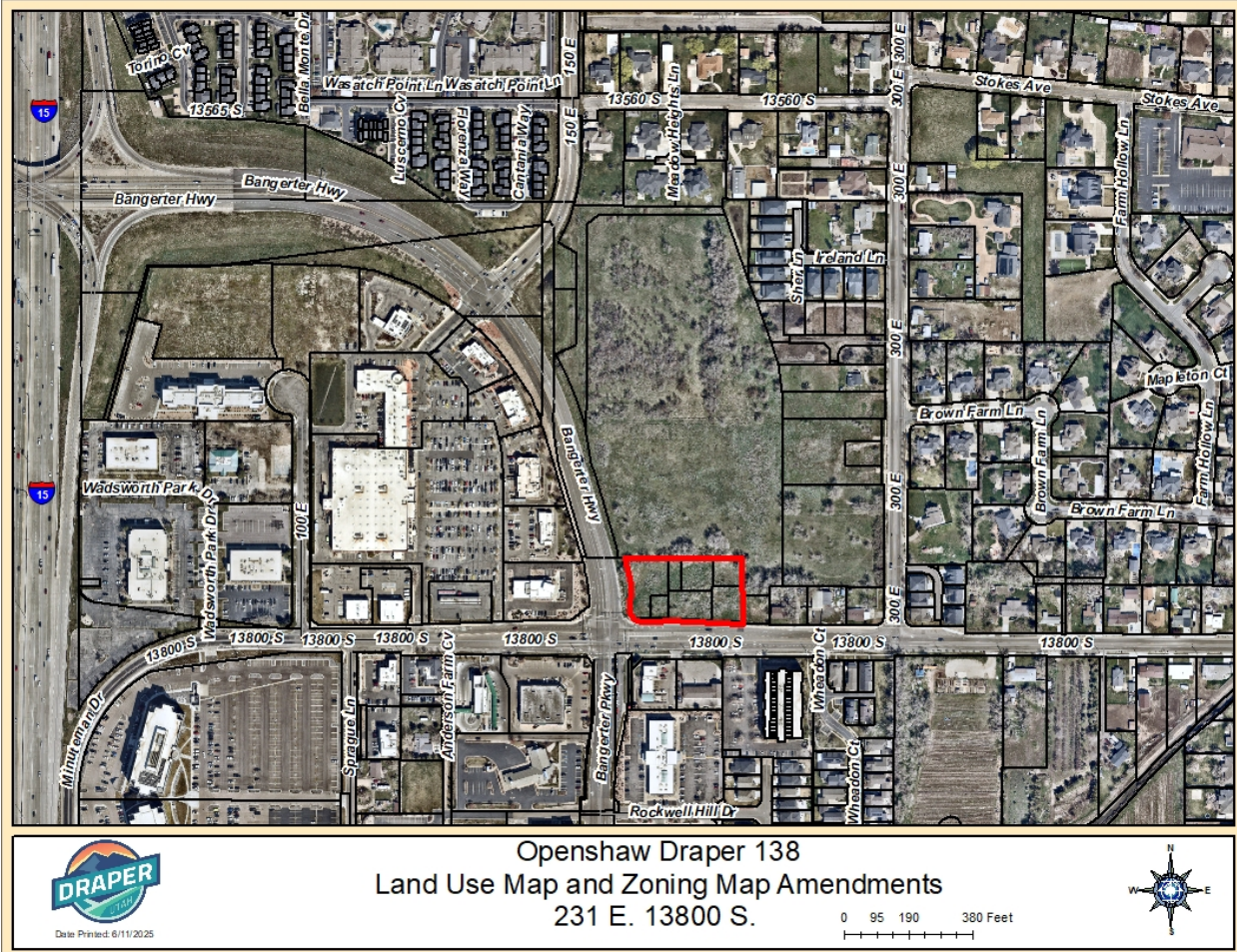


EXHIBIT E LAND USE MAP

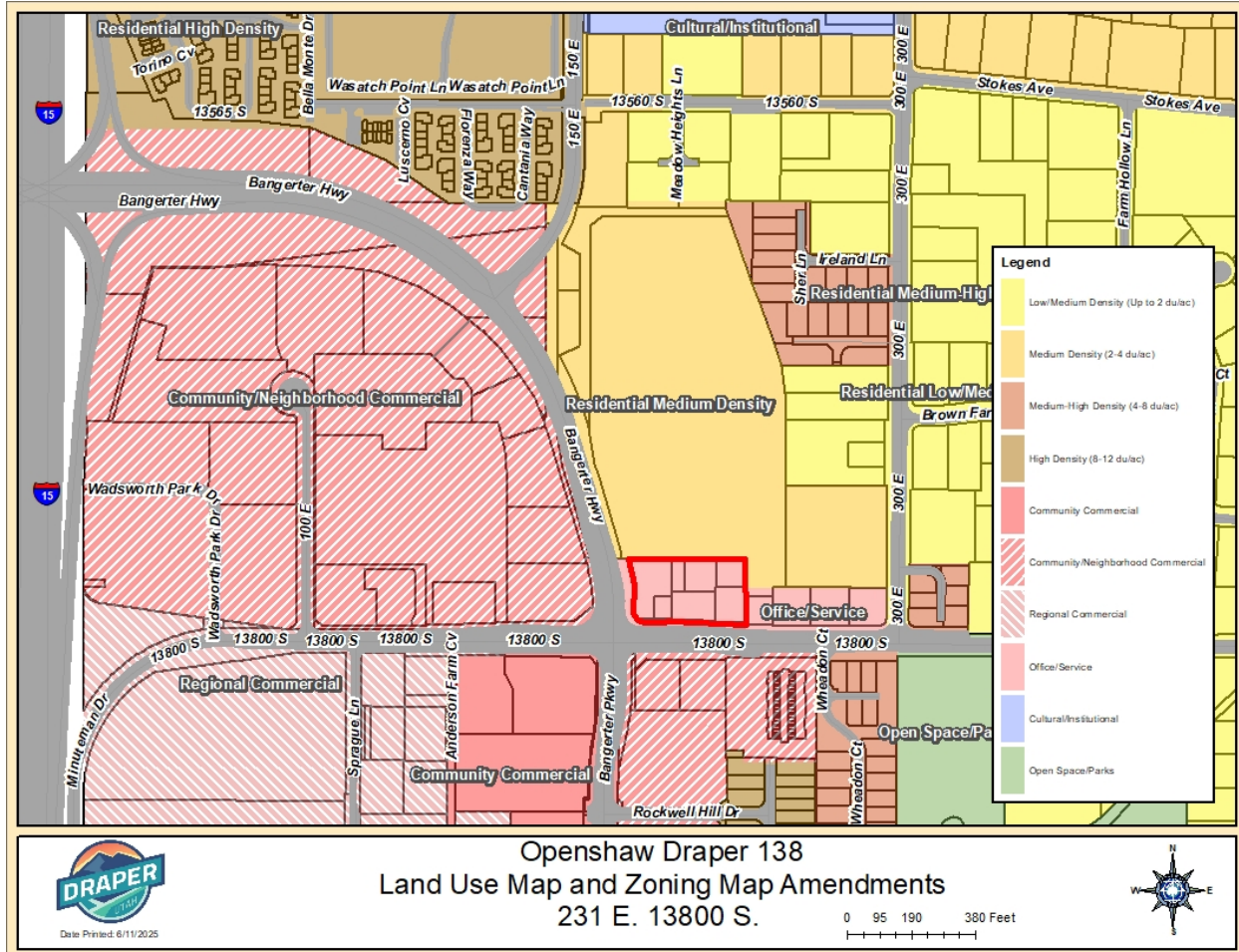


EXHIBIT F ZONING MAP

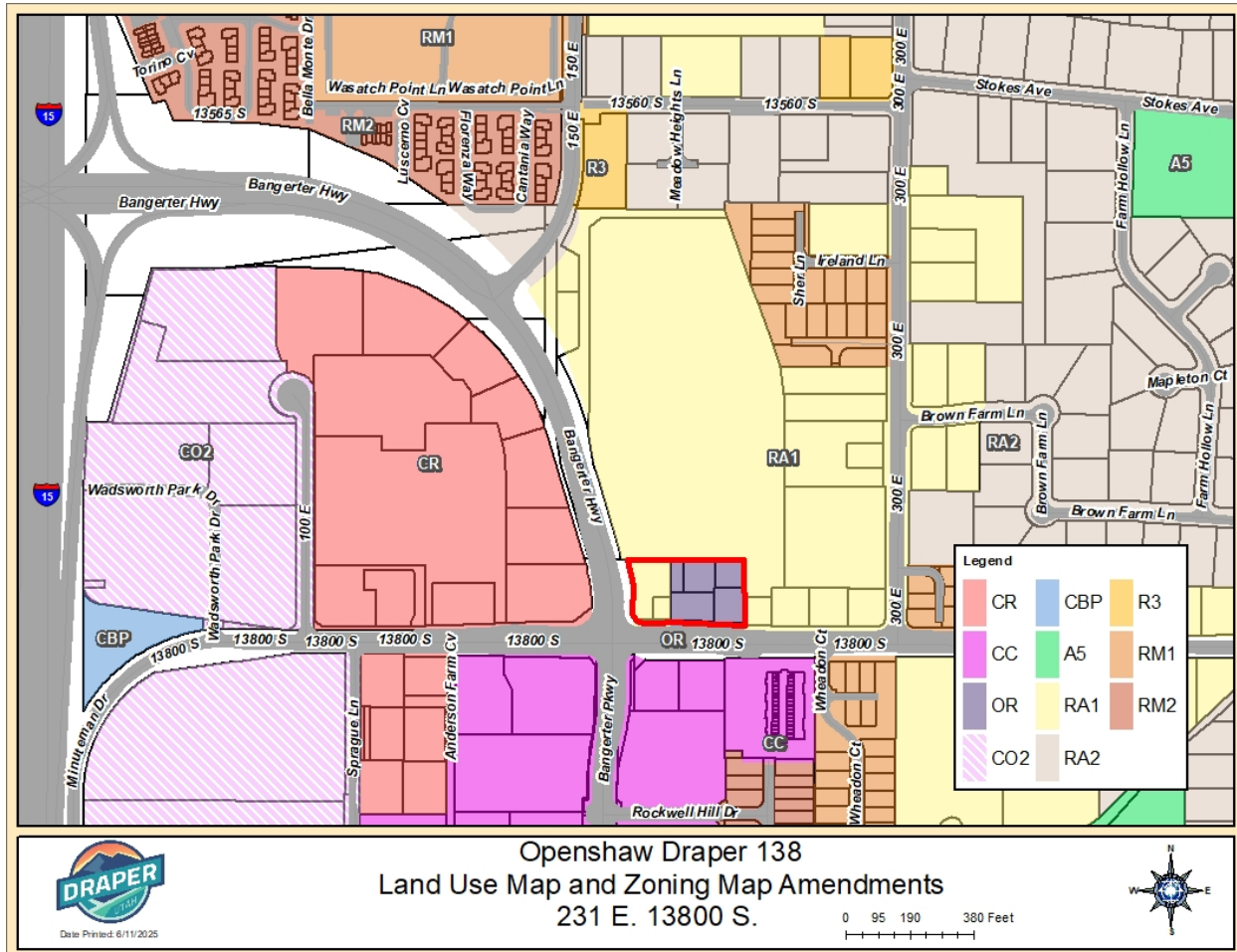


EXHIBIT G
APPLICANTS RESPONSES

General Plan Land Use Map Amendment

1. What is the requested land use designation?

The requested land use designation is **Regional Commercial (CR)**.

2. Please explain the reason for the request and the justification for approval.

The current land use designation for the property is **Office/Service**, but two of the parcels in this proposal already do not comply with this designation. Changing the designation to **Regional Commercial (CR)** will allow all parcels to be compliant and better reflect the existing and intended use of the area.

The justification for this request includes:

- **Alignment with Existing Development:** Two of the other three corners of the intersection are already designated as Community/Neighborhood Commercial, while the remaining corner is designated as Regional Commercial. This change will create consistency across all corners of the intersection.
- **Intended Land Use:** The proposed use of the property for food service and retail aligns with the purpose of Community/Neighborhood Commercial zoning.
- **Traffic Compatibility:** Given the existing traffic patterns in the area, this designation change will have no adverse effects on Draper City's infrastructure or traffic flow.
- **Community Benefit:** The proposed change will enable commercial uses that directly serve the surrounding community and neighborhood.

3. How is the requested land use designation harmonious with the overall character of existing development in the vicinity of the subject property? Explain.

The requested designation is harmonious with the surrounding development for several reasons:

- The property is located along the **Bangerter Highway corridor**, a major roadway that already supports commercial uses.
- **Two of the three other corners at the intersection are already designated as**

Community/Neighborhood Commercial, making this change a logical and compatible extension of the existing land use pattern.

- The remaining corner is designated as **Regional Commercial**, further reinforcing the area's commercial nature.
- The proposed retail and food service use aligns with the needs of the surrounding community, complementing existing businesses and services in the area.

4. Is the proposed land use designation consistent with the goals, objectives, and policies of the City's General Plan? Explain.

Yes, the proposed **Community/Neighborhood Commercial** land use designation aligns with Draper City's General Plan in the following ways:

- **Encourages commercial development in key corridors:** The General Plan supports commercial development along major roadways like Bangerter Highway, where businesses can efficiently serve the community.
- **Enhances economic growth:** By allowing for food service and retail, this designation supports local businesses and contributes to the city's economic vitality.
- **Promotes land use compatibility:** The change ensures that all parcels within the proposal comply with their designated land use, creating consistency and preventing fragmented zoning.
- **Serves the immediate community:** The proposed designation facilitates neighborhood-oriented businesses that directly meet the needs of local residents and visitors.

For these reasons, this land use designation change is a logical and beneficial adjustment that aligns with Draper City's long-term planning goals.

Draper Zone Amendment Application

Zoning Map Amendment

1. What is the requested zoning designation?

The requested zoning designation is **Regional Commercial (CR)**. Approximately two-thirds of the property on the eastern side is currently zoned Office Residential (OR), while the remaining one-third on the western side, directly adjacent to Bangerter Highway, is currently zoned Residential Agricultural (RA1).

2. Please explain the reason for the request and the justification for approval.

The property is currently zoned OR and RA1, but it is surrounded on three sides by properties zoned Community Commercial (CC) and Regional Commercial (CR). Additionally, a neighboring parcel is also applying for a rezone to Regional Commercial. Given the property's location along the Bangerter Highway corridor, which is a high-traffic commercial area, rezoning to Regional Commercial is a logical step to better align with the surrounding land uses and economic development patterns.

This rezone will:

- Provide consistency with adjacent commercial properties.
- Enhance economic opportunities by allowing for a wider range of commercial uses that serve residents, businesses in the area, and enhances the city's sales tax base.
- Support Draper City's vision for commercial corridors along major roadways.
- Maximize the property's potential by permitting appropriate commercial development that aligns with the demands of a growing community.

3. How is the requested zoning designation harmonious with the overall character of existing development in the vicinity of the subject property? Explain.

The requested Community Commercial zoning is harmonious with the existing development in the area for several reasons:

- The property is surrounded on three sides by Community Commercial and Regional Commercial zoning, making this rezone a natural extension of the existing commercial district.
- The neighboring property is also seeking a rezone to Regional Commercial, ensuring

compatibility and continuity of development.

- The Bangerter Highway corridor is already developed with commercial uses, and rezoning this property will further enhance the commercial synergy of the area.
- Regional Commercial zoning will allow for appropriately scaled businesses that complement existing commercial properties while serving the needs of nearby residents and commuters.

4. Are facilities and services, such as roadways and utilities, sufficient to serve the property under the proposed zoning? Explain.

Yes, the existing infrastructure is sufficient to support the proposed Regional Commercial zoning.

- **Roadways:** The property is located along Bangerter Highway, a major transportation corridor designed to accommodate high traffic volumes, making it well-suited for commercial development. The existing road network is capable of handling the additional traffic generated by commercial uses. The proposed addition of a traffic light and access point along Tom Lloyd's property will allow access to our parcels and provide an efficient flow of traffic.
- **Utilities:** Water, sewer, electricity, and other essential utilities are already in place and capable of supporting commercial development. No significant infrastructure upgrades are anticipated.
- **Emergency Services:** The property is within the service area of Draper City's fire, police, and emergency services, ensuring adequate public safety support for future commercial operations.

5. Is the proposed zoning designation consistent with the goals, objectives, and policies of the City's General Plan? Explain.

Yes, the proposed Regional Commercial zoning is consistent with Draper City's General Plan.

- The General Plan encourages **commercial development along major corridors** like Bangerter Highway, where businesses can thrive and serve the community effectively.
- The rezone supports the city's goal of **expanding economic opportunities** and fostering business growth in designated commercial areas.
- Regional Commercial zoning promotes **land use compatibility** by aligning with the existing commercial properties in the vicinity.

- By allowing for a mix of retail, service, and office uses, this rezone contributes to a **balanced and vibrant economic environment** in Draper City.

For these reasons, the rezone request aligns with Draper City's vision for sustainable and strategic development and should be approved.

General Plan Land Use Map Amendment

1. What is the requested land use designation?

The requested land use designation is **Regional Commercial (CR)**.

2. Please explain the reason for the request and the justification for approval.

The current land use designation for the property is **Office/Service**, but two of the parcels in this proposal already do not comply with this designation. Changing the designation to **Regional Commercial (CR)** will allow all parcels to be compliant and better reflect the existing and intended use of the area.

The justification for this request includes:

- **Alignment with Existing Development:** Two of the other three corners of the intersection are already designated as Community/Neighborhood Commercial, while the remaining corner is designated as Regional Commercial. This change will create consistency across all corners of the intersection.
- **Intended Land Use:** The proposed use of the property for food service and retail aligns with the purpose of Community/Neighborhood Commercial zoning.
- **Traffic Compatibility:** Given the existing traffic patterns in the area, this designation change will have no adverse effects on Draper City's infrastructure or traffic flow.
- **Community Benefit:** The proposed change will enable commercial uses that directly serve the surrounding community and neighborhood.

3. How is the requested land use designation harmonious with the overall character of existing development in the vicinity of the subject property? Explain.

The requested designation is harmonious with the surrounding development for several reasons:

- The property is located along the **Bangerter Highway corridor**, a major roadway that already supports commercial uses.
- **Two of the three other corners at the intersection are already designated as Community/Neighborhood Commercial**, making this change a logical and compatible extension of the existing land use pattern.

- The remaining corner is designated as **Regional Commercial**, further reinforcing the area's commercial nature.
- The proposed retail and food service use aligns with the needs of the surrounding community, complementing existing businesses and services in the area.

4. Is the proposed land use designation consistent with the goals, objectives, and policies of the City's General Plan? Explain.

Yes, the proposed **Community/Neighborhood Commercial** land use designation aligns with Draper City's General Plan in the following ways:

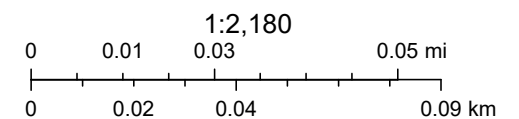
- **Encourages commercial development in key corridors:** The General Plan supports commercial development along major roadways like Bangerter Highway, where businesses can efficiently serve the community.
- **Enhances economic growth:** By allowing for food service and retail, this designation supports local businesses and contributes to the city's economic vitality.
- **Promotes land use compatibility:** The change ensures that all parcels within the proposal comply with their designated land use, creating consistency and preventing fragmented zoning.
- **Serves the immediate community:** The proposed designation facilitates neighborhood-oriented businesses that directly meet the needs of local residents and visitors.

For these reasons, this land use designation change is a logical and beneficial adjustment that aligns with Draper City's long-term planning goals.

My Map



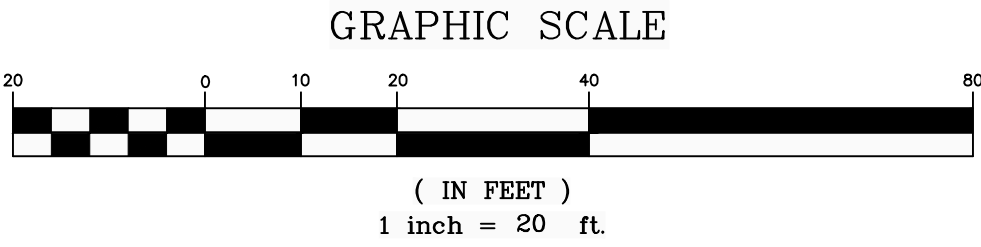
March 28, 2025



County of Salt Lake, County of Utah, Bureau of Land Management, Utah AGRC, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

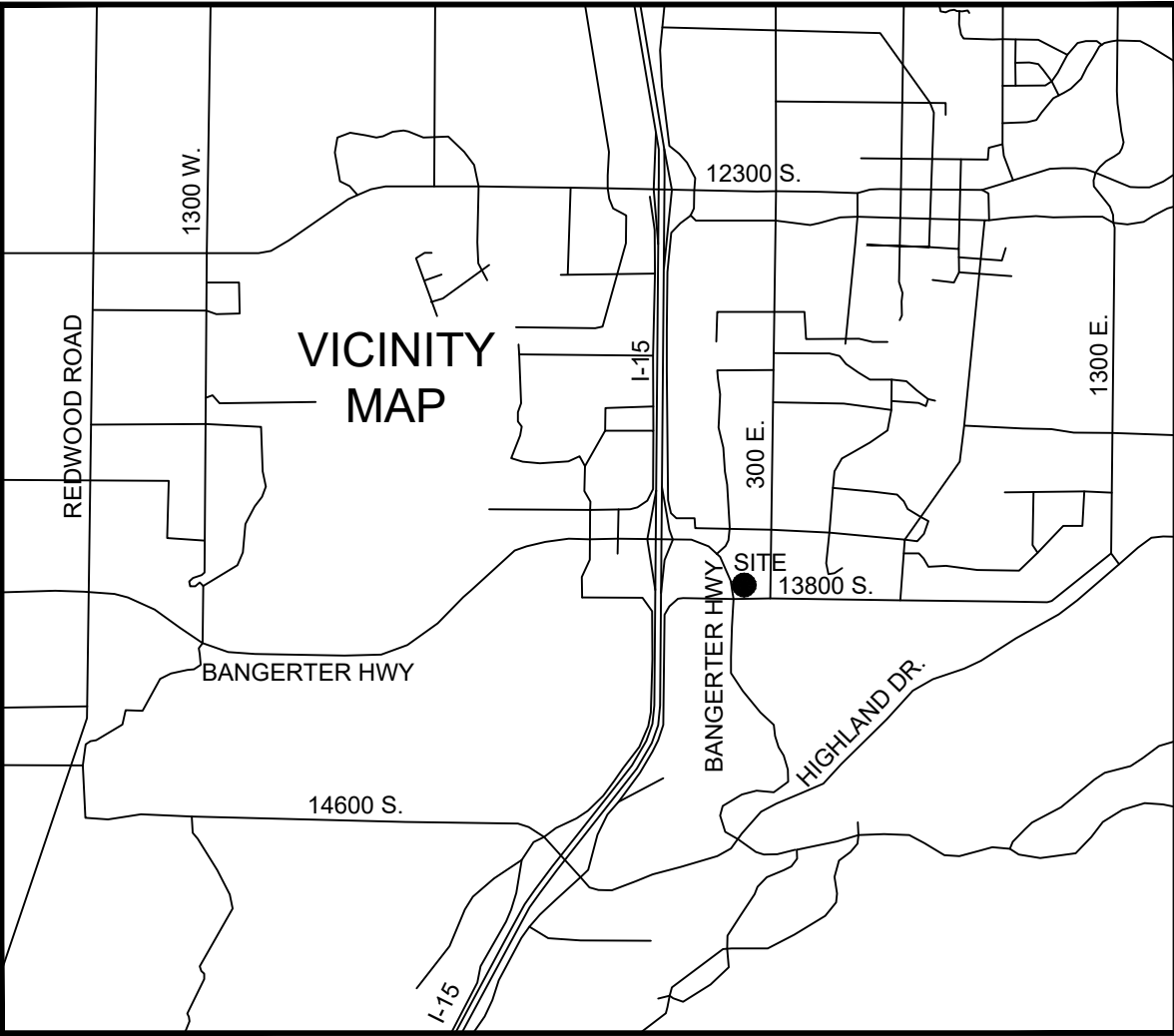
This map was created by the office of the Salt Lake County Assessor, in
The information depicted here is to be taken as an approximate fit in regards to the spatial position of the layers presented. This map is not intended to represent an actual field Survey of, nor establish the actual relation between, any of the layers depicted here.

DRAPER 138 - SURVEY
Located in the Northwest Quarter of Section 6,
Township 4 South, Range 1 East, Salt Lake Base and Meridian
215 East 13800 South, Draper, Salt Lake County, Utah



SYMBOL LEGEND:	
	FIRE HYDRANT (FH)
	SIGNAL POLE
	POWER POLE (PP)
	SEWER MANHOLE
	SD MANHOLE (SDMH)
	WATER VALVE (WV)
	WATER METER (WM)

SYMBOL LEGEND:	
	SECTION LINE
	BOUNDARY LINE
	ADJACENT PROPERTY LINE
	COMMUNICATION LINE
	ELECTRICAL LINE
	FENCE
	OVERHEAD POWER LINE
	SEWER PIPE
	STORM DRAIN PIPE
	WATER PIPE



NARRATIVE:

I was asked by the owner to perform a Boundary Survey of the subject property being located 215 East 13800 South, Draper, Utah, Salt Lake County, Utah.

The survey was begun at the East Corner of Section 6, Township 4 South, Range 1 East, Salt Lake Base and Meridian. The Basis of Bearing being South 89°56'23" East along the Section from the East Quarter Corner to the calculated True Center of the Section of said Section 6.

The survey data was calculated and plotted together with the deeds, plats, and surveys from the office of Salt Lake County Recorder, and a title report provided by American First Title Company, of the surrounding properties to show any gaps or overlaps between the deeds and the field survey of the subject property.

This survey does not guarantee, grant, transfer or imply fee title ownership of any portion of this property in whole or part to any party or persons. This survey makes reference to owners names, documents and deed lines which are depicted hereon to the best of the surveyor's ability, however all information shown hereon should be verified by county records, title companies and other qualified professionals to meet the specific purposes and intents of the client. Furthermore, the filing of this survey with the respective county in which the property is situated does not serve as an instrument to subdivide, transfer, sell, or trade any portion of the property shown hereon. It is recommended that a qualified title company and/or other qualified professionals be contacted to address any and all questions regarding property ownership, title and the transfer of real property.

SURVEY BOUNDARY DESCRIPTION:

BEGINNING AT AN EXISTING REBAR AND CAP LOCATED BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET, SAID POINT BEING LOCATED NORTH 00°39'30" WEST 8.57' FEET TO THE FOUND STANDARD COUNTY MONUMENT FOR THE CENTER OF SECTION 6 AND WEST 458.01' FEET AND NORTH 55.10' FROM THE CALCULATED TRUE CENTER OF SECTION 6 AT THE INTERSECTION OF 13800 SOUTH AND 300 EAST (MONUMENT WAS NOT FOUND), TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE ALONG THE NORTHERLY RIGHT OF WAY OF 13800 SOUTH STREET THE FOLLOWING TWO (2) CALLS: NORTH 86°52'26" WEST 99.40' FEET, NORTH 89°40'40" WEST 217.33' FEET TO AN EXISTING REBAR AND CAP BEHIND THE EXISTING SIDEWALK OF 13800 SOUTH STREET; THENCE ALONG THE EASTERLY RIGHT OF WAY OF BANGARTER HIGHWAY THE FOLLOWING THREE (3) CALLS: NORTH 47°30'37" WEST 16.24' FEET TO AN EXISTING REBAR AND CAP, NORTH 00°12'30" WEST 9.31' FEET, ALONG AN ARC OF A 719.17' FOOT RADIUS CURVE TO THE LEFT 165.41' FEET (CHORD BEARS NORTH 06°47'49" WEST 165.04' FEET) TO AN EXISTING REBAR AND CAP; THENCE NORTH 89°26'42" EAST ALONG AN EXISTING FENCE LINE 348.15' FEET TO AN EXISTING FENCE; THENCE SOUTH ALONG AN EXISTING FENCE LINE 194.18' FEET TO THE POINT OF BEGINNING.

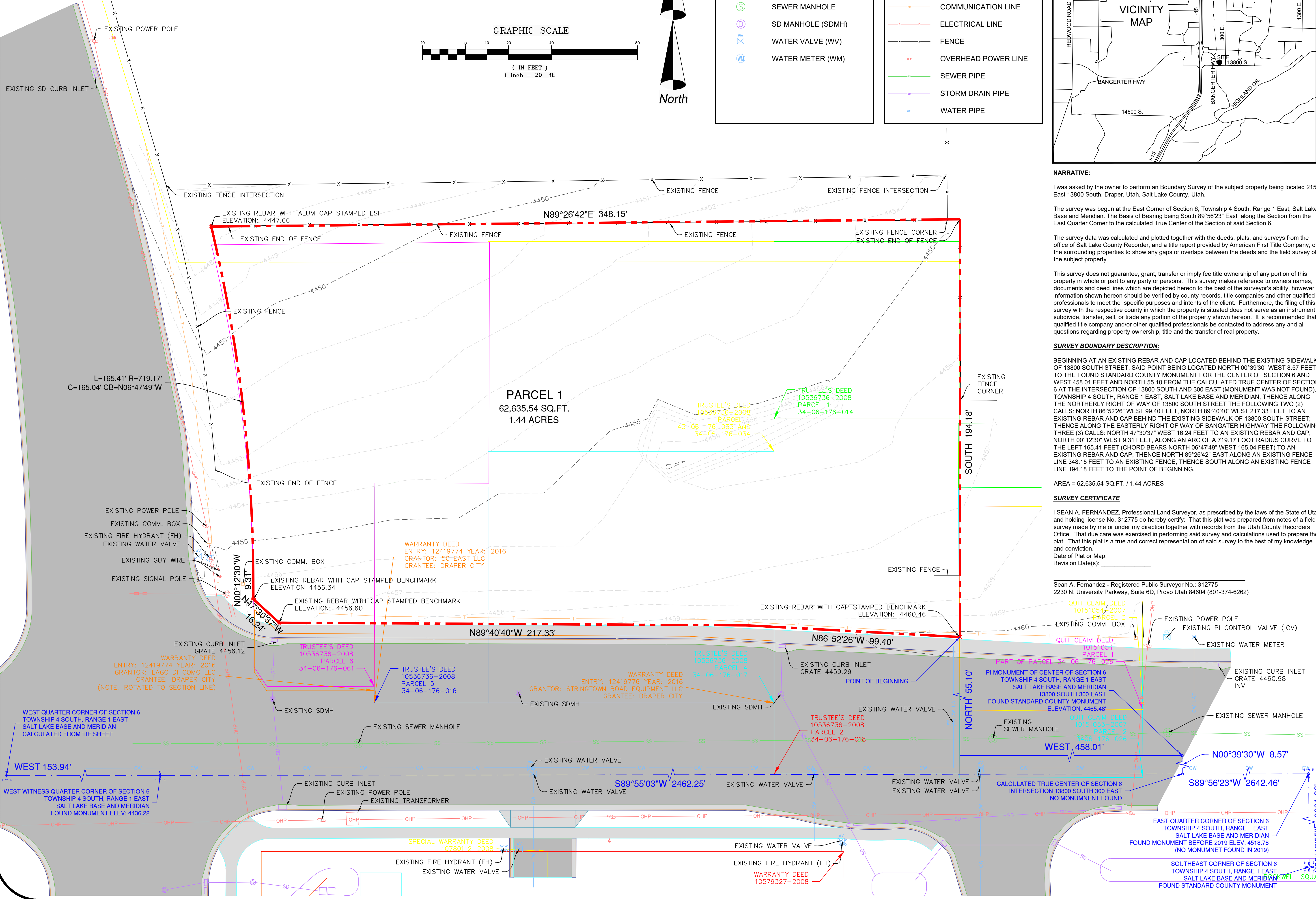
AREA = 62,635.54 SQ.FT. / 1.44 ACRES

SURVEY CERTIFICATE

I SEAN A. FERNANDEZ, Professional Land Surveyor, as prescribed by the laws of the State of Utah and holding license No. 312775 do hereby certify: That this plat was prepared from notes of a field survey made by me or under my direction together with records from the Utah County Records Office. That due care was exercised in performing said survey and calculations used to prepare the plat. That this plat is a true and correct representation of said survey to the best of my knowledge and conviction.

Date of Plat or Map: _____
Revision Date(s): _____

Sean A. Fernandez - Registered Public Surveyor No.: 312775
2230 N. University Parkway, Suite 6D, Provo Utah 84604 (801-374-6262)



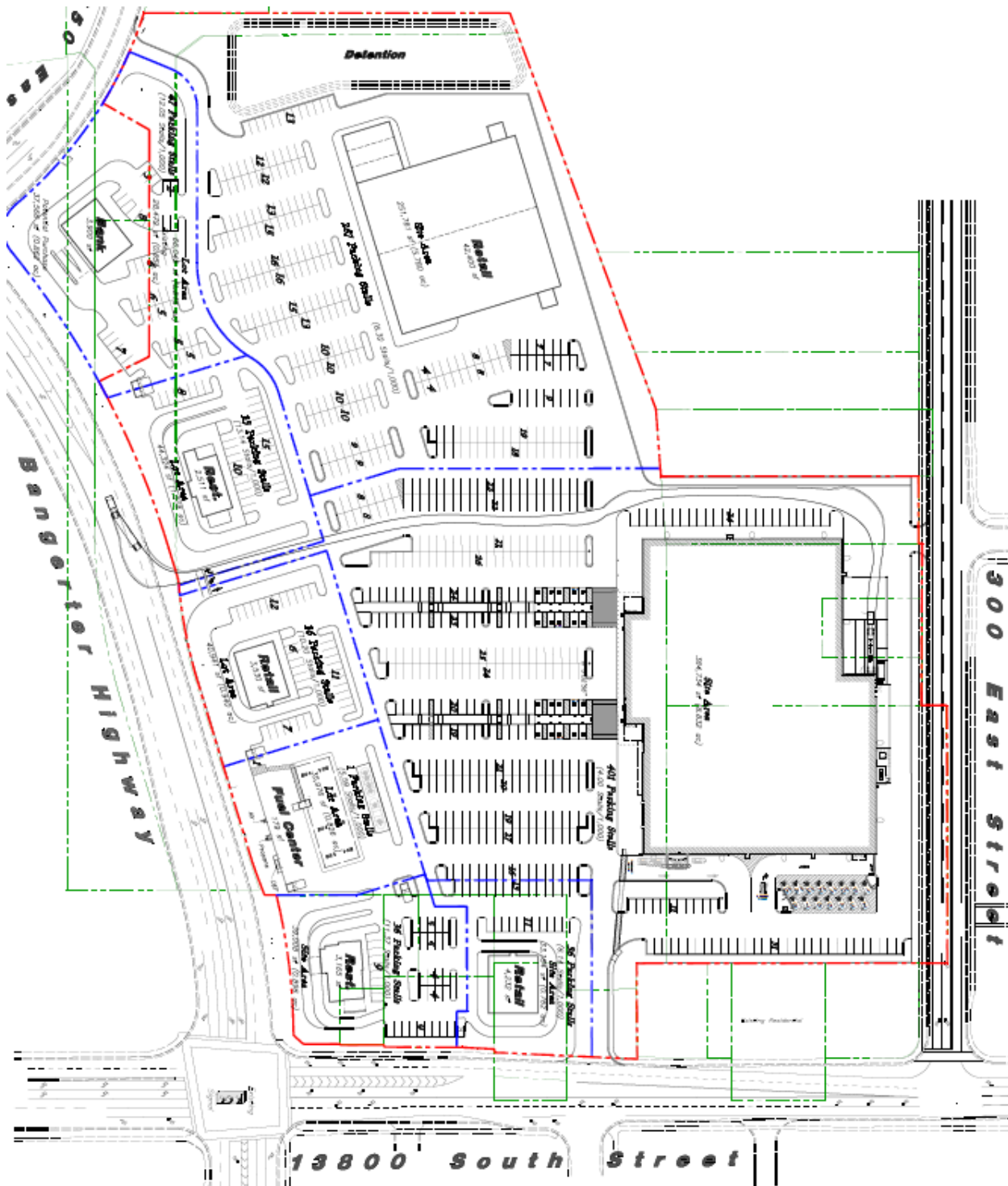
A.L.M. & Associates, Inc.
Engineering • Surveying • Development • Planning
2230 North University Parkway, Building 6D, Provo, Utah 84604 ph: (801) 374-6262

DRAPER 138
OPENSHAW DEVELOPMENT
DRAFT ALTA/NSPS Survey

No.	Revision	Date

1
OF 1 SHEETS
Proj # 000-0000

Exhibit A



MEMO



To: City Council
From: Todd Taylor
Date: 2025-12-16
Re: Public Hearing: Ordinance #1696

Comments:

This application is a request for approval of a Text Amendment to portions of Draper City Municipal Code (DCMC) Titles 9, 10, 17 and 18. The purpose of the request is to update the text of the Geologic Hazards Ordinance and move it from Title 9, Land Use and Development Regulations, to Title 10, Building Regulations. Additionally, amendments to Title 17, Land Development, will clarify a standard, and amendments to Title 18, Land Disturbance, will update cross-references.

The Planning Commission reviewed this item at their December 11, 2025 meeting and forwarded a positive recommendation with a vote of 4-0.

Findings for Approval:

1. The proposed amendment is consistent with goals, objectives and policies of the City's General Plan;
2. The proposed amendment is appropriate given the context of the request and there is sufficient justification for a modification to the development codes;
3. The proposed amendment will not create a conflict with any other section or part of the development codes or the General Plan;
4. The potential effects of the proposed amendment have been evaluated and are determined not to be detrimental to public health, safety, or welfare and represents an overall community benefit; and
5. The proposed text amendment implements best current, professional practices of urban planning, design, and engineering practices.

Findings for Denial:

1. The proposed amendment is not consistent with goals, objectives and policies of the City's General Plan;
2. The proposed amendment is not appropriate given the context of the request and there is not sufficient justification for a modification to the development codes;
3. The proposed amendment could create a conflict with another section or part of the development codes or the General Plan;
4. The potential effects of the proposed amendment have been determined to be detrimental to public health, safety, or welfare or do not represent an overall

community benefit; and

5. The proposed text amendment is not consistent with best current, professional practices of urban planning, design, and engineering practices.

ATTACHMENTS:

[Ordinance No. 1696.pdf](#)

ATTACHMENTS:

[City Initiated Geologic Hazards Ordinance Staff Report_Finalized.pdf](#)

ORDINANCE NO. 1696

AN ORDINANCE OF DRAPER CITY AMENDING THE TEXT OF TITLES 9, 10, 17, AND 18 OF THE DRAPER CITY MUNICIPAL CODE RELATED TO THE GEOLOGIC HAZARDS ORDINANCE.

WHEREAS, Utah State law grants to Draper City the authority to regulate uses of property by enacting land use regulations, among other methods; and

WHEREAS, it is necessary from time to time to amend certain terms of the Draper City Municipal Code to address provisions that become diminished in appropriateness, applicability, or clarity; and

WHEREAS, the City Council of Draper City adopted the Geologic Hazards Ordinance to protect the health, safety, and welfare of the citizens of Draper City, protect Draper City's infrastructure and financial health, and minimize adverse effects of geologic hazards to public health, safety, and property by encouraging wise land use; and

WHEREAS, the City Council of Draper City finds good cause to revise the terms and provisions of the Geologic Hazards Ordinance and move it to a new chapter; and

WHEREAS, notice has been issued according to the requirements of the Utah Code Annotated and Draper City Municipal Code for public hearings before the Planning Commission and City Council to receive public input regarding the revision of portions of the Draper City Municipal Code; and

WHEREAS, the Planning Commission and City Council have each held a public hearing to receive public input regarding the revision of portions of the Draper City Municipal Code.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Findings. The City Council of Draper City has made the following findings that the proposed text amendments to Title 9, 10, 17, and 18 of the Draper City Municipal Code: 1. The proposed amendment is consistent with goals, objectives and policies of the city's general plan. 2. The proposed amendment is appropriate given the context of the request and there is sufficient justification for a modification to the Development Codes. 3. The proposed amendment will not create a conflict with any other section or part of the Development Codes or the general plan. 4. The potential effects of the proposed amendment have been evaluated and determined to be beneficial to public health, safety, and welfare and represent an overall community benefit. 5. The proposed text amendment implements best current, professional practices of urban planning, design, and engineering practices.

Section 2. Repeal. Chapter 9-19 of the Land Use and Development Regulations Code of the Draper City Municipal Code is hereby repealed as set forth in Exhibit A.

Section 3. Enactment. Chapter 10-7 of the Building Regulations Code of the Draper City Municipal Code is hereby enacted to read as set forth in Exhibit A.

Section 4. Amendment. Sections 9-5-090, 9-16-020, 9-16-030, 9-16-050, and 9-27-085 of the Land Use and Development Code, Section 17-4-030, of the Land Development Code, and Section 18-2-010 of the Land Disturbance Code of the Draper City Municipal Code are hereby amended to read as set forth in Exhibit A.

Section 5. Correction of Editing Errors. The city attorney is authorized to correct any punctuation, spelling, formatting, clerical, or de minimis errors in Exhibit A prior to submitting the ordinance for publishing.

Section 4. Severability. If any section, part or provision of this Ordinance is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Ordinance, and all sections, parts and provisions of this Ordinance shall be severable.

Section 5. Effective Date. This Ordinance shall become effective immediately upon publication or posting, or 30 days after final passage, whichever is closer to the date of final passage.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE 16th DAY OF DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:	YES	NO	ABSENT
Councilmember Green	_____	_____	_____
Councilmember Johnson	_____	_____	_____
Councilmember T. Lowery	_____	_____	_____
Councilmember F. Lowry	_____	_____	_____
Councilmember Vawdrey	_____	_____	_____
Mayor Walker	_____	_____	_____

EXHIBIT A

TITLE 9

LAND USE AND DEVELOPMENT REGULATIONS

...

9-5-090: SITE PLAN REVIEW:

...

D. Procedure: An application for site plan approval shall be considered and processed as provided in this subsection.

1. A complete application shall be submitted to the office of the zoning administrator in a form established by the administrator, along with any fee established by the city's consolidated fee schedule. The application shall include the following information:

...

- d. A single electronic set of development plans showing the information required in subsections D(1)(d)(1) to D(1)(d)(6) of this section. The information required by each subsection shall be shown on separate sheets. Plans shall be drawn at a scale no smaller than one inch equals one hundred feet (1" = 100'). Plan sets shall be prepared, stamped and signed by the professional, licensed with the state of Utah, who prepared the drawings or is professionally responsible for the drawings content, including the engineering, landscaping and architectural drawings. The development plans shall include:

- (1) Site plan showing the following:

...

(H) Geologic hazards setbacks and geologic-restricted areas as defined in Section 10-7-20.

...

- e. Soils report, geotechnical reports, and geologic hazards reports as required ~~elsewhere~~ in ~~this~~ Title 10, Chapter 7, of this code.

...

9-16-020: SCOPE:

...

- C. Preliminary Activities: The following requirements shall govern any preliminary surveying, testing, or design related activities conducted within the hillside sensitive lands overlay zone for the purpose of exploring, evaluating and/or establishing locations for any permanent improvements. Preliminary activities associated with the investigation of geologic hazards shall also be subject to the requirements of ~~section 9-19-070~~ [Section 10-7-070](#), "Preliminary Activities", of this ~~title~~ [code](#).

...

9-16-030: PROCEDURE:

...

- C. Preliminary Approval: Following conceptual master plan approval, a preliminary approval shall be obtained. The following information and reports shall be submitted as part of an application for preliminary approval and may be in addition to information required for preliminary approval for a subdivision:

...

4. A geotechnical and geological report in accordance with the provisions of ~~chapter 19~~ [Title 10, Chapter 7](#), "Geologic Hazards", of this ~~title~~ [code](#).

...

9-16-050: DEVELOPMENT STANDARDS:

...

C. Cut And Fill Slopes:

1. Cut and fill slopes shall be provided in accordance with ~~chapter 19 of this title~~ [Title 10, Chapter 7, "Geologic Hazards"](#), ~~slope stability ordinance~~, and title 18, "Land Disturbance", of this code.

...

~~CHAPTER 19~~ ~~GEOLOGIC HAZARDS~~

~~9-19-010: PURPOSE:~~

- ~~A. The purpose of this geologic hazards chapter is to protect the health, safety, and welfare of the citizens of Draper City, protect Draper City's infrastructure and financial health, and minimize adverse effects of geologic hazards to public health, safety, and property by encouraging wise land use.~~

- ~~B. This chapter and its appendices address surface fault rupture, slope stability, liquefaction, debris flow, and rockfall hazards, and present minimum standards and methods for evaluating geologic hazards.~~
- ~~C. Results of geologic hazard studies shall comply with this chapter and its appendices. The standards set forth in the appendices are minimum requirements. More complex projects may require more detailed and in-depth evaluations than outlined herein. In addition, the appendices shall not supersede other more stringent requirements that may be required by other regulatory agents.~~
- ~~D. Section 9-19-161-1, appendix A of this chapter presents geologic hazards study area maps reflecting geological concerns pertaining to development within Draper City. The maps incorporate data obtained from previous geologic hazard studies. Site specific geologic hazard assessments performed by qualified engineering geologists shall be required prior to developing projects located within a geologic hazards study area. In the event known or readily apparent geologic hazards exist in an area subject to a development application, which area is not depicted on the geologic hazards study area maps, the developer shall nevertheless submit the applicable study and the process outlined in this chapter shall be followed.~~

~~9-19-020: DEFINITIONS:~~

~~As used in this chapter:~~

~~ACCEPTABLE AND REASONABLE RISK: No loss or significant injury to occupants, no release of hazardous or toxic substances, and minimal structural damage.~~

~~ACCESSORY BUILDING: Any structure not designed for human occupancy, which may include tool or storage sheds, gazebos, and swimming pools.~~

~~ACTIVE FAULT: A fault displaying evidence of displacement along one or more of its traces during Holocene time, which is approximately ten thousand (10,000) years ago to the present.~~

~~AVALANCHE: A large mass of snow, ice, soil or rock, or a mixture of these materials, falling, sliding, or flowing rapidly under the force of gravity.~~

~~BUILDABLE AREA: Based on an accepted engineering geology report, the portion of a site not impacted by geologic hazards, or the portion of a site where it is concluded the identified geologic hazards can be mitigated to a level where risk to human life, property and city infrastructure are reduced and where structures may be safely sited.~~

~~CITY: The public works director, city engineer, community development director, planning manager, building official, or other Draper City employee.~~

~~CITY COUNCIL: The city council of Draper City.~~

CRITICAL FACILITIES: Essential, hazardous, special occupancy facilities, and occupancy categories III and IV as defined in the currently adopted international building code, and lifelines, such as major utility, transportation, and communication facilities and their connections to critical facilities.

DEBRIS FLOW: A slurry of rock, soil, organic material, and water transported in an extremely fast and destructive flow that flows down channels and onto and across alluvial fans; including a continuum of sedimentation events and processes, including debris flows, debris floods, mudflows, clear water floods, and alluvial fan flooding.

DEVELOPMENT: All critical facilities, subdivisions, single and multi-family dwellings, commercial and industrial buildings; also additions to or intensification of existing buildings, storage facilities, pipelines and utility conveyances, and other land uses.

ENGINEERING GEOLOGIST: A Utah licensed geologist, who, through education, training, and experience, is competent in applying geologic data, geologic techniques, and geologic principles, which includes conducting field investigations, so that geologic conditions and geologic factors affecting engineered works, groundwater resources, and land use planning are recognized, adequately interpreted, and clearly presented for use in engineering practice, land use planning, and for the protection of the public, and who utilizes specialized geologic training and experience to provide quantitative geologic information and recommendations and also works with and for land use planners, environmental specialists, architects, public policymakers, and property owners to provide geologic information on which decisions can be made.

ENGINEERING GEOLOGY: Geologic work that is relevant to engineering and environmental concerns, and the public health, safety, and welfare. "Engineering geology" is the application of geological data, principles, and interpretation so that geological factors affecting planning, design, construction, and maintenance of engineered works, land use planning, and groundwater resources are adequately recognized and properly interpreted for use in engineering, land use planning, and related practice.

ESSENTIAL FACILITY: Buildings and other structures intended to remain operational in the event of an adverse geologic event, including all structures defined in section 9-19-160, "Table 1", of this chapter.

FAULT: A fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other.

FAULT SCARP: A steep slope or cliff formed by movement along a fault.

FAULT SETBACK: An area on either side of a fault within which structures for human occupancy or critical facilities or their structural supports are not permitted.

FAULT TRACE: The intersection of a fault plane with the ground surface, often present as a fault scarp, or detected as a lineament on aerial photographs.

~~FAULT ZONE: A corridor of variable width along one or more fault traces, within which deformation has occurred.~~

~~GEOLOGIC HAZARD: A surface fault rupture, liquefaction, slope stability, landslide, debris flow, and rockfall that may present a risk to life or property.~~

~~GEOLOGIC HAZARD STUDY AREA: A potentially hazardous area as shown on the geologic hazard study area maps within which hazard investigations are required prior to development.~~

~~GEOTECHNICAL ENGINEER: A professional, Utah licensed engineer who, through education, training and experience, is competent in the field of geotechnical engineering.~~

~~GEOTECHNICAL ENGINEERING: The investigation and engineering evaluation of earth materials, including soil, rock, and manmade materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.~~

~~GOVERNING BODY: The city council, or a designee of the city council.~~

~~LANDSLIDE: The downslope movement of a mass of soil, surficial deposits or bedrock, including a continuum of processes between landslides, earth flows, debris flows and debris avalanches, and rockfalls.~~

~~LIQUEFACTION: A process by which certain water saturated soils lose bearing strength because of earthquake related ground shaking and subsequent increase of groundwater pore pressure.~~

~~NONBUILDABLE AREA: That portion of a site which a geologic hazards report has concluded may be impacted by geologic hazards and where the siting of critical facilities is not permitted.~~

~~ROCKFALL: A rock or mass of rock, newly detached from a cliff or other steep slope which moves downslope by falling, rolling, toppling, or bouncing; includes rockslides, rockfall avalanches, and talus.~~

~~SETBACK: An area within which support of critical facilities is not permitted.~~

~~SLOPE STABILITY: The resistance of a natural or artificial slope or other inclined surface to failure by landsliding, usually assessed under both static and dynamic (earthquake induced) conditions.~~

~~SNOW AVALANCHE: A mass of predominantly snow and ice, but also including a mixture of soil or rock and organic debris, falling, sliding, and/or flowing rapidly under the force of gravity.~~

~~STRUCTURE DESIGNED FOR HUMAN OCCUPANCY: Any residential dwelling or any other structure used or intended for supporting or sheltering any use or occupancy, which is expected to have an occupancy rate of at least two thousand (2,000) person hours per year, but does not include an accessory building.~~

~~TALUS: Rock fragments lying at the base of a cliff or a very steep rocky slope.~~

~~9-19-030: APPLICABILITY:~~

~~The regulations contained in this chapter shall apply to all lands in Draper City.~~

~~9-19-040: RESPONSIBILITY FOR GEOLOGIC HAZARD STUDIES:~~

~~Geologic hazard studies often involve both engineering geology and geotechnical engineering. Engineering geologic studies shall be performed under the direct supervision of a qualified engineering geologist. Geotechnical engineering studies shall be performed under the direct supervision of a qualified geotechnical engineer.~~

~~9-19-050: MINIMUM QUALIFICATIONS OF THE GEOLOGIST:~~

~~Engineering geology and the evaluation of geologic hazards is a specialized discipline within the practice of geology requiring technical expertise and knowledge of techniques not commonly used in other geologic investigations. Therefore, geologic hazard investigations involving engineering geologic studies shall only be accepted by Draper City when conducted and signed by a qualified engineering geologist. The minimum qualifications of the engineering geologist who performs geologic hazard investigations are:~~

- ~~A.—An undergraduate or graduate degree in geology, engineering geology, or geological engineering, or closely related field, from an accredited college or university;~~
- ~~B.—Five (5) full years of experience in a responsible position in the field of engineering geology in Utah, or in a state with similar geologic hazards and regulatory environment. This experience must demonstrate the engineering geologist's knowledge and application of appropriate techniques in performing geologic hazard studies; and~~
- ~~C.—A Utah state professional geologist's license.~~

~~9-19-060: MINIMUM QUALIFICATIONS OF THE ENGINEER:~~

~~Evaluation and mitigation of geologic hazards often require contributions from a qualified geotechnical engineer, particularly in the design of mitigation measures. Geotechnical~~

~~engineering is a specialized discipline within the practice of civil engineering requiring technical expertise and knowledge of techniques not commonly used in civil engineering investigations. Therefore, geologic hazard investigations requiring contributions from a qualified geotechnical engineer will only be accepted by Draper City when also signed and sealed by a qualified geotechnical engineer. Minimum qualifications of the geotechnical engineer who participates in geologic hazard investigations are:~~

- ~~A. A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or a B.S. degree in civil engineering with twelve (12) semester hours of post-B.S. credit in geotechnical engineering, or course content related to evaluation of geologic hazards, from an accredited college or university;~~
- ~~B. Five (5) full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazard studies; and~~
- ~~C. A Utah state professional engineer's license.~~

~~9-19-070: PRELIMINARY ACTIVITIES:~~

- ~~A. Development Improvements: This section shall apply to any geologic hazard investigation for the purpose of determining the feasibility of development or for the purpose of exploring, evaluating or establishing locations for permanent improvements.~~
- ~~B. Scoping Meeting: The developer or consultant shall schedule a scoping meeting with the city to evaluate the engineering geologist/geotechnical engineer's investigative approach. At this meeting, the consultant shall present a work plan that includes locations of anticipated geologic hazards and locations of proposed exploratory excavations, such as trenches, borings, and CPT soundings, which meet the minimum standard of practice. The investigation approach should allow for flexibility due to unexpected site conditions. Field findings may require modifications to the work plan. Upon completion of a successful scoping meeting, a land disturbance permit application may be submitted to Draper City.~~
- ~~C. Land Disturbance Permit: As required by title 18 of this code and except as otherwise noted therein, no person shall commence or perform any land disturbance, grading, relocation of earth, or any other land disturbance activity, without first obtaining a land disturbance permit. Application for a land disturbance permit shall be filed with the city engineer on forms furnished by the city for such purposes only after a scoping meeting has taken place.~~

~~D.—Responsible Contact: The applicant shall specify a primary contact responsible for coordination with the city during the land disturbance activity.~~

~~9-19-080: GEOLOGIC HAZARDS STUDY AREA MAPS:~~

- ~~A.—Geologic hazards study area maps are prepared using the best available scientific information but are necessarily generalized and designed only to indicate areas where hazards may exist and where geologic hazards studies are required. Because the geologic hazards study area maps are prepared at a nonsite specific scale, hazards may exist that are not shown on the geologic hazards study area maps. The fact that a site is not in a geologic hazards study area for a particular hazard does not exempt the applicant from considering the hazard if evidence is found that it may exist. If it is subsequently determined that the site has geologic hazards that are not shown on the geologic hazards study area maps, the review process will be pursuant to this chapter.~~
- ~~B.—Geologic hazards study area boundaries shown on the maps will not be systematically adjusted as each individual site specific study indicates whether or not an actual hazard exists at a site because geologic hazards study area maps are meant only to indicate where scientific evidence indicates a hazard may exist. However, geologic hazards study area maps may be updated and amended by the city if found to be inaccurate or in error, or as new methods or data are developed to better define areas of potential hazards.~~
- ~~C.—Where geologic hazards study area maps are thought by an applicant to be inaccurate or in error and require revision, the applicant shall submit to the city technical evidence by a qualified professional supporting the claim and showing the proposed revision. The city will review the information and render a decision. The applicant may appeal that decision to the city council.~~

~~9-19-090: GEOLOGIC HAZARD STUDIES AND REPORTS REQUIRED:~~

~~Any applicant requesting development approval on a parcel of land within a geologic hazard study area or where there are known or readily apparent geologic hazards and the area is not depicted on the geologic hazards study area maps, shall submit to the city two (2) paper copies and one electronic copy of a site specific geologic hazard study report.~~

~~9-19-100: GEOLOGIC HAZARD REPORTS:~~

- ~~A.—Each geologic hazards report shall be site specific and shall identify all known or suspected potential geologic hazards, originating on site or off site, whether previously identified or previously unrecognized, that may affect the subject property. All geologic~~

hazards reports shall include the original or wet signature and professional seal, both in blue ink, of the qualified professional. Geologic hazards reports coprepared by professional geologists and engineers must include both professionals' original signature and seal in blue ink.

- B. ~~Surface fault rupture reports shall contain all requirements as described in section 9-19-161-2, "Appendix B, Minimum Standards For Surface Fault Rupture Hazard Studies", of this chapter. Surface fault rupture studies shall be prepared by a qualified engineering geologist.~~
- C. ~~Slope stability and landslide reports shall contain all requirements as described in section 9-19-161-3, "Appendix C, Minimum Standards For Slope Stability Analysis", of this chapter. Slope stability and landslide studies shall be prepared by a qualified engineering geologist and a qualified geotechnical engineer.~~
- D. ~~Liquefaction reports shall contain all requirements as described in section 9-19-161-4, "Appendix D, Minimum Standards For Liquefaction Investigations And Evaluations", of this chapter. Liquefaction analyses shall be prepared by a qualified geotechnical engineer. Liquefaction investigations are not required for residential construction classified in the international residential code as R-3.~~
- E. ~~Debris flow reports shall contain all requirements as described in section 9-19-161-5, "Appendix E, Minimum Standards For Debris Flow Analyses", of this chapter. Debris flow hazard investigations shall be prepared by a qualified engineering geologist. Mitigation measures will generally require contributions from geotechnical engineers, hydrologists, or civil engineers.~~
- F. ~~Rockfall reports shall contain all requirements as described in section 9-19-161-6, "Appendix F, Minimum Standards For Rockfall Analyses", of this chapter. Rockfall studies shall be prepared by a qualified engineering geologist. Mitigation measures will generally require contributions from geotechnical and/or civil engineers.~~
- G. ~~All geologic hazards reports shall include, at a minimum:~~
 - 1. ~~A one to twenty four thousand (1:24,000) scale geologic map, with references, showing the general surface geology (landslides, alluvial fans, etc.), bedrock geology where exposed, bedding attitudes, faults, and other geologic structural features;~~
 - 2. ~~A detailed site map of the subject area, at a scale equal to or more detailed than one inch equals two hundred feet (1" = 200'), showing the locations of subsurface investigations and site specific geologic mapping performed as part of the geologic investigation, including boundaries and features related to any geologic hazards, topography, and drainage. The site map must show the location and boundaries of the property, geologic hazards, delineation of any recommended setback distances from hazards, and recommended locations for structures. Buildable and nonbuildable areas shall be clearly identified;~~

- ~~3. Trench logs, when applicable, prepared in the field and presented in the geologic hazard report at a scale equal to or more detailed than one inch equals five feet (1" = 5');~~
 - ~~4. Boring logs when applicable, prepared with standard geologic nomenclature;~~
 - ~~5. Listing of aerial photographs used and other supporting information, as applicable;~~
 - ~~6. Conclusions, clearly supported by adequate data included in the report, that summarize the characteristics of the geologic hazards, and that address the potential effects of the geologic conditions and geologic hazards on the proposed development and occupants thereof, particularly in terms of risk and potential damage;~~
 - ~~7. Specific recommendations for additional or more detailed studies, as may be required to understand or quantify a geologic hazard;~~
 - ~~8. An evaluation of whether or not mitigation measures are required, including an evaluation of multiple mitigation options;~~
 - ~~9. Specific recommendations for avoidance or mitigation of the effects of the hazards, consistent with the purposes set forth in section 9-19-010 of this chapter, including design or performance criteria for engineered mitigation measures and all supporting calculations, analyses, modeling or other methods, and assumptions. Final design plans and specifications for engineered mitigation must be signed and stamped by a qualified geotechnical, civil and/or structural engineer, as appropriate;~~
 - ~~10. Data upon which recommendations and conclusions are based, shall be clearly stated in the report; and~~
 - ~~11. A statement shall be provided regarding the suitability of the proposed development from a geologic hazard perspective.~~
- ~~H. When a submitted report does not contain adequate data to support its findings, additional or more detailed studies shall be required to explain or quantify a particular geologic hazard or to describe how mitigation measures recommended in the report are appropriate and adequate.~~

~~9-19-110: REVIEW OF GEOLOGIC HAZARD REPORTS:~~

- ~~A. Scope: The city shall review any proposed land use which requires preparation of a geologic hazards report under this chapter to determine the possible risks to the safety of persons, property and city infrastructure from geologic hazards.~~

- ~~B. Submittal: Prior to consideration of any request for preliminary plat approval or site plan approval, the geologic hazards report, if required, shall be submitted to the city for review.~~
- ~~C. Time Frame For Review: The city will complete each review in a reasonable time frame, not to exceed forty five (45) days.~~
- ~~D. Costs Borne By Applicant: All direct costs associated with the review of geologic hazard studies shall be paid by the applicant.~~
- ~~E. Records: The city shall retain a copy of each geologic report in the planning division project file.~~
- ~~F. Standards: The city shall determine whether the report complies with all of the following standards:~~
- ~~1. A suitable geologic hazard report has been prepared by qualified professionals.~~
 - ~~2. The proposed land use does not present an unreasonable risk to the health, safety, and welfare of persons or property, including buildings, storm drains, public streets, culinary water facilities, utilities or critical facilities, whether off site or on site, or to the aesthetics and natural functions of the landscape, such as slopes, streams or other waterways, drainage, or wildlife habitat, whether off site or on site, because of the presence of geologic hazards or because of modifications to the site due to the proposed land use.~~
 - ~~3. The proposed land use demonstrates that, consistent with the state of the practice, the identified geologic hazards can be mitigated to a level where the risk to human life and damage to property are reduced to an acceptable and reasonable level in a manner which will not violate applicable federal, state, or local statutes, ordinances or regulations. Mitigation measures should consider, in their design, the intended aesthetic functions of other governing ordinances, such as the sensitive lands overlay zone. The applicant must include with the geologic hazards report a mitigation plan that defines how the identified hazards or limitations will be addressed without impacting or adversely affecting off site areas. Mitigation measures must be reasonable and practical to implement especially if such measures require ongoing maintenance by property owners.~~
- ~~G. Additional Requirements: The city may set other requirements as are necessary to overcome any geologic hazards and to ensure that the purposes of this chapter are met. These requirements may include, but are not limited to:~~
- ~~1. Additional or more detailed studies to understand or quantify the hazard or determine whether mitigation measures recommended in the report are adequate;~~
 - ~~2. Specific mitigation requirements; establishing buildable and nonbuildable areas; limitations on slope grading and controls on grading, or revegetation;~~

- ~~3. Grading plans, when required, shall be prepared, signed and sealed by a licensed professional engineer. As built grading plans, when required, shall be signed and sealed by the project geotechnical engineer as well as the professional engineer that prepared the grading plans. Grading plans, when required, shall include, at a minimum, the following:
 - ~~a. Maps of existing and proposed contours;~~
 - ~~b. Present and proposed slopes for each graded area;~~
 - ~~c. Existing and proposed drainage patterns;~~
 - ~~d. Location and depth of all proposed cuts and fills;~~
 - ~~e. Description of methods to be employed to achieve stabilization and compaction;~~
 - ~~f. Location and capacities of proposed drainage, structures, and erosion control measures based on maximum runoff for a 100-year storm;~~
 - ~~g. Location of existing buildings or structures on or within one hundred feet (100') of the site, or which may be affected by proposed grading and construction; and~~
 - ~~h. Plan for monitoring and documentation of testing, field inspections during grading, and reporting to the city.~~~~
 - ~~4. Installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions, including groundwater levels; and~~
 - ~~5. Other requirements such as time schedules for completion of the mitigation and phasing of development.~~
- ~~H. Condition Of Approval: Draper City may also set requirements necessary to protect the health, safety, and welfare of the citizens of Draper City, protect Draper City's infrastructure and financial health, and minimize potential adverse effects of geologic hazards to public health, safety, and property as a condition of approval of any development which requires a geologic hazards report.~~
- ~~I. On Site Professional; Final Inspection: Draper City may require a qualified professional be on site, at the cost of the developer, during certain phases of construction, particularly during grading phases and the construction of retaining walls. For any real property with respect to which development has proceeded on the basis of a geologic or geotechnical report which has been accepted by the city, no final inspection shall be completed or certificate of occupancy issued or performance bond released until the geotechnical engineer or engineering geologist who signed and approved the report certifies, in writing, that the completed improvements and structures conform to the descriptions and requirements contained in said report.~~

~~J.—Appeal: An applicant may appeal any decision made under the provisions of this chapter only after the city has issued a written review of a report, and shall set forth the specific grounds or issues upon which the appeal is based. The appeal shall be submitted in writing to the director of community development within thirty (30) days of the issuance of the written review or other decision. The city shall assemble a professional panel of three (3) qualified experts to serve as the appeal authority for any technical dispute. The panel shall consist of an expert designated by the city, an expert designated by the applicant, and an expert chosen by the city's and the applicant's designated experts. If the city's and the applicant's designated experts cannot reach a consensus of the third expert within thirty (30) days, the city shall select the third expert. Decisions of the panel will be binding and will be based on the majority decision of the panel. The costs of the appeal process shall be paid by the applicant.~~

~~9-19-120: DISCLOSURE WHEN A GEOLOGIC HAZARD REPORT IS REQUIRED:~~

~~A.—Form Of Disclosure: Whenever a geologic hazards report is required under this chapter, the owner of the parcel shall record a notice running with the land in a form satisfactory to Draper City prior to the approval of any development or subdivision of such parcel. Disclosure shall include signing a disclosure and acknowledgment form provided by the city, which includes:~~

- ~~1.—Notice that the parcel is located within a geologic hazards study area as shown on the geologic hazards study area map or as otherwise defined in this chapter; and~~
- ~~2.—Notice that a geologic hazards report was prepared and is available for public inspection in the city's files.~~

~~B.—Additional Notification On Plat: Where geologic hazards and related setbacks are delineated in a subdivision, the owner shall also place additional notification on the plat stating the above information, prior to final approval of the plat.~~

~~9-19-130: WARNING AND DISCLAIMER:~~

~~The geologic hazards study area maps represent only those potentially hazardous areas known to Draper City and should not be construed to include all possible potential hazard areas. This chapter and the geologic hazards study area maps may be amended as new information becomes available pursuant to procedures set forth in section 9-5-060 of this title. The provisions of this chapter do not in any way assure or imply that areas outside the geologic hazards study area maps boundaries are free from the possible adverse effects of geologic hazards. This chapter shall not create any liability on the part of Draper City, any Draper City officer, Draper City reviewer, or Draper City employee thereof, for any damages~~

~~from geologic hazards that result from reliance on this chapter or any administrative requirement or decision lawfully made hereunder.~~

~~9-19-140: CHANGE OF USE:~~

~~No change in use which results in the conversion of a building or structure from one not used for human occupancy to one that is so used shall be permitted unless the building or structure complies with the provisions of this chapter.~~

~~9-19-150: CONFLICTING REGULATIONS:~~

~~In cases of conflict between the provisions of existing zoning classifications, building code, subdivision ordinance, or any other ordinance of Draper City and the geologic hazards ordinance codified in this chapter, the most restrictive provision shall apply.~~

~~9-19-160: TABLE 1:~~

~~In the event of failure, the following buildings and structures represent a substantial hazard to human life:~~

- ~~1. Those where more than 300 people congregate in one area;~~
- ~~2. Elementary schools, secondary schools, or daycare facilities with an occupancy greater than 250;~~
- ~~3. Those colleges or adult education facilities with an occupancy greater than 500;~~
- ~~4. Healthcare facilities with an occupancy greater than 50 or more resident patients but not having surgery or emergency treatment facilities;~~
- ~~5. Jails and detention facilities;~~
- ~~6. Any structure with an occupancy greater than 1,000;~~
- ~~7. Power generating stations, water treatment or storage for potable water, wastewater treatment facilities and other public utility facilities; and~~
- ~~8. Those containing toxic or explosive substances that would be dangerous to the public if released.~~

~~The following buildings and structures are designated as essential facilities, including, but not limited to:~~

- ~~1. Hospitals and other care facilities having surgery or emergency treatment facilities;~~

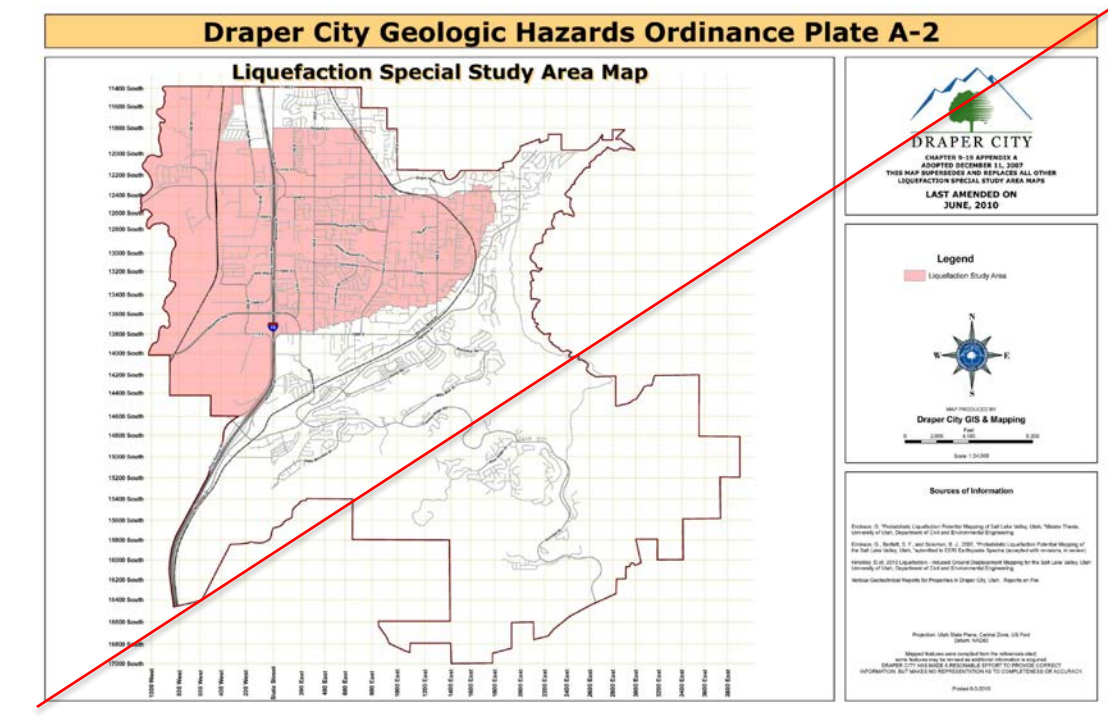
- ~~2. Fire, rescue and police stations and emergency vehicle garages and fueling facilities;~~
- ~~3. Designated emergency shelters;~~
- ~~4. Designated emergency preparedness, communications, and operation centers and other facilities required for emergency response;~~
- ~~5. Power generating stations and other public utility facilities required as emergency backup facilities for facilities and structures included in this table;~~
- ~~6. Structures containing highly toxic materials as defined by the most recently adopted version of the IBC;~~
- ~~7. Aviation control towers, air traffic centers and emergency aircraft hangars;~~
- ~~8. Buildings and other structures having critical national defense functions; and~~
- ~~9. Water treatment and storage facilities required to maintain water pressure for fire suppression.~~

~~9-19-161: APPENDICES:~~

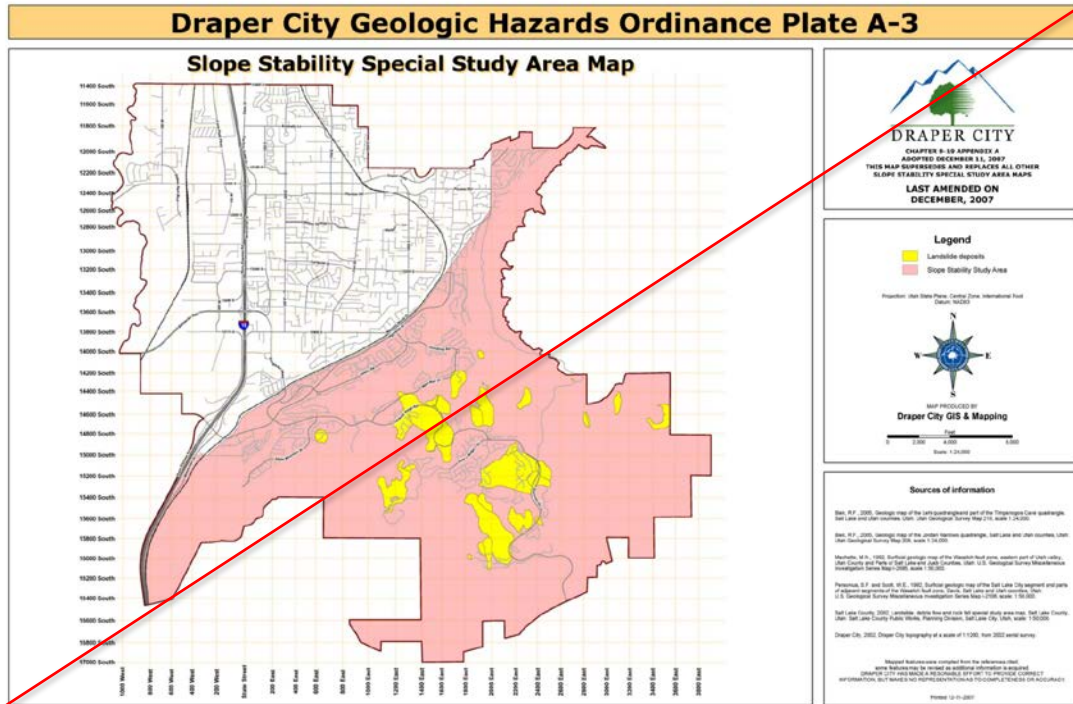
~~9-19-161-1: APPENDIX A, GEOLOGIC HAZARDS STUDY AREA MAPS:~~

~~— PLATE A-1: SURFACE FAULT RUPTURE HAZARD SPECIAL STUDY AREA MAP~~

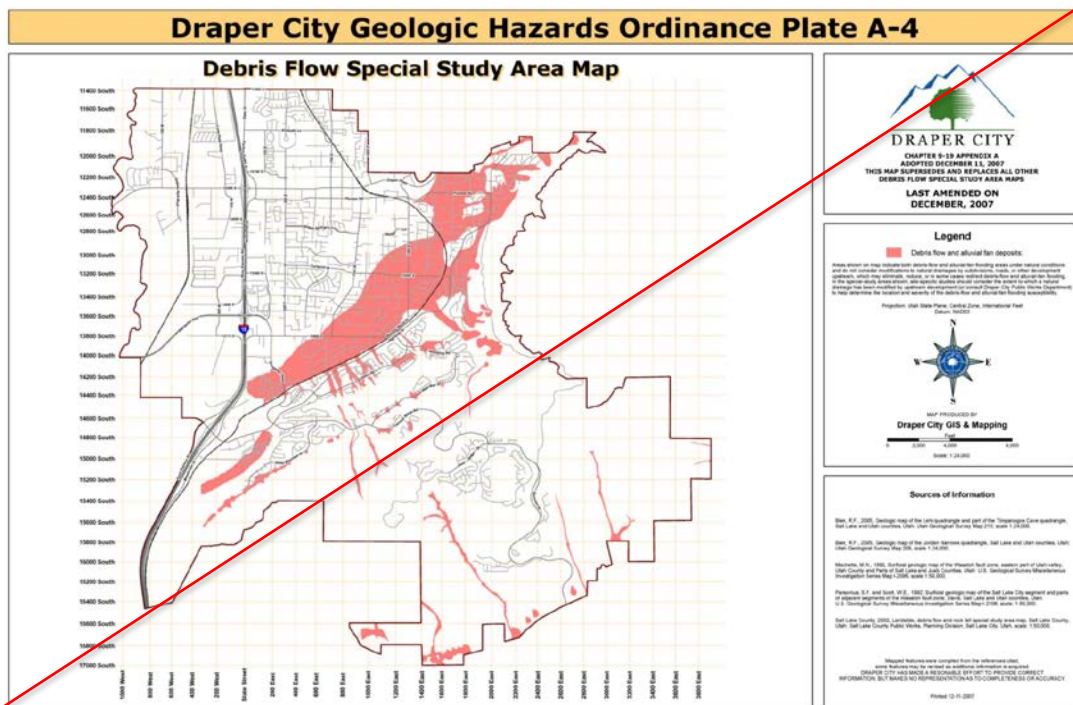
~~PLATE A-2: LIQUEFACTION SPECIAL STUDY AREA MAP~~



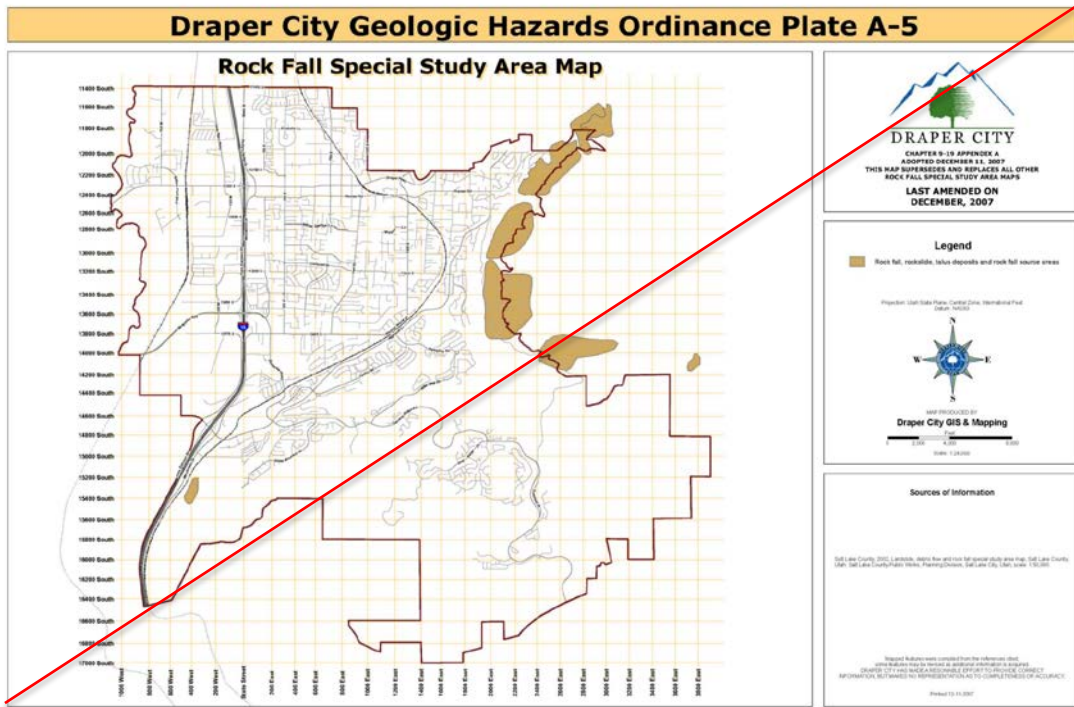
~~—PLATE A-3: SLOPE STABILITY SPECIAL STUDY AREA MAP~~



~~—PLATE A-4: DEBRIS FLOW SPECIAL STUDY AREA MAP~~



~~PLATE A-5: ROCKFALL SPECIAL STUDY AREA MAP~~



~~9-19-161-2: APPENDIX B, MINIMUM STANDARDS FOR SURFACE FAULT RUPTURE HAZARD STUDIES:~~

~~1.0 INTRODUCTION~~

The Wasatch Fault Zone (WFZ) is a major tectonic feature in the western United States, extending for about 230 miles from near Fayette, Utah at the south to near Malad, Idaho at the north. Surface faulting has occurred along the WFZ in northern Utah throughout late Pleistocene and Holocene time (Lund, 1990; Black and others, 2003). "Surface faulting" is fault-related offset or displacement of the ground surface that may occur in an earthquake.

The WFZ consists of a series of normal-slip fault segments with relative movement down to the west and up to the east. Ten major fault segments are recognized along the WFZ (Machette and others, 1992), which are believed to be independent in regard to their potential for surface faulting. These segments have distinct geomorphic expression and are clearly visible on aerial photographs.

In Salt Lake Valley, the WFZ is represented by the Salt Lake City segment which extends for 23± miles along the eastern edge of the valley (Lund, 1990). A portion of the Salt Lake City segment of the WFZ is present within the east part of the City (Personius and Scott, 1992; Machette, 1992).

Repeated Holocene movement has been well documented along the Salt Lake City segment. Studies along Wasatch Boulevard near the mouth of Little Cottonwood Canyon and at South Fork Dry Creek indicate at least four major earthquake events in the last 6,000 years (Black and others, 2003).

If a fault were to break the ground surface beneath a building, significant damage could occur, perhaps resulting in injuries or loss of life. To reduce risk from surface-fault-rupture hazards and to protect public health and safety, the City has defined Surface-Fault-Rupture Special Study Areas. Quaternary faults located within the Surface-Fault-Rupture Special Study Areas should be considered active until proven otherwise.

To ensure that buildings are not sited across Holocene-age (active) faults, the Draper City Geologic Hazards Ordinance (Article 4, chapter 9-19 of the Draper City Municipal Code) requires a site-specific geologic investigation of the portion of the property situated within the Surface-Fault-Rupture Special Study Area. The primary purposes of the geologic investigation are to assess the surface-fault-rupture potential of the property and to assess the suitability of the property for the proposed development from the standpoint of surface-fault-rupture. If a fault is discovered and determined (or presumed) to be Holocene-age (i.e., "active"), appropriate building setbacks from the fault are required such that structures are not located astride the fault trace. Building setbacks must be established prior to development of sites located within the Surface-Fault-Rupture Special Study Area.

A site-specific surface-fault-rupture hazard study includes a field investigation (usually involving the excavation and geologic documentation of a trench) and report. This appendix describes the minimum standards required by the City for surface-fault-rupture hazard studies.

The purpose of establishing minimum standards for surface fault rupture hazard studies is to:

- (a) Protect the health, safety, welfare, and property of the public by minimizing the potentially adverse effects of surface fault rupture and related hazards;
- (b) Assist property owners and land developers within the Surface-Fault-Rupture Special Study Area in conducting reasonable and adequate studies;
- (c) Provide consulting engineering geologists with a common basis for preparing proposals, conducting investigations, and recommending setbacks; and,
- (d) Provide an objective framework for review of fault study report.

The procedures outlined herein are intended to provide the developer and consulting engineering geologist with an outline of appropriate exploration methods, standardized report information, and expectations of the City.

~~These standards constitute the minimum level of effort required in conducting surface-fault-rupture-hazard special studies in the City. Considering the complexity of evaluating surface and near-surface faults, additional effort beyond the minimum standards may be required at some sites to adequately address the fault hazard. The information presented herein does not relieve the engineering geologist from his/her duty to perform additional geologic or engineering services he/she believes are necessary to assess the fault rupture potential at a site.~~

~~1.1—References and Sources~~

~~The minimum standards presented herein were developed from the following sources:~~

- ~~(a) Guidelines for Evaluating Surface Fault Rupture Hazards in Utah (AEG, 1987).~~
- ~~(b) Guidelines to geologic and seismic reports, (CDMG, 1986a).~~
- ~~(c) Guidelines for preparing engineering geologic reports (CDMG, 1986b).~~
- ~~(d) Guidelines for Evaluating Potential Surface Fault Rupture/Land Subsidence Hazards in Nevada (Nevada Earthquake Safety Council, 1998).~~
- ~~(e) Fault Setback Requirements to Reduce Fault Rupture Hazards in Salt Lake County (Batatian and Nelson, 1999).~~
- ~~(f) Salt Lake County Geologic Hazards Ordinance (2002).~~
- ~~(g) Draper City geologic hazard ordinance (2003).~~
- ~~(h) Guidelines for evaluating surface-fault-rupture hazards in Utah: Christenson and others (2003).~~

~~1.2—Properties Requiring a Fault Investigation~~

~~A fault study is required, prior to approval of any land use, for properties situated within Surface Fault Rupture Study Areas, as shown on the Surface Fault Rupture Study Area map (Plate A-1). This map identifies known active faults in the City, and defines special study areas where site-specific geologic investigations are required. Development of any parcel within a Surface Fault Rupture Study Areas requires submittal and review of a site-specific fault study prior to receiving a land use or building permit from the City. It is the responsibility of the applicant to retain a qualified engineering geologist to perform the fault study (see Draper City Geologic Hazards Ordinance 9-19).~~

~~In addition, a fault investigation may be required if on-site or nearby fault-related features not shown on the Surface Fault Rupture Study Area map are identified during the course of other geologic or geotechnical studies performed on or near the site or during construction.~~

2.0—MINIMUM STANDARDS FOR FAULT STUDIES

Following are the minimum standards for a comprehensive fault investigation. Fault investigations may be reported in conjunction with other geological and geotechnical investigations, or may be submitted separately. See Draper City Geologic Hazards Ordinance (9-19) for supplemental requirements.

2.1—Scoping Meeting

The developer's consultant must schedule a scoping meeting with the City to evaluate the fault investigation approach. At this meeting, the consultant should present a site plan that includes: proposed building locations (if known); expected fault location(s) and orientation; and the proposed trench locations, orientation, length, and depth (see section 2.3, Fault Investigation Method). The investigative approach should allow for flexibility due to unexpected site conditions; field findings may require modifications to the work plan.

2.2—Fault Investigation Method

Inherent in fault study methods is the assumption that future faulting will recur along pre-existing faults and in a manner consistent with past displacement. The focus of fault investigations is therefore to accurately locate existing faults. If faults are documented, the investigation shall also 1) evaluate the age of movement along the fault trace(s), and 2) estimate amounts of past displacement, which is required in order to derive fault setbacks.

2.2.1—Previous Studies and Aerial Photograph Review

A fault investigation shall include review of available literature pertinent to the site and vicinity, including previous published and unpublished geologic/soils reports, and interpretation of available stereo-paired aerial photographs. The photographs reviewed should include more than one set and should include pre-urbanization aerial photographs, if available. Efforts must be made to accurately plot the locations of mapped or inferred fault traces on the property as shown by previous studies in the area.

2.2.2—Exploration Methods

Subsurface exploration consisting of trenching is required. The engineering geologist shall clean and document ("log") trench exposures as described in section 2.3.5. Existing faults may also be identified and mapped in the field by direct observation of young, fault-related geomorphic features, and by examination of aerial photographs. When trenching is not feasible (i.e., the presence of shallow ground water, excessive thickness of fill, etc.), supplemental methods such as closely spaced Cone Penetration Test (CPT) soundings may be employed. Such supplemental methods must be discussed with the City prior to implementation and should be clearly described in the report.

In lieu of conventional trenching or the CPT method, an alternative subsurface exploration program may be acceptable, depending upon site conditions. Such a program may consist

of a sufficient number of closely spaced downhole-logged bucket-auger borings, geophysical exploration techniques, or a combination of techniques.

When an alternative exploration program is proposed, a written description of the proposed exploration program along with an exploration plan should be submitted to the City for review, prior to the exploration. The plan must include, at a minimum, a map of suitable scale showing the site limits, surface geologic conditions within several thousand feet of the site boundary, the location and type of the proposed alternative subsurface exploration, and the anticipated earth materials present at depth on the site.

The actual subsurface exploration program to be used on any specific parcel will be determined on an individual basis, considering the current state of technical knowledge about the fault zone and information gained from previous exploration on adjacent or nearby parcels. At all times, consideration must be given to safety, and trenching should comply with all applicable safety regulations.

2.2.3—Trench Siting

Exploratory trenches must be oriented approximately perpendicular to the anticipated trend of known fault traces. The trenches shall provide the minimum footage of trenching necessary to explore the portion of the property situated in the surface fault rupture special study area, such that the potential for surface fault rupture may be adequately assessed. When trenching to determine if faults might affect a proposed building site, the trench should extend beyond the building footprint at least the minimum setback distance for the building type (see Table A-1).

Test pits or potholes alone are neither adequate nor acceptable. In some instances more than one trench may be required to cover the entire building area, particularly if the proposed development involves more than one building. Where feasible, trenches shall be located outside the proposed building footprint, as the trench is generally backfilled without compaction, which could lead to differential settlement beneath the footings. Supplemental trenching may be required in order to: 1) further refine fault locations (or the absence thereof); 2) accurately define building restriction areas, and/or; 3) provide additional exposures for evaluating the age of movement along fault traces.

2.2.4—Location Determination

All trenches and fault locations must be surveyed by a registered professional land surveyor. Fault locations should be surveyed with an accuracy of about 0.1 foot or better, so that structural setbacks can be developed.

2.2.5—Depth of Excavation

The depth of the trenches will ultimately depend on the trench location, occurrence of ground water, stability of subsurface deposits, and the geologic age of the subsurface geologic units. As a minimum, however, trenches shall extend substantially below the A

~~and B soil horizons and well into distinctly bedded Pleistocene-age materials, if possible. Where possible, the trenches should extend below Holocene deposits and should expose contacts between Holocene materials and the underlying older materials.~~

~~Appropriate safety measures pertaining to trench safety for ingress, egress, and working in or in the vicinity of the trench must be implemented and maintained. It is the responsibility of the person in the field directing trench excavation to ensure that fault trenches are excavated in compliance with current Occupational Safety and Health Administration excavation safety regulations.~~

~~Trench backfilling methods and procedures should be documented in order to establish whether additional corrective excavation, backfilling, and compaction should be performed at the time of site grading.~~

~~In cases where Holocene (i.e., active) faults may be present, but pre-Holocene deposits are below the practical limit of excavation, the trenches must extend at least through sediments that are clearly older than several fault recurrence intervals. The practical limitations of the trenching must be acknowledged in the report and recommendations must reflect resulting uncertainties.~~

~~2.2.6 Documenting Trench Exposures~~

~~Trench walls shall be cleaned of debris and backhoe smear prior to documentation. Trench logs shall be carefully drawn in the field at a minimum scale of 1-inch equals 5-feet (1:60) following standard and accepted fault trench investigation practices. Vertical and horizontal control must be used and shown on trench logs. Trench logs must document all significant geologic information from the trench and should graphically represent the geologic units observed; see section 2.6.3(E). The strike, dip, and net vertical displacement (or minimum displacement) of faults must be noted.~~

~~2.2.7 Age Dating~~

~~The engineering geologist shall interpret the ages of geologic units exposed in the trench. When necessary, radiocarbon or other age determinations methods shall be used. If evidence of faulting is documented, efforts shall be made to date the time of latest movement (to determine whether recent (Holocene) displacement has occurred) using appropriate geologic and/or soil stratigraphic dating techniques. When necessary, obtain radiocarbon or other age determinations. If soil stratigraphic dating techniques are used, a geologist experienced in using the techniques and soil development rates in the area should perform them.~~

~~Many of the surficial deposits within Salt Lake Valley were deposited during the last pluvial lake cycle, referred to as the Bonneville lake cycle. Although late-stage Bonneville lake cycle sediments do not correspond to the Pleistocene-Holocene boundary (i.e., Bonneville lake cycle deposits are older than 10,000 years old), for purposes of evaluating fault activity,~~

these deposits provide a useful regional datum (particularly so when the entire Holocene sequence of sediments is not present).

For practical purposes, and due to documented Holocene displacement along the Salt Lake segment of the Wasatch fault, any fault which displaces late-stage Bonneville Lake Cycle deposits should be considered active unless the Bonneville deposits are overlain by clearly unfaulted early Holocene-age deposits. Conversely, the presence of demonstrably unbroken, undeformed, and stratigraphically continuous Bonneville sediments constitutes reasonable geologic evidence for the absence of active faulting.

2.3 Field Review

A field review by the City is required during exploratory trenching. The applicant must provide a minimum of 48 hours notice to schedule the field review with the City. The trenches should be open, safe, cleaned, and a preliminary log completed at the time of the review. The field review allows the City to evaluate the subsurface data (i.e., age and type of sediments; presence/absence of faulting, etc.) with the consultant. Discussions about questionable features or an appropriate setback distance are encouraged, but the City will not help log the trench, explain the stratigraphy, or give verbal approval of the proposed development during the field review.

2.4 Recommendations for Fault Setbacks

To address wide discrepancies in fault setback recommendations, the City has adopted the fault setback calculation methodology for normal faults of Batatian and Nelson (1999) and Christenson and others (2003). The consultant should use this method to establish the recommended fault setback for critical facilities and structures designed for human occupancy. If another fault setback method is used, the consultant must provide justification in the report for the method used. Faults and fault setbacks must be clearly identified on site plans and maps.

Minimum setbacks are based on the type and occupancy of the proposed structures (see Table A-1). A setback should be calculated using the formulas presented below, and then compared to the minimum setback established in Table A-1. The greater of the two shall be used as the setback. Minimum setbacks apply to both the hanging wall and footwall blocks.

Top of slope and/or toe of slope setbacks required by the local Building Code must also be considered; again, the greater setback must be used.

Downthrown Fault Block (Hanging Wall)

The fault setback for the downthrown block will be calculated using the following formula:
 $S = U(2D + F/\tan)$ where:

-

- S = Setback within which structures for human occupancy are not permitted;
- U = Criticality Factor, based on the proposed occupancy of the structure (see Table A-4)
- D = Expected fault displacement per event (assumed to be equal to the net vertical displacement measured for each past event)
- F = Maximum depth of footing or subgrade portion of the building
- = Dip of the fault (degrees)

-

Uplifted Fault Block (Footwall)

The dip of the fault and depth of the subgrade portion of the structure are irrelevant in calculating the setback on the uplifted fault block. Therefore, the setback for the uplifted side of the fault will be calculated as:

$$S = U \times 2D$$

The setback is measured from the portion of the building closest to the fault, whether subgrade or above grade. Minimum setbacks apply as discussed above.

2.5—Small Displacement Faults

Small-displacement faults are not categorically exempt from setback requirements. Some faults having less than 4 inches (100 mm) of displacement ("small displacement faults") may be exempt from setback requirements.

Specific structural risk-reduction options such as foundation reinforcement may be acceptable for some small-displacement faults in lieu of setbacks. Structural options must minimize structural damage.

Fault studies must still identify faults and fault displacements (both net vertical displacements and horizontal extension across the fault or fault zone), and consider the possibility that future displacement amounts may exceed past amounts. If structural risk-reduction measures are proposed for small displacement faults, the following criteria must be addressed:

- (a) Reasonable geologic data indicating that future surface displacement along the particular fault will not exceed 4 inches.
- (b) Specific structural mitigation to minimize structural damage.
- (c) A structural engineer must provide appropriate designs and the City shall review the designs.

2.6—Required Outline for Surface Fault Rupture Hazard Studies

~~The information described herein may be presented as a separate surface-fault-rupture-potential report or it may be incorporated within other geology or engineering reports that may be required for the property.~~

~~The report shall contain a conclusion regarding the potential risk of surface fault rupture on the subject property and a statement addressing the suitability of the proposed development from a surface-fault-rupture-hazard perspective. If exploration determines that there is a potential for surface rupture due to faulting, or if gradational contacts or other uncertainties associated with the exploration methods preclude the determination of absence of small fault offsets, the report should provide estimates of the amplitude of fault offsets that might affect habitable structures.~~

~~Surface-fault-rupture-hazard reports submitted to the City are expected to follow the outline and address the subjects presented below. However, variations in site conditions may require that additional items be addressed, or permit some of the subjects to be omitted (except as noted).~~

~~2.6.1.—Report~~

~~(a) Purpose and scope of work: The report shall contain a clear and concise statement of the purpose of the investigation and the scope of work performed for the investigation.~~

~~(b) Geologic and tectonic setting: The report shall contain a clear and concise statement of the general geologic and tectonic setting of the site vicinity. The section should include a discussion of active faults in the area, paleoseismicity of the relevant fault system(s), and should reference relevant published and unpublished geologic literature.~~

~~(c) Site description and conditions: The report shall include information on geologic units, graded and filled areas, vegetation, existing structures, and other factors that may affect site development, choice of investigative methods, and the interpretation of data.~~

~~(d) Methods of investigation:~~

~~(1) Review of published and unpublished maps, literature and records concerning geologic units, faults, surface and ground water, and other factors.~~

~~(2) Stereoscopic interpretation of aerial photographs to detect fault-related topography, vegetation or soil contrasts, and other lineaments of possible fault origin. Reference the photograph source, date, flightline numbers, and scale. Salt Lake County has an excellent collection of stereoscopic aerial photographs dating back to 1937 (including 1937, 1940, 1958, 1964, and 1985).~~

~~(3) Observations of surface features, both on-site and off site, including mapping of geologic and soil units; geomorphic features such as scarps, springs, and seeps (aligned or not); faceted spurs, offset ridges or drainages; and geologic structures. Locations and relative ages of other possible earthquake-induced features such as sand blows, lateral spreads, liquefaction, and ground settlement should be mapped and described. Slope~~

~~failures, although they may not be conclusively tied to earthquake causes, should also be noted.~~

~~(4) Subsurface investigations: The report shall include a description of the program of subsurface exploration, including trench logs, purpose of trench locations, and a summary of trenching or other detailed, direct observation of continuously exposed geologic units, soils, and geologic structures. All trench logs shall be at a scale of at least 1-inch equals five-feet.~~

~~The report must describe the criteria used to evaluate the ages of the deposits encountered in the trench, and clearly evaluate the presence or absence of active (Holocene) faulting.~~

~~(e) Conclusions: Conclusions must be supported by adequate data and shall contain, at a minimum:~~

~~(1) Summary of data upon which conclusions are based.~~

~~(2) Location of active faults, including orientation and geometry of faults, amount of net slip along faults, anticipated future offset, and delineation of setback areas.~~

~~(3) Degree of confidence in and limitations of data and conclusions.~~

~~(f) Recommendations: Recommendations must be supported by adequate geologic data and appropriate reasoning behind each statement. Minimum recommendations shall include:~~

~~(1) Recommended setback distances per section 2.5. Supporting calculations must be included. Faults and setbacks must be shown on site maps and final recorded plat maps.~~

~~(2) Other recommended building restrictions or use limitations (i.e., placement of detached garages, swimming pools, or other non-habitable structures).~~

~~(3) Need for additional or future studies to confirm buildings are not sited across active faults, such as inspection of building footing or foundation excavations by the consultant.~~

~~2.6.2. Report References~~

~~Reports must include citations of literature and records used in the study, referenced aerial photographs or images interpreted (air-photo source, date and flight number, scale), and any other sources of data and information, including well logs, personal communications, etc.~~

~~2.6.3. Illustrations:~~

~~At a minimum, reports must include the following illustrations:~~

~~(a) Location Map: A site location map depicting topographic and geographic features and other pertinent data. Generally a 1:24,000-scale USGS topographic base map will suffice.~~

~~(b) Geologic Map: A regional-scale map (1:24,000 to 1:50,000 scale) is generally adequate. Depending on site complexity, a site-scale geologic map (1 inch = 200 ft or more detailed) may also be necessary. The map should show Quaternary and bedrock geologic units, faults, seeps or springs, soil or bedrock slumps, and other geologic and soil features existing on and adjacent to the project site. Geologic cross-sections may be included as needed to illustrate 3-dimensional relationships.~~

~~(c) Site Plan: A detailed site plan is required. The site plan should be at a scale of at least 1 inch = 200 feet (or more detailed) and should clearly show site boundaries, proposed building footprints, existing structures, streets, slopes, drainages, exploratory trenches, boreholes, test pits, geophysical traverses, and any other data pertinent data.~~

~~(d) Site Specific Fault Map: If faulting is documented at a parcel, the report shall include a site-specific fault map. The fault map should be at a scale of at least 1 inch = 200 feet and should clearly show the surveyed locations of trenches (and any other exploratory techniques), surveyed location(s) of faults documented in the trenches, inferred location of the faults between trenches, recommended fault setback distance on each side of the faults, topographic contours, and proposed building locations, if known.~~

~~(e) Exploratory Trench Logs: Trench logs are required for each trench excavated as part of the study. Trench logs shall accurately depict all observed geologic features and conditions. Trench logs shall not be generalized or diagrammatic. The minimum scale is 1 inch = 5 feet (1:60) with no vertical exaggeration. Trench logs must accurately reflect the features observed in the trench (see section 2.3.6).~~

~~—Trench logs shall include: trench orientation and indication of which trench wall was logged; trench top and bottom; stratigraphic contacts; stratigraphic unit descriptions including lithology, USCS soil classification, genesis (geologic origin), age, and contact descriptions; soil (pedogenic) horizons; marker beds; and deformation or offset of sediments, faults, and fissures. Other features of tectonic significance such as buried scarp free-faces, colluvial wedges, in-filled soil cracks, drag folds, rotated clasts, lineations, and liquefaction features including dikes, sand blows, etc. should also be shown. Interpretations of the age and origin of the deposits and any faulting or deformation must be included, based on depositional sequence. Fault orientation and geometry (strike and dip), and amount of net displacement must be measured and noted.~~

~~(f) Exploratory boreholes and CPT soundings: Should boreholes or CPT soundings be utilized as part of the investigation, reports shall include the logs of the borings/soundings. Borehole logs must include lithology descriptions, interpretations of geologic origin, USCS soil classification or other standardized engineering soil classification (include an explanation of the classification scheme), sample intervals, penetrative resistance values, static ground-water depths and dates measured, total depth of borehole, and identity of the person logging the borehole. Electronic copies of CPT data files should be provided to the City's reviewer, upon request.~~

~~(g) Geophysical data: All geophysical data, showing stratigraphic interpretations and fault locations, must be included in the report, along with correlations to trench or borehole logs to confirm interpretations.~~

~~(h) Photographs: Photographs of scarps, trench walls, or other features that enhance understanding of site conditions and fault-related conditions are not required but should be included when deemed appropriate. Composited, rectified digital photographs of trench walls may be used as background for trench logs, but features as outlined in section F above must still be delineated.~~

~~—REFERENCES~~

~~Batatian, L.D., and Nelson, C.V., 1999, Fault setback requirements to reduce fault rupture hazards in Salt Lake County: AEG Abstracts with Programs, 42nd Annual Meeting, Salt Lake City, p. 59.~~

~~Biek, R.F., 2005, Geologic map of the Lehi quadrangle and part of the Timpanogos Cave quadrangle, Salt Lake and Utah Counties, Utah: Utah Geological Survey Map 210, scale 1:24,000.~~

~~Black, B.D., Hecker, S., Hylland, M.D., Christenson, G.E., and McDonald, G.N., 2003, Quaternary fault and fold database and map of Utah: Utah Geological Survey Map 193DM.~~

~~Black, B.D., Lund, W.R., Schwartz, D.P., Gill, H.E., and Mayes, B.H., 1996, Paleoseismic investigation on the Salt Lake City segment of the Wasatch fault zone at the South Fork Dry Creek and Dry Gulch Sites, Salt Lake County, Utah: Utah Geological Survey Special Study 92, 22 p.~~

~~Bonilla, M.G., and Lienkaemper, J.J., 1991, Factors affecting the recognition of faults exposed in exploratory trenches: U.S. Geological Survey Bulletin 1947.~~

~~Bonilla, M.G., 1970, Surface faulting and related effects, in Wiegel, R.L., editor, Earthquake Engineering: Englewood Cliffs, N.J., Prentice-Hall, Inc., p. 47-74. (Contains an extensive bibliography on surface faulting, fault patterns and types, width of fault zones, and creep).~~

~~Bonilla, M.G., 1982, Evaluation of potential surface faulting and other tectonic deformation: U.S. Geological Survey Open-File Report 82-732, 58 p.~~

~~California Department of Conservation, Division of Mines and Geology, 1986a (revised), Guidelines to geologic and seismic reports: DMG Note 42, 2 p.~~

~~California Department of Conservation, Division of Mines and Geology, 1986b (revised), Guidelines for preparing engineering geologic reports: DMG Note 44, 2 p.~~

~~Chase, G.W., and Chapman, R.H., 1976, Black-box geology - uses and misuses of geophysics in engineering geology: California Geology, v. 29, p. 8-12.~~

Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey, Miscellaneous Publication 03-6, 14 p.

Christenson, G.E., 1993, The Wasatch Front County Hazards Geologist Program, in Gori, P.L., editor, Applications of research from the U.S. Geological Survey Program, Assessment of Regional Earthquake Hazards and Risk Along the Wasatch Front, Utah; U. S. Geological Survey Professional Paper 1519, p. 114-120.

Christenson, G.E., and Purcell, C.R., 1985, Correlation and age of Quaternary alluvial-fan sequences, Basin and Range Province, southwestern United States, in Soils and Quaternary Geology of the Southwestern United States, Weide, D.L., editor: Geological Society of America Special Paper 203, p. 1-21.

Cluff, L.S., Brogan, G.E., and Glass, E.E., 1970, Wasatch fault, northern portion, earthquake fault investigation and evaluation, a guide to land use planning: Oakland, California, Woodward-Clyde and Associates, unpublished report for the Utah Geological and Mineral Survey, variously paginated.

Crittenden, M.D., Jr., 1965, Geology of the Draper quadrangle, Utah: U.S. Geological Survey Map GQ 377, scale 1:24000.

Davis, F.D., 1983, Geologic map of the central Wasatch Front, Utah: Utah Geological and Mineral Survey Map 54A - Wasatch Front Series, scale 1:100,000.

Draper City, 2003, Article 4 - Special purpose and overlay zones, chapter 9-19, Geologic Hazards Ordinance, adopted December 30, 2003 - Ord. 547, effective January 13, 2004.

Draper City, 2003, Appendix A, Minimum standards for surface fault rupture hazard studies: July 2003, Draper City Geologic Hazards Ordinance, chapter 9-19.

Gilbert, G.K., 1875, Report upon the geology of portions of Nevada, Utah, California, and Arizona, Examined in the years 1871 and 1872, in Wheeler, G.M., editor, Report upon geographical and geological exploration and surveys west of the 100th meridian, vol 3: Geology, published by the Washington D.C., government printing office, p. 17-187.

Gilbert, G.K., 1890, Lake Bonneville: U.S. Geological Survey Monograph 1, 438 p.

Hart, E.W., 1992 (revised), Fault-rupture hazard zones in California: California Department of Conservation, Division of Mines and Geology, Special Publication 42, 32 p. (Revised periodically; information on state law and zoning program for regulating development near hazardous faults.

Hart, E.W., and Williams, J.W., 1978, Geologic review process: California Geology, v. 31, no 10, p. 235-236.

Hatheway, A. W., and Leighton, F.B., 1979, Trenching as an exploratory tool, in Hatheway, A. W., and McClure, C.R., Jr., editors, Geology in the siting of nuclear power plants: Geologic Society of America, Reviews in Engineering Geology, v. IV, p. 169-195.

Joint Committee on Seismic Safety, California Legislature, 1974, Meeting the earthquake challenge: California Division of Mines and Geology, Special Publication 45, 223 p.

Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p.

Lund, W.R., 1990, editor, Engineering geology of the Salt Lake City metropolitan area, Utah: Utah Geological Survey Bulletin 126, 66 p.

Machette, M.N., 1989, Preliminary surficial geologic map of the Wasatch fault zone, eastern part of Utah valley, Utah County and parts of Salt Lake and Juab Counties, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2109, scale 1:50,000.

Machette, M.N., 1992, Surficial geologic map of the Wasatch fault zone, eastern part of Utah valley, Utah County and parts of Salt Lake and Juab Counties, Utah: U.S. Geological Survey Miscellaneous Investigation Series Map I-2095, scale 1:50,000.

Machette, M.N., Personius, S.F., Nelson, A.R., Schwartz, D.P., and Lund, W.R., 1991, The Wasatch fault zone, Utah—segmentation and history of Holocene earthquakes: Journal of Structural Geology, v. 13, no. 2, p. 137-149.

Machette, M.N., Personius, S.F., and Nelson, A.R., 1992, Paleoseismology of the Wasatch fault zone: a summary of recent investigations, interpretations, and conclusions, in Gori, P.L. and Hays, W.W., eds., Assessment of regional earthquake hazards and risk along the Wasatch Front, Utah: U.S. Geological Survey Professional Paper 1500, p. A1-A71.

Madsen, D.B., 2000, Late quaternary paleoecology in the Bonneville basin: Utah Geological Survey Bulletin 130, p. 190.

Madsen, D.B., and Currey, D.R., 1979, Late Quaternary glacial and vegetation changes, Little Cottonwood Canyon area, Wasatch Mountains, Utah: Quaternary Research, v. 12, p. 254-270.

McCalpin, James P., 2002, New age control from the Wasatch fault megatrench of 1999: Abstracts with Programs, Geological Society of America, Rocky Mountain section.

McCalpin, James P., 1996, editor, Paleoseismology: Academic Press, 588 p.

McCalpin, James P., 1987, Recommended setbacks from active normal faults, in McCalpin, James, editor, Proceedings of the 23rd Annual Symposium on Engineering Geology and Soils Engineering: Logan, Utah State University, April 6-8, 1987, p. 35-56.

Miller, R.D., 1980, Surficial geologic map along part of the Wasatch Front, Salt Lake valley, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1198, scale, 1:100,000.

National Research Council, 1986, Studies in geophysics-active tectonics: National Academy Press, Washington, D.C., 266 p. (contains several articles evaluating active faulting).

Nevada Earthquake Safety Council, 1998, Guidelines for Evaluating Potential Surface Fault Rupture/Land Subsidence Hazards in Nevada; Available online at <http://www.nbmng.unr.edu/nesc/guidelines.html>

Nelson, C.V., 1987, Surface fault rupture and liquefaction hazard areas, map compiled for public information and planning: Salt Lake County Planning Division, Salt Lake City, Utah.

Noller, J.S., Sowers, J.M., and Lettis, W.R., editors, Quaternary geochronology, methods and applications: Washington D.C., American Geophysical Union AGU Reference Shelf 4, 582 p.

Occupational Safety and Health Administration, 1989, Federal Register, Tuesday October 31, 1989. 29 CFR Part 1926. For updates: www.osha-slc.gov/SLTC/constructiontrenching/index.html.

Oviatt, C.G., and Thompson, R.S., 2002, Recent developments in the study of Lake Bonneville since 1980, in Gwynn, J.W., editor, Great Salt Lake 2000—An Overview of Change: Utah Geological Survey Miscellaneous Publication XX, p. XX.

Oviatt, C.G., Currey, D.R., and Sack, D., 1992, Radiocarbon chronology of Lake Bonneville, Eastern Great Basin, U.S.A.: Paleogeography, Paleoclimatology, and Paleoecology, v. 99, p. 225-241.

Personius, S.F., and Scott, W.E., 1992, Surficial geologic map of the Salt Lake City segment and parts of adjacent segments of the Wasatch fault zone, Davis, Salt Lake, and Utah Counties, Utah: U.S. Geological Survey Map I-2106.

Salt Lake County, 2002a, Geologic hazards ordinance, chapter 19.75 of the Salt Lake County zoning code of ordinances, adopted July 2002: Salt Lake County Planning and Development Services Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, 11p.

Salt Lake County, 2002b, Minimum standards for surface fault rupture hazard studies, Appendix A, Geologic hazards ordinance, chapter 19.75 of the Salt Lake County zoning code of ordinances, adopted July 2002: Salt Lake County Planning and Development Services Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, 9p.

Salt Lake County, 2001, Liquefaction: a guide to land use planning, Geologic Hazards Ordinance chapter 19.75 Appendix B: Salt Lake County Planning and Development Services Division. 6 p.

Salt Lake County, 1995, Surface rupture and liquefaction potential special study areas map, Salt Lake County, Utah, adopted March 1989, revised July 1995: Salt Lake County Public Works, Planning Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, scale: 1:43,547.

Schwartz, D.P., and Coppersmith, K.J., 1984, Fault behavior and characteristic earthquakes: examples from the Wasatch and San Andreas fault zones: *Journal of Geophysical Research*, v. 89, no. B-7, July 10, 1984, p. 5681-5698.

Scott, W.E., and Shroba, R.R., 1985, Surficial geologic map of an area along the Wasatch fault zone in the Salt Lake Valley, Utah: U.S. Geol. Survey Open-File Report 85-448, 18 p.

Scott, W.E., McCoy, W.D., Shroba, R.R., and Rubin, M., 1983, Reinterpretation of the exposed record of the last two cycles of Lake Bonneville, Western United States: *Quaternary research*, v. 20, p. 261-285.

Sherard, J.L., Cluff, L.S., and Allen, C.R., 1974, Potentially active faults in dam foundations: *Geotechnique*, Institute of Civil Engineers, London, v. 24, no. 3, p. 367-428.

Simon, D.B., and Shlemon, R.J., 1999, The Holocene "Downtown Fault" in Salt Lake City, Utah, 1999: Association of Engineering Geologists, 1999 Annual Meeting, Abstract Volume, Salt Lake City, Utah, p. 85.

Simon, D.B., Bartlett, S.J., and Shlemon, R.J., 1999, Holocene ground failure in downtown Salt Lake City, Utah: Geological Society of America, Cordilleran section, Abstracts with Program, v. 31, no. 6, p. A-95.

Slemmons, D.B., 1977, State-of-the-art for assessing earthquake hazards in the United States: Report 6, faults and earthquake magnitude: U.S. Army Engineer Waterways Experiment Station Miscellaneous Paper S-73-1, 129 p., 37 p. appendix (Summarizes fault evaluation techniques; extensive bibliography).

Slemmons, D.B., and dePolo, C.M., 1992, Evaluation of active faulting and associated hazards: in *Studies in Geophysics-Active Tectonics*: National Research Council, p. 45-62.

Taylor, C.L., and Cluff, L.S., 1973, Fault activity and its significance assessed by exploratory excavation, in *Proceedings of the Conference on Tectonic Problems of the San Andreas Fault System*; Stanford University Publication, Geological Sciences, v. XIII, September 1973, p. 239-247.

Wallace, R.E., 1977, Profiles and ages of young fault scarps, north-central Nevada: *Geological Society of America Bulletin*, v. 88, p. 1267-1281.

Youd, T.L., 1980, Ground failure displacement and earthquake damage to buildings: American Society of Civil Engineers Conference on Civil Engineering and Nuclear Power, 2nd, Knoxville, Tennessee, v. 2, p. 7-6-2 to 7-6-26.

TABLE A-1

SETBACK RECOMMENDATIONS AND CRITICALITY FACTORS (U) FOR IBC OCCUPANCY CLASSES

(International Code Council, 2003)

Class (IBC)	Occupancy Group	Criticality	U	Minimum Setback
Class (IBC)	Occupancy Group	Criticality	U	Minimum Setback
A	Assembly	2	2.0	25 feet
B	Business	2	2.0	20 feet
E	Educational	1	3.0	50 feet
F	Factory/Industrial	2	2.0	20 feet
H	High hazard	1	3.0	50 feet
I	Institutional	1	3.0	50 feet
M	Mercantile	2	2.0	20 feet
R	Residential (R-1, R-2, R-4)	2	2.0	20 feet
R-3	Residential (R-3, includes single family homes)	3	1.5	15 feet
S	Storage	-	1	0
U	Utility and misc.	-	1	0
-	Table A-2	1	3.0	50 feet

TABLE A-2

ADDITIONAL STRUCTURES REQUIRING GEOLOGIC INVESTIGATION

Buildings and other structures that represent a substantial hazard to human life in the event of failure, but not limited to:

1. Buildings and other structures where more than 300 people congregate in one area.
2. Buildings and other structures with elementary school, secondary school or day care facilities with occupancy greater than 250.
3. Buildings and other structures with occupancy greater than 500 for colleges or adult education facilities.
4. Health care facilities with occupancy greater than 50 or more resident patients but not having surgery or emergency treatment facilities.
5. Jails and detention facilities.
6. Any other occupancy with occupancy greater than 1000.

~~7. Power generating stations, water treatment or storage for potable water, waste water treatment facilities and other public utility facilities.~~

~~8. Buildings and other structures containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.~~

~~Buildings and other structures designed as essential facilities including, but not limited to:~~

~~1. Hospitals and other care facilities having surgery or emergency treatment facilities.~~

~~2. Fire, rescue and police stations and emergency vehicle garages and fueling facilities.~~

~~3. Designated emergency shelters.~~

~~4. Designated emergency preparedness, communications, and operation centers and other facilities required for emergency response.~~

~~5. Power generating stations and other public utility facilities required as emergency backup facilities for facilities and structures included in this table.~~

~~6. Structures containing highly toxic materials as defined by the most recently adopted version of the IBC where the quantity of the material exceeds the maximum allowable quantities defined by the most recently adopted version of the IBC.~~

~~7. Aviation control towers, air traffic centers and emergency aircraft hangars.~~

~~8. Buildings and other structures having critical national defense functions.~~

~~9. Water treatment and storage facilities required to maintain water pressure for fire suppression.~~

~~9-19-161-3: APPENDIX C, MINIMUM STANDARDS FOR SLOPE STABILITY ANALYSIS:~~

~~1.0 INTRODUCTION~~

~~The procedures outlined herein are intended to provide consultants with a general outline for performing quantitative slope stability analyses and to clarify the expectations of Draper City. These standards constitute the minimum level of effort required in conducting quantitative slope stability analyses in Draper City. Considering the complexity inherent in performing slope stability analyses, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address slope stability. The information presented herein does not relieve consultants of their duty to perform additional geologic or engineering analyses they believe are necessary to assess the stability of slopes at a site.~~

~~The evaluation of landslides generally requires quantitative slope stability analyses. Therefore, the standards presented herein are directly applicable to landslide investigation,~~

~~and also constitute the minimum level of effort when performing landslide investigations. This appendix does not address debris flows (see appendix E) or rock falls (see appendix F).~~

~~The purposes for establishing minimum standards for slope stability analyses are to:~~

- ~~(a) Protect the health, safety, welfare, and property of the public by minimizing the potentially adverse effects of unstable slopes and related hazards;~~
- ~~(b) Assist property owners and land developers in conducting reasonable and adequate studies;~~
- ~~(c) Provide consulting engineering geologists and geotechnical engineers with a common basis for preparing proposals, conducting investigations, and mitigation; and,~~
- ~~(d) Provide an objective framework for regulatory review of slope stability reports.~~

~~1.1 References and Sources~~

~~The minimum standards presented herein were developed, in part, from the following sources:~~

- ~~(a) Guidelines for Evaluating Landslide Hazards in Utah (Hylland, 1996).~~
- ~~(b) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California (Blake et al., 2002).~~
- ~~(c) CDMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California~~
- ~~(d) Salt Lake County Geologic Hazards Ordinance (2002).~~
- ~~(e) Holladay City, Utah Natural Hazards Areas Provision (2006).~~
- ~~(f) Cottonwood Heights, Utah Code of Ordinances (2005).~~
- ~~(g) Centerville City Planning and Zoning Ordinance, section 12-330-2 Hillside Overlay District (1995).~~
- ~~(h) City of Camarillo, California 2003 Guidelines for the preparation of geotechnical and geologic studies, prepared by Fugro, dated June 18, 2003.~~
- ~~(i) City of Palmdale, California, Guidelines for preparation of geotechnical reports, prepared by GeoDynamics, Inc., dated April 2006 (draft copy).~~
- ~~(j) City of Malibu, California, Guidelines for the preparation of engineering geologic and geotechnical engineering reports and procedure for report submittal, prepared by Bing Yen and Associates) dated April, 2006.~~

1.2—Areas Requiring Slope Stability Analyses

Slope stability analyses shall be performed for all sites located within the Slope Stability Study Area Map (Plate A-3) and for all slopes that may be affected by the proposed development which meet the following criteria:

- (a) Cut and/or fill slopes steeper than about 2 horizontal (h) to 1 vertical (v).
- (b) Natural slopes steeper than or equal to 3 horizontal (h) to 1 vertical (v).
- (c) Natural and cut slopes with potentially adverse geologic conditions (e.g., bedding, foliation, or other structural features that are potentially adverse to the stability of the slope).
- (d) Natural and cut slopes which include a geologic hazard such as a landslide, irrespective of the slope height or slope gradient.
- (e) Buttresses and stability fills.
- (f) Cut, fill, or natural slopes of water retention basins or flood control channels.
- (g) In hillside areas (Plate A-3), investigations shall address the potential for surficial instability, debris/mudflows (see Appendix E), rock falls (see Appendix F), and soil creep on all slopes that may affect the proposed development or be affected by the proposed development.
- (h) When evaluating site conditions to determine the need for slope stability analyses, off-property conditions shall be considered (both up-slope to the top(s) of adjacent ascending slopes and down-slope to and beyond the toe(s) of adjacent descending slopes). Also, the consultant shall demonstrate that the proposed hillside development will not affect adjacent sites or limit adjacent property owners' ability to develop their sites.

1.3—Roles of Engineering Geologist and Engineering

The investigation of the static and seismic stability of slopes is an interdisciplinary practice. To provide greater assurance that the hazards are properly identified, assessed, and mitigated, involvement of both an engineering geologist and geotechnical engineer is required. Analyses shall be performed only by or under the direct supervision of licensed professionals, qualified and competent in their respective area of practice. An engineering geologist shall provide appropriate input to the geotechnical engineer with respect to the potential impact of the geology, stratigraphy, and hydrologic conditions on the stability of the slope. The shear strength and other geotechnical earth material properties shall be evaluated by the geotechnical engineer. Qualified engineering geologists, geological engineers and geotechnical engineers may assess and quantitatively evaluate slope stability. However, the geotechnical engineer shall perform all design stability calculations. Ground motion parameters for use in seismic stability analysis may be provided by either the engineering geologist or geotechnical engineer.

~~1.4 Minimum Qualifications of the Licensed Professional~~

~~Slope stability analyses must be performed by qualified engineering geologists and qualified geotechnical engineers (see sections 9-19-050 and 9-19-060 of the Draper City Geologic Hazards Ordinance, chapter 9-19).~~

~~2.0 GENERAL REQUIREMENTS~~

~~Except for the derivation of the input ground motion for pseudostatic and seismic deformation analyses (see section 12), slope stability analyses and evaluations should be performed in general accordance with the latest version of Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California (Blake et al., 2002). Procedures for developing input ground motions to be used in Draper City are described in section 12.1. See Draper City Geologic Hazard Ordinance, chapter 9-19, for supplemental requirements.~~

~~3.0 SUBMITTALS~~

~~Submittals for review shall include boring logs; geologic cross sections; trench and test pit logs; laboratory data (particularly shear strength test results, including individual stress-deformation plots from direct shear tests); discussions pertaining to how idealized subsurface conditions and shear strength parameters used for analyses were developed; analytical results, including computer output files (if requested); and summaries of the slope stability analyses and conclusions regarding slope stability.~~

~~Subsurface geologic and groundwater conditions must be illustrated on geologic cross sections and must be utilized by the geotechnical engineer for the slope stability analyses. If on-site sewage or storm water disposal exists or is proposed, the slope stability analyses shall include the effects of the effluent plume on slope stability.~~

~~The results of any slope stability analyses must be submitted with pertinent backup documentation (i.e., calculations, computer output, etc.). Printouts of input data, output data (if requested), and graphical plots must be submitted for each computer-aided slope stability analysis. In addition, input data files, recorded on diskettes, CDs, or other electronic media may be requested to facilitate the City's review.~~

~~4.0 FACTORS OF SAFETY~~

~~The minimum acceptable static factor of safety is 1.5 for both gross and surficial slope stability. The minimum acceptable factor of safety for a calibrated pseudostatic analysis is 1.0 using the method of Stewart and others (2003) (see section 12.2).~~

~~5.0 LANDSLIDES~~

~~The evaluation of landslides generally requires quantitative slope stability analyses. Therefore, the standards presented herein are directly applicable to landslide investigation, and also constitute the minimum level of effort when performing landslide investigations.~~

~~Evaluation of landslides shall be performed in the preliminary phase of hillside developments. Where landslides are present or suspected, sufficient subsurface exploration will be required to determine the basic geometry and stability of the landslide mass and the required stabilization measures. The depth of geologic exploration shall consider the regional geologic structure, the likely failure mode of the suspected failure, and past geomorphic conditions.~~

~~6.0 SITE INVESTIGATION AND GEOLOGIC STUDIES~~

~~Adequate evaluation of slope stability for a given site requires thorough and comprehensive geologic and geotechnical engineering studies. These studies are a crucial component in the evaluation of slope stability. Geologic mapping and subsurface exploration are normal parts of field investigation. Samples of earth materials are routinely obtained during subsurface exploration for geotechnical testing in the laboratory to determine the shear strength parameters and other pertinent engineering properties.~~

~~In general, geologic studies for slope stability consist of the following fundamental phases:~~

- ~~(a) Study and review of published and unpublished geologic information (both regional and site specific).~~
- ~~(b) Review and interpretation of available stereoscopic and oblique aerial photographs, DEMs, and LiDAR.~~
- ~~(c) Geologic field mapping, including, but not necessarily limited to, measurement of bedding, foliation, fracture, and fault attitudes and other parameters.~~
- ~~(d) Documentation and evaluation of subsurface groundwater conditions (including effects of seasonal and longer term natural fluctuations as well as landscape irrigation), surface water, on-site sewage disposal, and/or storm water disposal.~~
- ~~(e) Subsurface exploration.~~
- ~~(f) Analysis of the geologic failure mechanisms that could occur at the site (e.g., mode of failure and construction of the critical geologic cross sections).~~
- ~~(g) Presentation and analysis of the data, including an evaluation of the potential impact of geologic conditions on the project.~~

~~Geologic/geotechnical reports shall demonstrate that each of these phases has been adequately performed and that the information obtained has been considered and logically evaluated. Minimum criteria for the performance of each phase are described and discussed in Blake and others (2002).~~

~~7.0 SUBSURFACE EXPLORATION~~

~~The purpose of subsurface exploration is to identify potentially significant geologic materials and structures at a site and to provide samples for detailed laboratory~~

characterization of materials from potentially critical zones. Subsurface exploration is almost always required and may be performed by a number of widely known techniques such as bucket-auger borings, conventional small-diameter borings, cone penetration testing (CPT), test pits, trenches, and/or geophysical techniques (see section 4.2 of Blake et al., 2002). A discussion of the applicability of some subsurface exploration techniques follows.

7.1—Trenching

Subsurface exploration consisting of trenching has proven, in some cases, to be necessary when uncertainty exists regarding whether or not a particular landform is a landslide. Care must be exercised with this exploration method because landslides characteristically contain relatively large blocks of intact geologic units, which in a trench exposure could give the false impression that the geologic unit is "in-place." Although limited to a depth of about 15 feet below existing grades, trenching has also proven to be a useful technique for verifying margins of landslides, although the geometry of a landslide can generally be readily determined from evaluation of stereoscopic aerial photographs. Once a landslide is identified, conventional subsurface exploration drilling techniques will be required (see section 7.2 and 7.3). Slope stability analyses based solely on data obtained from trenches will not be accepted.

7.2—Methods for Bedded Formations

Conventional subsurface exploration techniques involving continuous core drilling with an oriented core barrel, test pits, and deep bucket-auger borings may be used to assess the subsurface soil and geologic conditions, particularly for geologic units with inclined bedding that includes weak layers.

Although not commonly utilized in Utah, a 24-inch-diameter bucket-auger boring with down-hole logging can provide valuable data (provided the consultant has determined the drill hole is safe to enter). The evaluation of safety of the proposed subsurface exploration program will be the responsibility of the consultant.

Particular attention must be paid to the presence or absence of weak layers (e.g., clay, claystone, silt, shale, or siltstone units) during the exploration. Unless adequately demonstrated (through comprehensive and detailed subsurface exploration) that weak (clay, claystone, silt, shale, or siltstone) layers (even as thin as 1/16-inch or less) are not present, a weak layer shall be assumed to possibly occur anywhere in the stratigraphic profile (i.e., ubiquitous weak clay beds).

The depth of the subsurface exploration must be sufficient to assess the conditions at or below the level of the deepest potential failure surface possessing a factor of 1.5 or less. A preliminary slope stability analysis may need to be performed to assist in the planning of the subsurface exploration program.

7.3—Other Geologic Units

For alluvium, fill materials, or other soil units that do not contain weak interbeds, other exploration methods such as small-diameter borings (e.g., rotary wash or hollow-stem-auger) or cone penetration testing may be suitable.

8.0—SOIL PARAMETERS

Soil properties, including unit weight and shear strength parameters (cohesion and friction angle), may be based on conventional field and laboratory tests as well as on field performance. Where appropriate (i.e., for landslide slip surfaces, along bedding planes, for surficial stability analyses, etc.), laboratory tests for saturated, residual shear strengths must be performed. Estimation of the shear resistance along bedding (or landslide) planes normally requires an evaluation of saturated residual along-bedding strength values of the weakest interbedded (or slide-plane) material encountered during the subsurface exploration, or in the absence of sufficient exploration, the weakest material that may be present, consistent with site geologic conditions. Strength parameters derived solely from CPT data may not be appropriate for slope stability analysis in some cases, particularly for strengths along existing slip surfaces where residual strengths have developed. Additional guidance on the selection of strength parameters for slope stability analyses is contained in Blake et al. (2002).

8.1—Residual Shear Strength Parameters

Residual strength parameters may be determined using the direct shear or ring shear testing apparatus; however ring shear tests are preferred. If performed properly, direct shear test results may approach ring shear test results. The soil specimen must be subjected to a sufficient amount of deformation (e.g., a significant number of shearing cycles in the direct shear test or a significant amount of rotation in the ring shear test) to assure that residual strength has been developed. In the direct shear and ring shear tests, stress-deformation curves can be used to determine when a sufficient number of cycles of shearing have been performed by showing that no further significant drop in shear strength results with the addition of more cycles or more rotation. The stress-deformation curves obtained during the shear tests must be submitted with the other laboratory test results. It shall be recognized that for most clayey soils, the residual shear strength envelope is curved and passes through the origin (i.e., at zero normal stress there is zero shear strength). Any "apparent shear strength" increases resulting from a non-horizontal shear surface (i.e., ramping) or "bulldozing" in residual direct shear tests shall be discounted in the interpretation of the strength parameters.

8.2—Interpretation

The engineer will need to use considerable judgment in the selection of appropriate shear test methods and in the interpretation of the results to develop shear strength parameters commensurate with slope stability conditions to be evaluated. Scatter plots of shear strength data may need to be presented to allow for assessment of idealized parameters.

~~The report shall summarize shear strength parameters used for slope stability analyses and describe the methodology used to interpret test results and estimate those parameters.~~

~~Peak shear strengths may be used to represent across-bedding failure surfaces or compacted fill, in situations where strength degradations are not expected to occur (see guidelines in Blake et al., 2002). Where peak strengths cannot be relied upon, fully softened (or lower) strengths shall be used.~~

~~Ultimate shear strength parameters shall be used in static slope stability analyses when there has not been past deformation. Residual shear strength parameters shall be used in static slope stability analyses when there has been past deformation.~~

~~Averaged strength parameters may be appropriate for some across-bedding conditions, if sufficient representative samples have been carefully tested. Analyses for along-bedding or along-existing-landslide slip surfaces shall be based on lower-bound interpretations of residual shear strength parameters and comparison of those results to correlations, such as those of Stark and others (2005).~~

~~8.3—Default Soil Parameters~~

~~In the Traverse Mountain area, failure surfaces for known landslides commonly occur within the Tertiary volcanics. Those failure surfaces typically are along clay layers formed by the in situ alteration of tuff deposits. In cases when the failure surface has been sampled and tested, relatively low residual shear strength values have been obtained; these values are cohesion equal to 0 psf and a friction angles equal to 11 to 12 degrees. Similar values have also been reported from the Springhill landslide in North Salt Lake that is in a similar tuffaceous volcanic formation of Tertiary age.~~

~~To assist in understanding shear strengths of these materials, the following shear strength parameters for landslide failure surfaces and along weak layers within the Tertiary volcanics shall be used; cohesion equal to 0 psf and a friction angle equal to 11 degrees, unless otherwise demonstrated. If site-specific testing produces lower residual shear strength than these values, the site-specific test results should be used. If site-specific testing produces higher values, documentation must be provided to demonstrate that the weakest materials were retrieved and tested and that the materials retrieved truly represent the basal landslide slip surface.~~

~~9.0—SOIL CREEP~~

~~The potential effects of soil creep shall be addressed where any proposed structure is planned in close proximity to an existing fill slope or natural slope. The potential effects on the proposed development shall be evaluated and mitigation measures proposed, including appropriate setback recommendations. Setback recommendations shall consider the potential affects of creep forces.~~

~~All reports in hillside areas shall address the potential for surficial instability, debris/mudflow (Appendix E), rock falls (Appendix F), and soil creep on all slopes that may affect the proposed development or be affected by the proposed development. Stability of slopes along access roads shall be addressed.~~

~~10.0—GROSS STATIC STABILITY~~

~~Gross stability includes rotational and translational deep-seated failures of slopes or portions of slopes existing within or outside of but potentially affecting the proposed development. The following guidelines, in addition to those in the Blake and others (2002) document, shall be followed when evaluating slope stability:~~

- ~~(a) Stability shall be analyzed along cross-sections depicting the most adverse conditions (e.g., highest slope, most adverse bedding planes, shallowest likely ground-water table, and steepest slope). Often analyses are required for different conditions and for more than one cross-section to demonstrate which condition is most adverse. When evaluating the stability of an existing landslide, analyses must also address the potential for partial reactivation. Inclinometers may be used to help determine critical failure surfaces and, along with high-resolution GPS, the state of activity of existing landslides. The critical failure surfaces on each cross-section shall be identified, evaluated, and plotted on the large-scale cross-section.~~
- ~~(b) If the long-term, static factor of safety is less than 1.5, mitigation measures will be required to bring the factor of safety up to the required level or the project may be redesigned to achieve a minimum factor of safety of 1.5.~~
- ~~(c) The temporary stability of excavations shall be evaluated and mitigation measures shall be recommended as necessary to obtain a minimum factor of safety of 1.3.~~
- ~~(d) Long-term stability shall be analyzed using the highest known or anticipated groundwater level based upon a groundwater assessment performed under the requirements of section 6.0.~~
- ~~(e) Where back-calculation is appropriate, shear strengths utilized for design shall be no higher than the lowest strength computed using back-calculation. If a consultant proposes to use shear strengths higher than the lowest back-calculated value, justification shall be required. Assumptions used in back-calculations regarding pre-sliding topography and groundwater conditions at failure must be discussed and justified.~~
- ~~(f) Reports shall describe how the shear strength testing methods used are appropriate in modeling field conditions and long-term performance of the subject slope. The utilized design shear strength values shall be justified with laboratory test data and geologic descriptions and history, along with past performance history, if known, of similar materials.~~

~~(g) Reports shall include shear strength test plots consisting of normal stress versus shear resistance (failure envelope). Plots of shear resistance versus displacement shall be provided for all residual and fully softened (ultimate) shear tests.~~

~~(h) The degree of saturation for all test specimens shall be reported. Direct shear tests on partially saturated samples may grossly overestimate the cohesion that can be mobilized when the material becomes saturated in the field. This potential shall be considered when selecting shear strength parameters. If the rate of shear displacement exceeds 0.005 inches per minute, the consultant shall provide data to demonstrate that the rate is sufficiently slow for drained conditions.~~

~~(i) Shear strength values higher than those obtained through site-specific laboratory tests generally will not be accepted.~~

~~(j) If direct shear or triaxial shear testing is not appropriate to model the strength of highly jointed and fractured rock masses, the design strengths shall be evaluated in a manner that considers overall rock mass quality and be consistent with rock mechanics practice.~~

~~(k) Shear strengths used in slope stability analyses shall be evaluated considering the natural variability of engineering characteristics inherent in earth materials. Multiple shear tests on each site material are likely to be required.~~

~~(l) Direct shear tests do not always provide realistic strength values (Watry and Lade, 2000). Correlations between liquid limit, percent clay fraction, and strength (fully softened and residual) with published data (e.g., Stark and McCone, 2002) shall be performed to verify tested shear strength parameters. Strength values used in analyses that exceed those obtained by the correlation must be appropriately justified.~~

~~(m) Shear strengths for proposed fill slopes shall be evaluated using samples mixed and remolded to represent anticipated field conditions. Confirming strength testing may be required during grading.~~

~~(n) Where bedding planes are laterally unsupported on slopes, potential failures along the unsupported bedding planes shall be analyzed. Similarly, stability analyses shall be performed where bedding planes form a dip-slope or near-dip-slope using composite potential failure surfaces that consist of potential slip surfaces along bedding planes in the upper portions of the slope in combination with slip surfaces across bedding planes in the lower portions of the slope.~~

~~(o) The stability analysis shall include the effect of expected maximum moisture conditions on soil unit weight.~~

~~(p) For effective stress analyses, measured groundwater conditions adjusted to consider likely unfavorable conditions with respect to anticipated future groundwater levels, seepage, or pore pressure shall be included in the slope stability analyses.~~

~~(q) Tension crack development shall be considered in the analyses of potential failure surfaces. The height and location of the tension crack shall be determined by searching.~~

~~(r) Anticipated surcharge loads as well as external boundary pressures from water shall be included in the slope stability evaluations, as deemed appropriate.~~

~~(s) Analytical chart solutions may be used provided they were developed for conditions similar to those being analyzed. Generally though, computer-aided searching techniques shall be used, so that the potential failure surface with the lowest factor of safety can be located. Examples of typical searching techniques are illustrated on figures 9.1a through 9.1f in Blake and others (2002). However, verification of the reasonableness of the analytical results is the responsibility of the geotechnical engineer and/or engineering geologist.~~

~~(t) The critical potential failure surface used in the analysis may be composed of circles, wedges, planes, or other shapes considered to yield the minimum factor of safety most appropriate for the geologic site conditions. The critical potential failure surface having the lowest factor of safety with respect to shearing resistance must be sought. Both the lowest factor of safety and the critical failure surface shall be documented.~~

~~11.0 SURFICIAL STABILITY OF SLOPES~~

~~Surficial slope stability refers to slumping and sliding of near- surface sediments and is most critical during the snowmelt and rainy season or when excessive landscape water is applied. The assessment of surficial slope stability shall be based on analysis procedures for stability of an infinite slope with seepage parallel to the slope surface or an alternate failure mode that would produce the minimum factor of safety. The minimum acceptable depth of saturation for surficial stability evaluation shall be four feet.~~

~~11.1 Applicability and Procedures~~

~~Conclusions shall be substantiated with appropriate data and analyses. Residual shear strengths comparable to actual field conditions shall be used in completing surficial stability analyses. Surficial stability analyses shall be performed under rapid draw-down conditions where appropriate (e.g., for debris and detention basins).~~

~~Where 2:1 or steeper slopes have soil conditions that can result in the development of an infinite slope with parallel seepage, calculations shall be performed to demonstrate that the slope has a minimum static factor of safety of 1.5, assuming a fully saturated 4-foot thickness. If conditions will not allow the development of a slope with parallel seepage, surficial slope stability analyses may not be required (provided the geologic/geotechnical reviewer concurs).~~

~~Surficial slope stability analyses shall be performed for fill, cut, and natural slopes assuming an infinite slope with seepage parallel to the slope surface or other failure mode that~~

would yield the minimum factor of safety against failure. A suggested procedure for evaluating surficial slope stability is presented in Blake et al. (2002).

11.2—Soil Properties

Soil properties used in surficial stability analyses shall be determined as noted in section 8.1. Residual shear strength parameters for surficial slope stability analyses shall be developed for a stress range that is consistent with the near-surface conditions being modeled. As indicated in section 8.1, it shall be recognized that for most clayey soils, the residual shear strength envelope is curved and passes through the origin (i.e., at zero normal stress there is zero shear strength). For sites with deep slip surfaces, the guidelines given by Blake and others (2002) should be followed.

11.3—Seepage Conditions

The minimum acceptable vertical depth for which seepage parallel to the slope shall be applied is four feet for cut or fill slopes. Greater depths may be necessary when analyzing natural slopes that have significant thicknesses of loose surficial material.

12.0—SEISMIC SLOPE STABILITY

In addition to static slope stability analyses, slopes shall be evaluated for seismic slope stability as well. Acceptable methods for evaluating seismic slope stability using calibrated pseudo-static limit-equilibrium procedures and simplified methods (e.g., those based on Newmark, 1965) to estimate permanent seismic slope movements are summarized in Blake and others (2002).

Nonlinear, dynamic finite element/finite difference numerical methods also may be used to evaluate slope movements resulting from seismic events as long as the procedures, input data, and results are thoroughly documented, and deemed acceptable by the City.

12.1—Ground Motion for Pseudostatic and Seismic Deformation Analyses

The two controlling faults that would most affect Draper City are the Salt Lake City and Provo segments of the Wasatch fault zone (WFZ). Repeated Holocene movement has been well documented along both segments (Black and others, 2003). Studies along the Provo segment of the WFZ indicate a recurrence interval of about 1150 years (Olig, and others, 2006; later revised, Olig, 2007) and the most recent event being about 500 to 650 years ago (Black and others, 2003; Olig, and others, 2006). Studies along the Salt Lake City segment of the WFZ indicate a recurrence interval of about 1300 years and the most recent event being about 1300 years ago (Lund, 2005). Based on the paleoseismic record of the Salt Lake City segment and assuming a time-dependent model, McCalpin (2002) estimates a conditional probability (using a log-normal renewal model) of 16.5% in the next 100 years (8.25% in the next 50 years) for a $M > 7$ surface-faulting earthquake. Therefore, using a time-dependent rather than Poisson or random model for earthquake recurrence, the likelihood of a large surface-faulting earthquake on the Salt Lake City segment of the WFZ is relatively

high and therefore the Salt Lake City segment is considered the primary controlling fault for deterministic analyses.

In regards to design ground accelerations for seismic slope stability analyses, Draper City prefers a probabilistic approach to determining the likelihood that different levels of ground motion will be exceeded at a particular site within a given time period. In order to more closely represent the seismic characteristics of the WFZ and better capture this possible high likelihood of a surface-faulting earthquake on the Salt Lake City segment, design ground motion parameters for seismic slope stability analyses shall be based on the peak accelerations with a 3.5 percent probability in 50 years (1,400-year return period). Peak bedrock ground motions can be readily obtained via the internet from the United States Geological Survey (USGS) National Seismic Hazard Maps, Data and Documentation web page (USGS, 2002), which is based on Frankel and others (2002). PGAs obtained from the USGS (2002) web page should be adjusted for effects of soil/rock (site-class) conditions in accordance with Seed and others (2001). Site specific response analysis may also be used to develop PGA values as long as the procedures, input data, and results are thoroughly documented, and deemed acceptable by the City.

12.2 Pseudo-Static Evaluations

Pseudo-static methods for evaluating seismic slope stability are acceptable as long as minimum factors of safety are satisfied, and due consideration is given in the selection of the seismic coefficient, k_h , reduction in material shear strengths, and the factor of safety for pseudo-static conditions.

Pseudo-static seismic slope stability analyses can be performed using the "screening analysis" procedure described in Blake et al. (2002). For that procedure a k_h value is selected from seismic source characteristics (modal magnitude, modal distance, and firm rock peak ground acceleration) and an acceptable level of deformation (5 cm) is specified. For that procedure, a factor of safety of 1.0 or greater is considered acceptable; otherwise, an analysis of permanent seismic slope deformation shall be performed.

12.3 Permanent Seismic Slope Deformation

For seismic slope stability analyses, estimates of permanent seismic displacement are preferred and may be performed using the procedures outlined in Blake and others (2002). It should be noted that Bray and Rathje (1998), referenced in Blake and others (2002), has been updated and superseded by Bray and Travarasrou (2007), which is the City's currently preferred method. For those analyses, calculated seismic displacements shall be 5 cm or less, or mitigation measures shall be proposed to limit calculated displacements to 5 cm or less.

For specific projects, different levels of tolerable displacement may be possible, but site-specific conditions, which shall include the following, must be considered:

~~(a) The extent to which the displacements are localized or broadly distributed – broadly distributed shear deformations would generally be less damaging and more displacement could be allowed.~~

~~(b) The displacement tolerance of the foundation system – stiff, well-reinforced foundations with lateral continuity of vertical support elements would be more resistant to damage (and hence could potentially tolerate larger displacements) than typical slabs-on-grade or foundation systems with individual spread footings.~~

~~(c) The potential of the foundation soils to experience strain softening – slopes composed of soils likely to experience strain softening should be designed for relatively low displacements if peak strengths are used in the evaluation of k_y due to the potential for progressive failure, which could involve very large displacements following strain softening.~~

~~In order to consider a threshold larger than 5 cm, the project consultant shall provide prior, acceptable justification to the City and obtain the City's approval. Such justification shall demonstrate, to the satisfaction of the City, that the proposed project will achieve acceptable performance 1–.~~

~~13.0 WATER RETENTION BASINS AND FLOOD CONTROL CHANNELS~~

~~For cut, fill, or natural slopes of water retention basins or flood control channels, slope stability analyses shall be performed. In addition to analyzing typical static and seismic slope stability, those analyses shall consider the effects of rapid drawdown, if such a condition could develop.~~

~~14.0 MITIGATION~~

~~When slope stability hazards are determined to exist on a project, measures to mitigate impacts from those hazards shall be implemented. Some guidance regarding mitigation measures is provided in Blake et al. (2002). Slope stability mitigation methods include 1) hazard avoidance, 2) grading to improve slope stability, 3) reinforcement of the slope or improvement of the soil within the slope, and (4) reinforcement of the structure built on the slope to tolerate anticipated slope displacements.~~

~~Where mitigation measures that are intended to add stabilizing forces to the slope are to be implemented, consideration may need to be given to strain compatibility. For example, if a compacted fill buttress is proposed to stabilize laterally unsupported bedding or a landslide, the amount of deformation needed to mobilize the recommended shear strength in the buttress shall be considered to confirm that it will not result in adverse movements of the upslope bedding or landslide deposits. Similarly, if a series of drilled soldier piers is to be used to support a potentially unstable slope and a residential structure will be built on the piers, pier deformations resulting from movements needed to mobilize the soil's shear strength shall be compared to tolerable deflections in the supported structure.~~

14.1—Full Mitigation

Full mitigation of slope stability hazards shall be performed for developments in the City. Remedial measures that produce static factors of safety in excess of 1.5 and acceptable seismic displacement estimates shall be implemented as needed.

14.2—Partial Mitigation for Seismic Displacement Hazards

On some projects or portions thereof (such as small structural additions, residential "infill projects", non-habitable structures, and non-structural natural slope areas), full mitigation of seismic slope displacements may not be possible, due to physical or economic constraints. In those cases, partial mitigation, to the extent that it prevents structural collapse, injury, and loss of life, may be possible if it can be provided consistent with IBC philosophies, and if it is approved by Draper City. The applicability of partial mitigations to specific projects will be evaluated on a case-by-case basis.

15.0—Notice of Geologic Hazard and Waiver of Liability

For developments where full mitigation of seismic slope displacements is not implemented, a Notice of Geologic Hazard shall be recorded with the proposed development describing the displacement hazard at issue and the partial mitigation employed. The Notice shall clearly state that the seismic displacement hazard at the site has been reduced by the partial mitigation, but not totally eliminated.

In addition, the owner shall assume all risks, waive all claims against the City and its consultants, and indemnify and hold the City and its consultants harmless from any and all claims arising from the partial mitigation of the seismic displacement hazard.

—APPENDIX C - REFERENCES

Black, B.D., Hecker, Suanne, Hylland, M.D., Christenson, G.E., and McDonald, G.N. (2003), Quaternary fault and fold database and map of Utah, Utah Geological Survey Map 193DM, CD.

Blake, T.F., Hollingsworth, R.A. and Stewart, J.P., Editors (2002), Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for analyzing and mitigating landslide hazards in California: organized by the Southern California Earthquake Center, available for download at:
<http://www.scec.org/resources/catalog/hazardmitigation.html#land>.

California Division of Mines and Geology (CDMG) (1997), Guidelines for evaluating and mitigating seismic hazards in California, CDMG Special Publication (SP) 117.

FEMA (1997), NEHRP guidelines for the seismic rehabilitation of buildings: FEMA-273/October,

Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rukstales, K.S. (2002),

Documentation for the 2002 update of the National Seismic Hazard Maps, USGS Open-File Report 02-420.

IBC (2006), International Building Code, International Code Council, Inc., 658 p

Lund, W.R. (2005), Consensus preferred recurrence interval and vertical slip rate estimates- Review of Utah paleoseismic trenching data by the Utah Quaternary Fault Parameters Working Group, Utah Geological Survey Bulletin 134, CD.

McCalpin, J.P. (2002), Post-Bonneville paleoearthquake chronology of the Salt Lake City segment, Wasatch fault zone, from the 1999 "megatrench" site, Utah Geological Survey Miscellaneous Publication 02-7, 38 p.

Newmark, N.M. (1965), Effects of earthquakes on dams and embankments, *Geotechnique*, v. 25, no. 4.

Olig, S.S. (2007), written communication, August 16, 2007: URS Corp, Oakland, California.

Olig, S.S., McDonald, G., Black, B., DuRoss, C., and Lund, W.R. (2006), A longer and more complete paleoseismic record for the Provo segment of the Wasatch fault zone, Utah, (abs.), *Seismological Research Letters*, v. 77, p. 274.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F. (2001), Recent advances in soil liquefaction engineering and seismic site response evaluation, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, University of Missouri-Rolla, Rolla, Missouri, 2001, Paper No. SPL-2, 45 p.

Stark, T.D., Choi, H., and McCone, S. (2005), "Drained shear strength parameters for analysis of landslides," *Journal of Geotechnical and Geoenvironmental Engineering*, v. 131, no. 5, pp. 575-588.

Stewart, J.P., Blake, T.M., and Hollingsworth, R.A. (2003), Development of a screen analysis procedure for seismic slope stability: *Earthquake Spectra*, 19 (3), pp. 697-712.

USGS (2002), National Seismic Hazard Maps, Data and Documentation web page: <http://eqhazmap.usgs.gov>. For obtaining a pga for a specific probability or return period see <http://earthquake.usgs.gov/research/hazmaps/design/>.

Watry, S.M. and Lade, P.V. (2000), "Residual shear strengths of bentonites on Palos Verdes Peninsula, California," *Proceedings of the session of Geo-Denver 2000, American Society of Civil Engineers*, pp. 323-342.

-

Notes

1. The SP117 Guidelines Committee (Blake and others, 2002) struggled in its deliberations regarding this issue and was unable to reach unanimous consensus. However, it was the judgment of all but one of the committee members (14 out of the 15) that when the critical slip surface from slope stability analysis daylights within a structure that is likely to be occupied by people during an earthquake, and if calculated median displacements (u) can be maintained at less than 5 cm, it is unlikely that the building would be damaged sufficiently to significantly threaten its structural integrity. One of the committee members felt that the calculated median seismic displacements through occupied structures should be maintained at less than 15 cm, but other than having that opinion, he did not offer a specific justification for that choice. Neither of those values (5 or 15 cm) is necessarily the "correct" median value, because they are judgment-based.

-

Ideally, allowable displacements for analyses would be established from a database in which observed slope displacements from earthquakes are correlated to measures of damage in structures. Unfortunately, however, such data do not exist in sufficient quantity to be useful, and hence there is an insufficient basis for selecting allowable displacements empirically. Accordingly, allowable displacement levels are established from engineering judgment. A number of factors affect the degree to which slope displacements will be damaging to structures. Displacements that occur beneath occupied structures are more critical than those in garden areas or streets. Displacements that occur abruptly across a narrow shear surface can be more damaging than those that are broadly distributed across a wide zone of deformation. Moreover, different structural systems will have different tolerances to differential movements beneath their foundation.

-

In their recent paper, Bray and Travasarou (2007) describe displacements of 1 cm or less as "negligible" and displacements of 5 cm or less as "minor." In an oral presentation made to the Los Angeles section of ASCE (on November 15, 2007), Jonathan Bray described seismic displacements of 15 cm to 1 m as "moderate" and those larger than 1 m as "large," but he cautioned that such general classifications depend on things such as the foundation system, consequences of displacement, the soil behavior, etc.

9-19-161-4: APPENDIX D, MINIMUM STANDARDS FOR LIQUEFACTION INVESTIGATIONS AND EVALUATIONS:

1.0 INTRODUCTION

The procedures outlined herein are intended to provide consultants with a general outline for performing liquefaction investigations and to specify the expectations of Draper City. These standards constitute the minimum level of effort required in conducting liquefaction investigations in Draper City. Considering the complexity inherent in performing liquefaction investigations, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address the liquefaction potential at the site. The information presented herein does not relieve consultants of their duty to perform additional geologic or geotechnical engineering analyses they believe are necessary to adequately assess the liquefaction potential at a site.

The purpose of establishing minimum standards for liquefaction investigations is to:

- (a) Protect the health, safety, welfare, and property of the public by minimizing the potentially adverse effects of liquefaction and related hazards;
- (b) Assist property owners and land developers in conducting reasonable and adequate studies;
- (c) Provide consulting engineering geologists and geotechnical engineers with a common basis for preparing proposals, conducting investigations, and mitigation; and,
- (d) Provide an objective framework for regulatory review of liquefaction investigation reports.

1.1 References and Sources

The minimum standards presented herein were developed, in part, from the following sources:

- (a) CDMG Special Publication 117, Guidelines for evaluating and mitigating seismic hazards in California (1997).
- (b) Recommended procedures for implementation of DMG special publication 117, guidelines for analyzing and mitigating liquefaction hazards in California (Martin and Lew, 1999).
- (c) Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils, Technical Report NCEER-97-0022 (Youd and Idriss, 1997).
- (d) Liquefaction Resistance of Soils: Summary Report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, (Youd et al., 2001).
- (e) Salt Lake County geologic hazards ordinance (2002).
- (d) Draper City geologic hazard ordinance (2003).

~~(e) City of Camarillo, California 2003 Guidelines for the preparation of geotechnical and geologic studies, prepared by Fugro, dated June 18, 2003.~~

~~(f) City of Palmdale, California, Guidelines for preparation of geotechnical reports, prepared by GeoDynamics, Inc., dated April 2006 (draft copy).~~

~~(g) City of Malibu, California, Guidelines for the preparation of engineering geologic and geotechnical engineering reports and procedure for report submittal, prepared by Bing Yen and Associates) dated April, 2006.~~

~~1.2 Properties Requiring Liquefaction Analyses~~

~~Plate A-2 (Appendix A of the Draper City Geologic Hazards Ordinance, chapter 9-19), Liquefaction Special Study Area Map, depicts generalized liquefaction susceptibility for the city, and shall be used to determine whether or not a site-specific liquefaction assessment is required for a particular project.~~

~~The Liquefaction Special Study Area map is based on a regional-scale investigation of Salt Lake County. These maps may not identify all areas that have potential for liquefaction; a site located outside of a zone of required investigation is not necessarily free from liquefaction hazard. The zone does not always include lateral spread run-out areas. The Liquefaction Special Study Area map is available from the Draper City Planning Department.~~

~~The Draper City Geologic Hazards Ordinance requires a site-specific liquefaction investigation to be performed prior to approval of a project based on the land-use/liquefaction potential matrix shown in the following table.~~

~~-~~

Type Of Facility	Liquefaction Study Area	Acceptable Factor Of Safety
Critical facilities (essential facilities, hazardous facilities, and special occupancy structures as defined in section 9-19-20	YES	1.3
Category III and IV in table 1604.58 of the most recently adopted edition of the IBC.	YES	1.3
Industrial and commercial buildings.	YES	1.25
Residential structures and subdivisions	NO	-

~~-~~

~~1.3 Roles of Engineering Geology and Geotechnical Engineering~~

~~The investigation of liquefaction hazard is an interdisciplinary practice. The site investigation report must be prepared by a qualified engineering geologist or geotechnical~~

engineer, who must have competence in the field of seismic hazard evaluation and mitigation, and be reviewed by a qualified engineering geologist or geotechnical engineer, also competent in the field of seismic hazard evaluation and mitigation.

Because of the differing expertise and abilities of qualified engineering geologists and geotechnical engineers, the scope of the site investigation report for the project may require that both types of professionals prepare and review the report, each practicing in the area of their expertise. Involvement of both a qualified engineering geologist and geotechnical engineer will generally provide greater assurance that the hazard is properly identified, assessed, and mitigated.

Liquefaction analyses are the responsibility of the geotechnical engineer, although the engineering geologist should be involved in the application of screening criteria (section 3.0, steps 1 and 2) and general geologic site evaluation (section 4.1) to map the likely extent of liquefiable deposits and shallow groundwater. Engineering properties of earth material shall be evaluated by the geotechnical engineer. The performance of the quantitative liquefaction analysis resulting in a numerical factor of safety and quantitative assessment of settlement and liquefaction-induced permanent ground displacement shall be performed by geotechnical engineers. The geotechnical and civil engineers shall develop all mitigation and design recommendations. Ground motion parameters for use in quantitative liquefaction analyses may be provided by either the engineering geologist or geotechnical engineer.

1.4—Minimum Qualifications of the Licensed Professional

Liquefaction analyses must be performed by qualified engineering geologists and qualified geotechnical engineers (see sections 9-19-050 and 9-19-060 of the Draper City Geologic Hazards Ordinance).

—2.0—GENERAL REQUIREMENTS

Except for the derivation of input ground motion (see section 5.0), liquefaction investigations should be performed in general accordance with the latest version of Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California (Martin and Lew, 1999). Additional protocol for liquefaction investigations is provided in Youd and Idriss (1997). See Draper City Geologic Hazard Ordinance (Chapter 9-19) for supplemental requirements. Acceptable factors of safety are shown on the table in section 1.2.

3.0—PRELIMINARY SCREENING FOR LIQUEFACTION

The Liquefaction Study Area map is based on broad regional studies and does not replace site-specific studies. The fact that a site is located within a Liquefaction Study Area does not mean that there is a significant liquefaction potential at the site, only that a study shall be performed to determine if there is.

Soil liquefaction is caused by strong seismic ground shaking where saturated, cohesionless, granular soil undergoes a significant loss in shear strength that can result in settlement and permanent ground displacement. Surface effects of liquefaction include: settlement, bearing capacity failure, ground oscillations, lateral spread and flow failure. It has been well documented that soil liquefaction may occur in clean sands, silty sands, and sandy silt, non-plastic silts and gravelly soils. The following conditions must be present for liquefaction to occur:

- (a) Soils must be submerged below the water table;
- (b) Soils must be loose to moderately dense;
- (c) Ground shaking must be relatively intense; and
- (d) The duration of ground shaking must be sufficient for the soils to generate seismically-induced excess pore water pressure and lose their shearing resistance.

The following screening criteria may be applied to determine if further quantitative evaluation of liquefaction hazard is required:

- (a) If the estimated maximum past-, current-, and maximum- future-groundwater levels (i.e., the highest groundwater level applicable for liquefaction analyses) are determined to be deeper than 50 feet below the existing ground surface or proposed finished grade (whichever is deeper), liquefaction assessments are not required. For soil materials that are located above the level of the groundwater, a quantitative assessment of seismically induced settlement is required.
- (b) If "bedrock" or similar lithified formational material underlies the site, those materials need not be considered liquefiable and no analysis of their liquefaction potential is necessary.
- (c) If the corrected standard penetration blow count, $(N_1)_{60}$, is greater than or equal to 33 in all samples with a sufficient number of tests, liquefaction assessments are not required. If cone penetration test soundings are made, the corrected cone penetration test tip resistance, qc_{1N} , should be greater than or equal to 180 in all soundings in sand materials, otherwise liquefaction assessments are needed.

If plastic soil ($PI \geq 20$) materials are encountered during site exploration, those materials may be considered non-liquefiable. Additional acceptable screening criteria regarding the effects of plasticity on liquefaction susceptibility are presented in Boulanger and Idriss (2004), Bray and Sancio (2006), and Seed and others (2003).

If the screening investigation clearly demonstrates the absence of liquefaction hazards at a project site and the City concurs, the screening investigation will satisfy the site investigation report requirement for liquefaction hazards. If not, a quantitative evaluation is required to assess the liquefaction hazards.

4.0—FIELD INVESTIGATIONS

Geotechnical field investigations are routinely performed for new projects as part of the normal development and design process. Geologic reconnaissance and subsurface explorations are normally performed as part of the field exploration program even when liquefaction does not need to be investigated.

4.1—Geologic Reconnaissance

Geologic research and reconnaissance are important to provide information to define the extent of unconsolidated deposits that may be prone to liquefaction. Such information should be presented on geologic maps and cross sections and provide a description of the formations present at the site that includes the nature, thickness, and origin of Quaternary deposits with liquefaction potential. There also should be an analysis of groundwater conditions at the site that includes the highest recorded water level and the highest water level likely to occur under the most adverse foreseeable conditions in the future.

During the field investigation, the engineering geologist should map the limits of unconsolidated deposits with liquefaction potential. Liquefaction typically occurs in cohesionless silt, sand, and fine-grained gravel deposits of Holocene to late Pleistocene age in areas where the groundwater is shallower than about 50 feet.

Shallow groundwater may exist for a variety of reasons, some of which are of natural and or manmade origin. Landscape irrigation, on-site sewage disposal, and unlined manmade lakes reservoirs, and storm-water detention basins may create a shallow groundwater table in sediments that were previously unsaturated.

4.2—Subsurface Explorations

Subsurface explorations shall consist of drilled borings and/or cone penetration tests (CPTs). The exploration program shall be planned to determine the soil stratigraphy, groundwater level, and indices that could be used to evaluate the potential for liquefaction by either in situ testing or by laboratory testing of soil samples. Borings and CPT soundings must penetrate a minimum of 50 feet below final ground surface. If a standard penetration test (SPT) is used, sampling intervals shall not exceed 2.5 feet.

For saturated cohesionless soils where the SPT (N₁)₆₀ values are less than 15, or where CPT tip resistances are below 60 tsf, grain-size analyses, hydrometers tests, and Atterberg Limits tests shall be performed on these soils to further evaluate their potential for permanent ground displacement (Youd et al., 2002) and other forms of liquefaction-induced ground failure and settlement.

Where a structure may have subterranean construction or deep foundations (e.g., caissons or piles), the depth of investigation should extend to a depth that is a minimum of 20 feet (6 m) below the lowest expected foundation level (e.g., caisson bottom or pile tip) or 50 feet (15 m) below the existing ground surface or lowest proposed finished grade, whichever is

deeper. If, during the investigation, the indices to evaluate liquefaction indicate that the liquefaction potential may extend below that depth, the exploration should be continued until a significant thickness (at least 10 feet or 3 m, to the extent possible) of nonliquefiable soils are encountered.

5.0—GROUND MOTION FOR LIQUEFACTION SUSCEPTIBILITY AND GROUND DEFORMATION ANALYSES

The two controlling faults that would most affect Draper City are the Salt Lake City and Provo segments of the Wasatch Fault Zone (WFZ). Repeated Holocene movement has been well documented along both segments (Black and others, 2003). Studies along the Provo segment of the WFZ indicate a recurrence interval of about 1150 years (Olig, and others, 2006; later revised, Olig, 2007) and the most recent event being about 500 to 650 years ago (Black and others, 2003; Olig, and others, 2006). Studies along the Salt Lake City segment of the WFZ indicate a recurrence interval of about 1300 years and the most recent event being about 1300 years ago (Lund, 2005). Based on the paleoseismic record of the Salt Lake City segment and assuming a time-dependent model, McCalpin (2002) estimates a conditional probability (using a log-normal renewal model) of 16.5% in the next 100 years (8.25% in the next 50 years) for a $M > 7$ surface-faulting earthquake. Therefore, using a time-dependent rather than Poisson or random model for earthquake recurrence, the likelihood of a large surface-faulting earthquake on the Salt Lake City segment of the WFZ is relatively high and therefore the Salt Lake City segment is considered the primary controlling fault for deterministic analyses.

In regards to design ground accelerations for liquefaction analyses, Draper City prefers a probabilistic approach to determining the likelihood that different levels of ground motion will be exceeded at a particular site within a given time period. In order to more closely represent the seismic characteristics of the WFZ and better capture this possible high likelihood of a surface-faulting earthquake on the Salt Lake City segment, design ground motion parameters for liquefaction analyses shall be based on the peak accelerations with a 3.5 percent probability in 50 years (1,400-year return period). Peak bedrock ground motions can be readily obtained via the internet from the United States Geological Survey (USGS) National Seismic Hazard Maps, Data and Documentation web page (USGS, 2002), which is based on Frankel and others (2002). PGAs obtained from the USGS (2002) web page should be adjusted for effects of soil/rock (site-class) conditions in accordance with Seed and others (2001) or other appropriate methods that consider the site-specific soil conditions and their potential for amplification/deamplification of the high frequency strong motion.

6.0—REMEDIAL DESIGN

Sites, facilities, buildings, structures and utilities that are founded on or traverse liquefiable soils may require further remedial design and/or relocation to avoid liquefaction-induced damage. These should be investigated and evaluated on a site-specific basis with sufficient geologic and geotechnical evaluations to support the remedial design and/or mitigative

~~plan. This design or plan may include: changes/modifications to the soil, foundation system, structural frame or support of the building, etc. and should be reviewed and approved by the City.~~

~~7.0 SUBMITTALS~~

~~Submittals for review shall include: boring logs; geologic cross sections; laboratory data; discussions pertaining to how idealized subsurface conditions and parameters used for analyses were developed; analytical results, including computer output files (on request); and summaries of the liquefaction analyses and conclusions regarding liquefaction potential and likely types and amounts of ground failure.~~

~~Subsurface geologic and groundwater conditions must be illustrated on geologic cross-sections and must be utilized by the geotechnical engineer for the liquefaction analyses. If on-site sewage or storm water disposal exists or is proposed, the liquefaction analyses shall include the effects of the effluent plume on liquefaction potential.~~

~~The results of any liquefaction analyses must be submitted with pertinent backup documentation (i.e., calculations, computer output, etc.). Printouts of input data, output data (on request), and graphical plots must be submitted for each computer-aided liquefaction analysis. In addition, input data files, recorded on diskettes, CDs, or other electronic media, may be requested to facilitate the City's review.~~

~~—Appendix D – References~~

~~Bartlett, S.F. and Youd, T. L., (1995), Empirical prediction of liquefaction-induced lateral spread: Journal of Geotechnical Engineering, Vol. 121, No. 4, April, A.S.C.E., pp. 316-329.~~

~~Black, B.D., Hecker, S., Hylland, M.D., Christenson, G.E., and McDonald, G.N., (2003), Quaternary fault and fold database and map of Utah, Utah Geological Survey Map 193DM.~~

~~Boulanger, R.W., and Idriss I.M., (2004), "Evaluating the potential for liquefaction resistance or cyclic failures of silts and clays, Report UCD/CGM-04/01 University of California, Davis California.~~

~~Bray J. D. and Sancio R. B., (2006), Assessment of Liquefaction Susceptibility of Fine-Grained Soils, ASCE Journal of Geotechnical and Geoenvironmental Engineering, September 2006.~~

~~California Division of Mines and Geology (CDMG), (1997), Guidelines for evaluating and mitigating seismic hazards in California, CDMG Special Publication (SP) 117.~~

~~Lund, W.R. (2005), Consensus preferred recurrence interval and vertical slip-rate estimates- Review of Utah paleoseismic trenching data by the Utah Quaternary Fault Parameters Working Group, Utah Geological Survey Bulletin 134, CD.~~

~~McCalpin, J., (2002), Post-Bonneville paleoearthquake chronology of the Salt Lake City segment, Wasatch fault zone, from the 1999 (mega-trench) site, Utah Geological Survey Miscellaneous Publication 02-7.~~

Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rukstales, K.S., (2002), Documentation for the 2002 Update of the National Seismic Hazard Maps, U.S.G.S. Open-File Report 02-420, 33p.

Martin, G.R. and Lew, M., eds., (1999), Recommended procedures for implementation of DMG special publication 117, guidelines for analyzing and mitigating liquefaction potential in California, Southern California Earthquake Center (SCEC), University of Southern California, 63 p.

Olig, Susan S., McDonald, Greg, Black, Bill D., DuRoss, Christopher B., and Lund, William R., (2006), A longer and more complete paleoseismic record for the Provo segment of the Wasatch fault zone, Utah, 2006 Seismological Society of America Annual Meeting in San Francisco, California, April 17-22, 2006.

Olig, (2007), URS Corp, Oakland, California; written communication, August, 2007.

Seed, H.B., and Idriss, I.M., (1982), Ground motion and soil liquefaction during earthquakes: Earthquake Engineering Research Institute, Oakland, California, 135 p.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F., (2001), Recent advances in soil liquefaction engineering and seismic site response evaluation, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, University of Missouri-Rolla, Rolla, Missouri, 2001, Paper No. SPL-2, 45 p.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F. (2001) Recent Advances in Soil Liquefaction Engineering and Seismic Site Response Evaluation, Proceedings, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics and Symposium in Honor of Professor W.D. Liam Finn, San Diego, California, March 26-31, 2001, 45 pp.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F., Sancio, R.B., Bray, J.D., Kayen, R.E., and Faris, A. (2003) Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework, 26th Annual ASCE Los Angeles Geotechnical Spring Seminar, Keynote Presentation, H.M.S. Queen Mary, Long Beach, California, April 30, 2003, 71 pp.

Youd, T.L., and Idriss, I.M., eds., (1997), Proceedings of the NCEER workshop on evaluation of liquefaction resistance of soils: National Center for Earthquake Engineering Research Technical Report NCEER 97-0022.

Youd, T.L., and Gilstrap, S.D., (1999), Liquefaction and deformation of silty and fine-grained soils: Proceedings of the Second International Conference on Earthquake Geotechnical Engineering, Lisboa, Portugal, 21-25 June 1999, Seco e Pinto (ed.), pp. 1013-1020.

~~Youd, T.C., Hansen, C.M., and Bartlett, S.F., (2002), Revised MLR equations for predicting lateral spread displacement, ASCE Journal of Geotechnical and Geoenvironmental Engineering, December 2002.~~

~~9-19-161-5: APPENDIX E, MINIMUM STANDARDS FOR DEBRIS FLOW ANALYSES:~~

~~Debris-flow reports shall follow general guidance contained in "Guidelines for the geologic evaluation of debris-flow hazards on alluvial fans in Utah," Utah Geological Survey Miscellaneous Publication 05-6. Debris-flow hazard analyses and mitigation measures may require contributions from hydrologists as well as qualified engineering geologists and geotechnical engineers.~~

~~9-19-161-6: APPENDIX F, MINIMUM STANDARDS FOR ROCKFALL ANALYSES:~~

~~Useful methods to evaluate rock-fall hazards are outlined in: Evans, S.G., and Hungr, O., 1993, The assessment of rockfall hazard at the base of talus slopes: Canadian Geotechnical Journal, v. 30, p. 620-636; Jones, C.L., Higgins, J.D., and Andrew, R.D., 2000, Colorado rockfall simulation program, version 4.0: Report prepared for the Colorado Department of Transportation, 127 p.; and Wieczorek, G.F., Morrissey, M.M., Iovine, G., and Godt, J., 1998, Rock-fall hazards in the Yosemite Valley: U.S. Geological Survey Open-File Report 98-467, 7 p., 1 pl., scale 1:12,000. Rock-fall studies shall be prepared by a qualified engineering geologist and may require contributions from a qualified geotechnical engineer, particularly in the design of mitigation measures.~~

...

9-27-085: RETAINING WALLS:

...

- D. Geologic Hazards Ordinance Applicability: The Draper City geologic hazards ordinance, ~~section 9-19-161-3~~ [Title 10, Chapter 7](#), and ~~"Appendix C~~ [B](#), "Minimum Standards For Slope Stability Analysis", of ~~this title, section 1.2~~ [the Geotechnical Engineering Standards](#), requires global stability analysis of modified natural slopes steeper than three horizontal to one vertical (3H:1V) and cut or fill slopes of two horizontal to one vertical (2H:1V) or greater.

...

TITLE 10
BUILDING REGULATIONS

...

CHAPTER 7
GEOLOGIC HAZARDS

10-7-010: PURPOSE:

- A. The purpose of the Draper City (the City) geologic hazards ordinance is to protect the health, safety, welfare, and property of the citizens of the City, protect the city's infrastructure and financial health and minimize adverse effects of geologic hazards to public health, safety, and property by encouraging wise land use.
- B. This chapter and the appendices of the Geotechnical Engineering Standards address fault activity, slope stability, liquefaction, debris-flow, and rockfall hazards and present minimum standards and methods for evaluating geologic hazards.
- C. All persons required to comply with this chapter shall present the results of geologic hazards investigations in compliance with this chapter and the appendices of the Geotechnical Engineering Standards. The standards set forth in the appendices of the Geotechnical Engineering Standards are minimum requirements. More complex projects may require more detailed and in-depth evaluations than outlined herein. In addition, the appendices of the Geotechnical Engineering Standards shall not supersede other, more-stringent requirements that may be required by other regulatory agencies.
- D. Geologic hazards special study area maps reflecting geological concerns pertaining to development within the City may be viewed at the City online map portal via the geologic information application. The maps incorporate data obtained from previous geologic hazards study investigations performed in the City. Site-specific geologic hazards assessments performed by engineering geologists and/or geotechnical engineers shall be required before developing projects located within a geologic hazards study area. In the event known or readily apparent geologic hazards exist in an area subject to a development application, which area is not depicted on the geologic hazards special study area maps, the applicant shall nevertheless submit the applicable investigation and the process outlined in this chapter shall be followed.

10-7-015: ESTABLISHMENT OF STANDARDS AND SPECIFICATIONS:

The city manager, with the advice and consent of the city council through resolution, shall establish certain standards and specifications that shall be applicable to this chapter. All

such standards and specifications shall be published in the Geotechnical Engineering Standards on file with the building division for public inspection and review.

10-7-020: DEFINITIONS:

As used in this chapter:

ACCEPTABLE AND REASONABLE RISK: no loss of life or significant injury to occupants, no release of hazardous or toxic substances, and structural damage following an earthquake, rockfall, debris flow, or other natural hazard that retains a margin against the onset of partial or total collapse.

ACCESSORY BUILDING: any structure not designed for human occupancy, which may include tool or storage sheds, gazebos, and swimming pools.

ALLUVIAL FAN: a gently sloping fan-shaped landform (in plan view), created over time by stream deposition of eroded sediments where the stream emerges from a narrow drainage onto a plain or broad valley.

APPLICANT: any person, including a person's agents or consultants, required to act in compliance with this chapter. The city and its agents and consultants are not applicants.

BUILDABLE AREA:

1. The part of a site that may be developed after required setbacks have been deducted and open space requirements of Title 9 of this code have been met, and
2. If applicable, based on an accepted geologic hazards study report, the part of a site not impacted by geologic hazards, or the part of a site where the identified geologic hazards can be mitigated to an acceptable risk.

CITY: the city council, mayor, city manager, public works director, city engineer, community development director, planning manager, building official, or other city employee.

CRITICAL FACILITIES: essential, hazardous, special occupancy facilities, and Risk Categories III and IV as defined in the currently adopted International Building Code, and lifelines such as major utility, transportation, and communication facilities and their connections to critical facilities.

DEBRIS FLOW: a slurry of rock, soil, organic material, and water transported in an extremely fast and destructive flow that flows down channels and onto and across alluvial fans, including a continuum of sedimentation events and processes including debris flows, debris floods, mudflows, clear-water floods, and alluvial-fan flooding.

DEVELOPMENT: all critical facilities, subdivisions, single- and multi-family dwellings, commercial and industrial buildings, retaining walls, and public right-of-way improvements, also additions to or intensification of existing buildings, storage facilities, pipelines, and utility conveyances, and other land uses.

ENGINEERING GEOLOGIST: a Utah-licensed geologist, who, through education, training, and experience, is competent in applying geologic data, techniques, and principles, such that geologic conditions and factors affecting engineered works are recognized, adequately interpreted, and clearly presented for use in engineering practice, land use planning, and the protection of the public, safety, and welfare.

The individual must meet the following qualifications:

1. An undergraduate or graduate degree in geology, engineering geology, or geological engineering, or closely related field, from an accredited college or university.
2. Five full years of experience in a responsible position in the field of engineering geology in Utah, or in a state with similar geologic hazards and regulatory environments.

ENGINEERING GEOLOGY: geologic work relevant to engineering and environmental concerns, and public health, safety, welfare, and property. Engineering geology is the application of geological data, principles, and interpretation so geological factors affecting planning, design, construction, and maintenance of engineered works, land use planning, and groundwater resources are adequately recognized and properly interpreted for use in engineering, land-use planning, and related practice.

ESSENTIAL FACILITY: buildings and other structures intended to remain operational in the event of an adverse geologic event, including all structures defined in section 10-7-160 of this chapter.

FAULT: a fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other.

GEOLOGIC HAZARD: a surface-fault rupture, liquefaction, slope instability, landslide, debris flow, and rockfall that may present a risk to life or property.

GEOLOGIC HAZARDS STUDY REPORT: a report containing the results of the geologic hazards study including maps, figures, data, and calculations that substantiate all conclusions and recommendations.

GEOLOGIC HAZARDS STUDY AREA: a potentially hazardous area as shown on the geologic hazards special study area maps within which geologic hazards investigations are required prior to development.

GEOLOGIC RESTRICTED AREA: 1) an area of a property not included in a site-specific geologic hazards investigation, and 2) where a geologic hazards investigation must be performed before development and/or issuance of building permits for habitable structures.

GEOTECHNICAL ENGINEER: a Utah-licensed civil engineer who, through education, training, and experience, is competent in the field of geotechnical engineering for use in engineering practice, land use planning, and the protection of the public, safety, and welfare.

The individual must meet the following qualifications:

1. A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or an undergraduate degree in civil engineering with twelve (12) semester hours of graduate level education in geotechnical engineering, or course content related to evaluation of geologic hazards, from an accredited college or university.
2. Five (5) full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazards studies, including slope stability analyses.

GEOTECHNICAL ENGINEERING: the study and engineering evaluation of earth materials including soil, rock, and man-made materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.

GEOTECHNICAL ENGINEERING REPORT: reports prepared to provide data on the physical properties of surface and subsurface soil conditions for the development of a property that contain the findings of field studies, including maps, plans, figures, data, calculations, etc. necessary to substantiate all geotechnical engineering conclusions and recommendations.

LANDSLIDE: the downslope movement of a mass of soil, surficial deposits, or bedrock, including a continuum of processes between landslides, earth-flows, debris flows, debris avalanches, and rockfalls.

LIQUEFACTION: a process by which certain water-saturated soils lose bearing strength because of earthquake-related ground shaking and subsequent increase of groundwater pore pressure.

NON-BUILDABLE AREA: the portion of a site which a geologic hazards study report has concluded may be impacted by geologic hazards and cannot be reasonably mitigated to an acceptable level, and where the siting of structures designed for human occupancy, structures requiring a building permit, or critical facilities is not permitted.

ROCKFALL: a rock or mass of rock, newly detached from a cliff or other steep slope which moves downslope by falling, rolling, toppling, or bouncing; includes rockslides, rockfall avalanches, and talus.

SETBACK: an area subject to risk from a geologic hazard, within which construction of critical facilities and structures designed for human occupancy are not permitted.

SLOPE STABILITY: the resistance of a natural or artificial slope or other inclined surface to failure by landsliding, usually assessed under both static and dynamic (earthquake-induced) conditions.

SLOPE STABILITY ANALYSIS: the analysis of the static and seismic stability of engineered and natural slopes of soil and rock.

STRUCTURE DESIGNED FOR HUMAN OCCUPANCY: any building or structure containing a habitable space, or classified as an assembly, business, educational, factory and industrial, institutional, mercantile, or residential occupancy classification under the adopted International Building Code and/or any residential dwelling or any other structure containing a habitable space used or intended for supporting or sheltering any use or occupancy, which is expected to have an occupancy rate of at least 2000 person-hours per year but does not include an accessory building.

10-7-030: SCOPE:

- A. The regulations contained in this chapter shall apply to all lands in the City.
- B. This chapter shall apply to any geologic hazards investigation for the purpose of determining the feasibility of development or for exploring, evaluating, or establishing locations for permanent improvements.

10-7-040: RESPONSIBILITY FOR GEOLOGIC HAZARDS STUDY INVESTIGATIONS:

Geologic hazards investigations often involve both engineering geology and geotechnical engineering. Geologic hazards investigations shall be performed under the direct supervision of an engineering geologist (see Section 10-7-050) and/or geotechnical engineer (see Section 10-7-060). Geotechnical engineering investigations shall be performed under the direct supervision of a geotechnical engineer (see Section 10-7-060).

10-7-050: MINIMUM QUALIFICATIONS OF THE GEOLOGIST:

Engineering geology and the evaluation of geologic hazards is a specialized discipline within

the practice of geology requiring technical expertise and knowledge of techniques not commonly used in other geologic investigations. Therefore, geologic hazards investigations shall only be accepted by the City when conducted, signed and sealed by a Utah-licensed geologist, meeting the qualifications of an engineering geologist as defined in Section 10-7-020.

10-7-060: MINIMUM QUALIFICATIONS OF THE GEOTECHNICAL ENGINEER:

Evaluation and mitigation of geologic hazards often require contributions from a geotechnical engineer, particularly in the design of mitigation measures. Geotechnical engineering is a specialized discipline within the practice of civil engineering requiring technical expertise and knowledge of techniques not commonly used in civil engineering investigations. Therefore, geologic hazards investigations requiring a geotechnical engineer will only be accepted by the City when also signed and sealed by a Utah-licensed civil engineer meeting the qualifications of a geotechnical engineer as defined in Section 10-7-020.

10-7-070: PRELIMINARY ACTIVITIES:

This section shall apply to the investigation of any geologic hazards as defined herein.

- A. Scoping Meeting: The applicant or consultant shall schedule a scoping meeting with the City to evaluate the engineering geologist's and geotechnical engineer's (if applicable) investigative approach. Before scheduling the scoping meeting, the applicant's engineering geologist consultant and geotechnical engineering consultant (if applicable) shall present a written work plan which includes a site plan depicting anticipated geologic hazards and proposed explorations, such as trenches, borings, cone penetration test, proposed cross-section(s) for slope stability analysis as applicable that meet the requirements of the City geologic hazards ordinance, and any other information upon request. All work plans shall include the original or electronic signature and professional seal, both in blue ink, of the qualified professional(s) responsible for the work plan.

The investigation approach should allow for flexibility due to unexpected site conditions. Field findings may require modifications to the work plan. Upon completion of a successful scoping meeting, a land disturbance permit application may be submitted to the City. A work plan approval letter will be issued by the City after acceptance of the consultants' work plan.

- B. Land Disturbance Permit: As required by Title 18 of this code and except as otherwise noted therein, no person shall commence or perform any land disturbance, grading, relocation of earth, or any other land disturbance activity, without first obtaining a land disturbance permit. For geologic hazards investigations, an application for a land

disturbance permit shall be filed with the City Engineer on forms furnished by the City for such purposes only after a scoping meeting has taken place.

- C. Responsible Contact: The applicant shall specify a primary contact responsible for coordination with the City during the land disturbance activity.

10-7-080: GEOLOGIC HAZARDS SPECIAL STUDY AREA MAPS:

- A. Geologic hazards special study area maps are prepared using the best available scientific information but are necessarily generalized and intended only to indicate areas where hazards may exist and where geologic hazards investigations are required. Because the City geologic hazards special study area maps are prepared at a non-site-specific scale, geologic hazards special study area maps may exist that are not shown on the geologic hazards special study area maps. The fact that a site is not in a geologic hazards study area map for a particular hazard does not exempt the applicant from considering the hazard if evidence is found that it may exist. If it is subsequently determined that the site has geologic hazards that are not shown on the geologic hazards special study area maps, the review process will be pursuant to this chapter.
- B. Geologic hazards special study area boundaries shown on the maps will not be systematically adjusted as each individual site-specific study indicates whether an actual hazard exists at a site because geologic hazards study area maps are meant only to indicate where scientific evidence indicates a hazard may exist. However, geologic hazards special study area maps may be updated and amended by the City if found to be inaccurate or in error, or as new methods or data are developed to better define areas of potential hazards.
- C. Where geologic hazards special study area maps are thought by an applicant to be inaccurate or in error and require revision, the applicant shall submit to the City technical evidence by a qualified professional supporting the claim and showing the proposed revision. The City will review the information and render a decision. The applicant may appeal the decision using the process outlined in Section 10-7-110(L).

10-7-090: GEOLOGIC HAZARDS STUDY INVESTIGATIONS AND GEOLOGIC HAZARDS STUDY REPORTS:

Except as provided in 10-7-095, any applicant requesting development approval on a parcel or lot of land within a geologic hazards study area or where there are known, or readily apparent geologic hazards and the area is not depicted on the geologic hazards special study area maps, the applicant shall:

1. Perform a geologic hazards investigation, and,

2. Submit one electronic copy and two paper copies of site-specific geologic hazards study report to the City. Only electronic copies of geologic hazards study reports are retained by the City. Paper copies of geologic hazards study reports are only provided for use by the City geologic and geotechnical engineering consultants to facilitate the review process.

For sites outside the slope stability special study areas shown in the City online Geologic Information Application, slope stability analyses shall be completed in accordance with Appendix B of the Geotechnical Engineering Standards when proposed development includes natural, or cut and/or fill slopes steeper than or equal to 3 horizontal (h) to 1 vertical (v).

10-7-095: GEOLOGIC HAZARDS STUDY INVESTIGATIONS AND REPORTS EXEMPTIONS:

- A. Any applicant requesting development on a lot that has been included in a subdivision plat prior to the adoption of this section may apply for a building permit for that lot without submitting a geologic hazards study unless the subdivision plat notes for the lot indicate that inclusion in the plat does not guarantee a right to develop.
- B. Any applicant requesting development on a lot that has been included in a subdivision plat after the adoption of this section does not need to conduct or submit a geologic hazards study within the first five (5) years after the plat has been recorded.
- C. In order to qualify for an exemption under this section, an applicant for a building permit must acknowledge geologic hazards that may apply to the lot in a form provided by the city.

10-7-100: GEOLOGIC HAZARDS STUDY REPORTS:

- A. Each geologic hazards study report shall be site-specific and shall identify all known or suspected potential geologic hazards, originating on-site or off-site, whether previously identified or previously unrecognized, that may affect the subject property.
- B. All geologic hazards study reports shall include the original or electronic signature and professional seal, both in blue ink, of the engineering geologist and geotechnical engineer. Geologic hazards reports co-prepared by professional geologists and geotechnical engineers must include both professionals' original or electronic signatures and professional seals in blue ink.
- C. All final geologic maps, geologic cross-sections, sketches, drawings, plans, etc., prepared by, or under the supervision of, the engineering geologist shall bear the signature and seal, both in blue ink, of the engineering geologist when submitted to the City.

- D. Geologic hazards study reports for fault activity investigations shall contain all requirements as described in Appendix A, *Minimum Standards for Fault Activity Investigations*, of the Geotechnical Engineering Standards. Fault activity investigations shall be prepared by an engineering geologist.
- E. Geologic hazards study reports for slope stability and landslide investigations shall contain all requirements as described in Appendix B, *Minimum Standards for Slope Stability Analyses*, of the Geotechnical Engineering Standards. Slope-stability and landslide investigations shall be prepared by an engineering geologist and a geotechnical engineer.
- F. Geologic hazards study reports for liquefaction investigations shall contain all requirements as described in Appendix C, *Minimum Standards for Liquefaction Investigations*, of the Geotechnical Engineering Standards. Liquefaction analyses shall be prepared by a geotechnical engineer.
- G. Geologic hazards study reports for debris-flow investigations shall contain all requirements as described in Appendix D, *Minimum Standards for Debris Flow Investigations*, of the Geotechnical Engineering Standards. Debris flow hazard investigations shall be prepared by an engineering geologist. Mitigation measures will generally require contributions from geotechnical engineers, hydrologists, and/or civil engineers.
- H. Geologic hazards study reports for rockfall investigations shall contain all requirements as described in Appendix E, *Minimum Standards for Rockfall Hazard Investigations*, of the Geotechnical Engineering Standards. Rockfall investigations shall be prepared by an engineering geologist. Mitigation measures will generally require contributions from geotechnical and/or civil engineers.
- I. All geologic hazards reports shall include, at a minimum:
 - 1. A discussion of:
 - a) the proposed development.
 - b) geologic hazards present within and adjacent to the proposed development.
 - c) field investigation program.
 - d) laboratory testing program.
 - 2. Conclusions based on adequate and substantiated data regarding the presence or absence of geologic hazards within and adjacent to the proposed development.
 - 3. A vicinity map, with a north arrow and bar scale, depicting major streets, roadways, geographic features, and other pertinent data to locate and orient the site.

4. A site plan at a scale of at least 1 inch = 200 feet (or more detailed), with a north arrow and bar scale, clearly depicting site boundaries, contours labeled at a minimum of 10-foot intervals, proposed buildable area, existing structures, streets, slopes, drainages, subsurface explorations, geophysical traverses, etc., and all other pertinent data.
5. A regional geologic map, with a north arrow and bar scale, contours, and references, depicting the general surface geology (landslides, alluvial fans, etc.), bedrock geology where exposed, bedding attitudes, faults, and other geologic structural features near the site (generally a 1:24,000 scale map is adequate); geologic cross-sections may be included as deemed appropriate to illustrate three-dimensional relations. The map shall include a legend defining all items noted on the map.
6. A site-specific geologic map of the subject area, with a north arrow and bar scale, at a scale equal to or more detailed than 1 inch = 200 feet, depicting the locations of subsurface explorations and site-specific geologic mapping performed as part of the geologic investigation, including boundaries and features related to all geologic hazards, topography, contours labeled at a minimum of 10-foot intervals, and drainage.

The site geologic map must show the location and boundaries of the property, geologic hazards, delineation of any recommended setbacks from hazards, geologic-restricted areas, and recommended locations for structures. Buildable and non-buildable areas must be clearly identified. The map shall include a legend defining all items noted on the map.

All bedding, jointing, and other geologic structures must be shown on the site plan and/or geologic map following the Federal Geographic Data Committee (FGDC) Standard Geologic Map Symbolization.

7. Trench and test pit logs, when applicable, prepared in the field by an engineering geologist, and presented in the geologic hazards study report at a scale equal to or more detailed than 1 inch = 5 feet.
8. Geologic boring logs when applicable, prepared with standard geologic nomenclature.
9. Geologic cross-section(s), when applicable, prepared by an engineering geologist.
10. All final geologic maps, geologic cross-sections, sketches, drawings, plans, etc., shall be prepared by, or under the supervision of, an engineering geologist.
11. Citations of literature and records used in the investigation, referenced aerial photographs interpreted (air-photo source, date and flight number, scale), referenced lidar images interpreted and any other sources of data and information, including water-well logs, personal communications, etc.

12. Conclusions, clearly supported by adequate and substantiated data included in the geologic hazards study report, summarizing the characteristics of the geologic hazards, and addressing the potential effects of the geologic conditions and geologic hazards on the proposed development and occupants thereof, particularly in terms of risk and potential damage.
 13. Specific recommendations for additional or more detailed investigations, as may be required to understand or quantify a geologic hazard.
 14. An evaluation of whether mitigation measures are required, including an evaluation of multiple mitigation options.
 15. Specific recommendations for avoidance or mitigation of the effects of identified hazards, consistent with the purposes set forth in this chapter, including design or performance criteria for engineered mitigation measures, including all supporting calculations, analyses, modeling, or other methods, and assumptions. Final design plans and specifications for engineered mitigation must be signed and sealed in blue ink by a geotechnical, civil and/or structural engineer, as appropriate.
 16. Data upon which recommendations and conclusions are based shall be clearly stated in the geologic hazards study report.
 17. A statement that the proposed development and buildable area depicted on the site plan meet the requirements of the geologic hazards ordinance and the proposed development and buildable area are suitable for development from a geologic and geotechnical engineering perspective.
- J. When a submitted geologic hazards study report does not contain adequate and substantiated data to support the findings in the geologic hazards study report, additional or more detailed investigations shall be required to explain or quantify a particular geologic hazard or to describe how mitigation measures recommended in the geologic hazards study report are appropriate and adequate.

10-7-110: REVIEW OF GEOLOGIC HAZARDS STUDY REPORTS:

- A. Scope: All geologic hazards study reports performed in the City will be reviewed by the City's retained consultants and permanently filed with the City. The City's consultants will evaluate geologic hazards study investigations and geologic hazards study reports for conformance with the City geologic hazards ordinance and applicable City codes and advise the City regarding the conformance of the consultant geologic hazards study investigation and geologic hazards study reports with the City geologic hazards ordinance and applicable City codes.

The City consultants will not approve consultant documents or the supporting data in

consultant documents. The City consultants will recommend the City either consider a consultant submittal complete or incomplete in accordance with applicable City codes and ordinances. The City consultants will not deviate from applicable City codes and ordinances.

The City shall review any proposed land use that requires the preparation of a geologic hazards study report under this chapter to determine the possible risks to the safety of persons, property, and City infrastructure from geologic hazards.

- B. Submittal: Before the consideration of any request for preliminary plat approval or site plan approval, the geologic hazards study report shall be submitted to the City for review.
- C. Time Frame For Review: The City will complete each review in a reasonable time frame, not to exceed 21 working days.
- D. Costs Borne By Applicant: All direct costs associated with the review of geologic hazards investigations shall be paid by the applicant.
- E. Records: The City shall retain an electronic copy of each geologic hazards study report.
- F. Standards: The City shall determine whether geologic hazards study investigations and geologic hazards study reports comply with all the following standards:
 - 1. The City geologic hazards ordinance and applicable City codes.
 - 2. The City Geotechnical Engineering Standards, if the geologic hazards study report contains geotechnical engineering recommendations.
 - 3. The geologic hazards study report has been prepared, signed, and sealed by a Utah-licensed geologist meeting the qualifications of an engineering geologist as defined in Section 10-7-020.
 - 4. The geologic hazards study report has been prepared, signed, and sealed by a Utah-licensed civil engineer meeting the qualifications of a geotechnical engineer as defined in Section 10-7-020, if the geologic hazards study report contains geotechnical engineering recommendations.
 - 5. All final geologic maps, geologic cross-sections, sketches, drawings, plans, etc., prepared by, or under the supervision of the engineering geologist, and shall bear the signature and seal, both in blue ink, of the engineering geologist when submitted to the City.
 - 6. The proposed land use does not present an unreasonable risk to the health, safety, and welfare of persons or property, including buildings, storm drains, public streets, culinary water facilities, utilities, or critical facilities, whether off-site or on-site, or to the aesthetics and natural functions of the landscape, such as slopes, streams or other waterways, drainage, or wildlife habitat, whether off-site or on-site, because of

the presence of geologic hazards or because of modifications to the site due to the proposed land use.

7. Identified geologic hazards can be mitigated to an Acceptable and Reasonable Risk in a manner that will not violate applicable federal, state, or local statutes, ordinances, or regulations. Mitigation measures shall consider, in their design, the intended aesthetic functions of other governing ordinances such as the Sensitive Lands Overlay Zone.
 8. The geologic hazards study report contains a mitigation plan defining how the identified hazards or limitations will be addressed without impacting or adversely affecting off-site areas, if applicable.
 9. Whether mitigation measures are reasonable and practical to implement, especially if such measures require ongoing maintenance by property owners.
- G. When a geologic hazards investigation and geologic hazards study report complies with the City geologic hazards ordinance and applicable City codes, the City reviewers will prepare a report to the City recommending the City consider the geologic hazards investigation and geologic hazards study report complete.
- H. The City reviewers do not approve consultant documents or the supporting data in consultant documents. The City reviewers recommend the City either consider a consultant submittal complete or incomplete in accordance with applicable City codes and ordinances.
- I. Additional Requirements: The City may, at the City's discretion, set other requirements as are necessary to mitigate any geologic hazards and to ensure the purposes of this chapter are met. These requirements may include, but are not limited to:
1. Additional or more detailed investigations to understand or quantify the hazard or determine whether mitigation measures recommended in the geologic hazards study report are adequate.
 2. Field reviews of exploratory excavations.
 3. Specific mitigation requirements; establishing buildable and non-buildable areas; limitations on slope grading and controls on grading, or re-vegetation.
 4. Grading plans, when required, shall be prepared, signed, and sealed in blue ink by a licensed professional engineer. As-built grading plans, when required, shall be signed and sealed in blue ink by the project geotechnical engineer as well as the Utah-licensed civil engineer responsible for the preparation of the grading plans. Grading plans, when required, shall include, at a minimum, the following:
 - a. Maps of existing and proposed contours with the contours labeled at a minimum

of 10-foot intervals.

- b. Present and proposed slopes for each graded area.
 - c. Existing and proposed drainage patterns.
 - d. Location and depth of all proposed cuts and fills.
 - e. Description of methods to be employed to achieve stabilization and compaction.
 - f. Location and capacities of proposed drainage, structures, and erosion control measures based on maximum runoff for a 100-year storm.
 - g. Location of existing buildings or structures on or within 100 feet of the site, or which may be affected by proposed grading and construction.
 - h. Plan for monitoring and documentation of testing, field inspections during grading, and reporting to the City.
5. Installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions, including groundwater levels.
6. Other requirements such as time schedules for completion of the mitigation and phasing of development.
- J. Condition of Approval: The City may also set requirements necessary to protect the public health, safety, welfare, and property of the citizens of the City, protect the City's infrastructure and financial health, and minimize potential adverse effects of geologic hazards to public health, safety, welfare, and property as a condition of approval of any development which requires a geologic hazards study report.
- K. On-Site Professional: The City may require an engineering geologist and/or geotechnical engineer to be on-site, at the cost of the applicant, during certain phases of construction, particularly during grading phases and the construction of retaining walls. For any real property to which development has proceeded based on a geologic hazards study or a geotechnical engineering report that has been accepted by the City, no final inspection shall be completed, or certificate of occupancy issued, or performance bond released until the geotechnical engineer and/or engineering geologist who signed and approved the geologic hazards study or a geotechnical engineering report certifies, in writing, the completed improvements and structures conform to the descriptions and requirements contained in said geologic hazards study or a geotechnical engineering report.
- L. Appeal: An applicant may appeal any decision made under the provisions of this chapter only after the City has issued a written review of a geologic hazards study report. The applicant shall set forth the specific grounds or issues upon which the appeal is based. The appeal shall be submitted in writing to the Community Development Director within 30 days of the issuance of the City's written review or other decision.

The City shall assemble a professional panel of three engineering geologists and/or geotechnical engineers, qualified as defined in this ordinance, to serve as the appeal authority for any technical dispute. The appeal panel shall consist of an engineering geologist and/or geotechnical engineer (if applicable) designated by the City, an engineering geologist and/or geotechnical engineer (if applicable) designated by the applicant, and an engineering geologist and/or geotechnical engineer (if applicable) designated by the City's and the applicant's designated engineering geologists and/or geotechnical engineers (if applicable). If the City's and the applicant's designated engineering geologists and/or geotechnical engineers cannot reach a consensus on the third engineering geologist and/or geotechnical engineer within thirty days, the City shall select the third engineering geologist and/or geotechnical engineer.

The costs of the appeal process shall be paid by the applicant. Decisions of the appeal panel will be binding and based on the majority decision of the appeal panel. Before commencement of appeal panel activities, the City will issue a scope of work outlining the specific purpose and goals of the appeal panel.

10-7-120: DISCLOSURE WHEN A GEOLOGIC HAZARDS STUDY REPORT IS REQUIRED:

- A. Form of Disclosure: Whenever a geologic hazards study report is required under this chapter, the owner of the parcel shall record a notice running with the land in a form satisfactory to the City before the approval of any development or subdivision of such parcel. Disclosure shall include signing a Disclosure and Acknowledgment Form provided by the City, which includes:
1. Notice the parcel is located within a City geologic hazards special study area as shown on the geologic hazards special study area maps or as otherwise defined in this chapter.
 2. Notice a geologic hazards study report was prepared and is available for public review in the City's files.
- B. Additional Notification on Plat: Where geologic hazards and related setbacks are delineated in a subdivision, the applicant shall also place additional notification on the plat stating the above information, prior to final approval of the plat.

10-7-130: WARNING AND DISCLAIMER:

The geologic hazards special study area maps, which may be viewed at the City online map portal via the geologic information application, represent only those potentially hazardous areas known to the City and should not be construed to include all possible potential hazard areas. The City geologic hazards ordinance and the geologic hazards special study area maps

may be amended as new information becomes available. The provisions of this chapter do not in any way assure or imply areas outside the geologic hazards special study area maps boundaries are free from the possible adverse effects of geologic hazards. This chapter shall not create any liability on the part of the City, any City officer, City consultants, or City employee thereof for any damages from geologic hazards that result from reliance on this chapter, or any administrative requirement or decision lawfully made hereunder.

10-7-140: CHANGE OF USE:

No change in use that results in the conversion of a building or structure from one not used for human occupancy to one that is so used shall not be permitted unless the building or structure and accompanying geologic hazards report complies with the provisions of this chapter.

10-7-150: CONFLICTING REGULATIONS:

In cases of conflict between the provisions of existing zoning classifications, building code, subdivision ordinance, or any other ordinance of the City and the geologic hazards ordinance codified in this chapter, the most restrictive provision shall apply.

10-7-160: CRITICAL FACILITIES AND RISK CATEGORIES III AND IV STRUCTURES:

Critical Facilities means essential, hazardous, special occupancy facilities, and Risk Categories III and IV as defined in the currently adopted International Building Code, and lifelines such as major utility, transportation, and communication facilities and their connections to critical facilities.

In the event of failure, the following buildings and structures represent a substantial hazard to human life:

1. Those where more than 300 people congregate in one area.
2. Elementary schools, secondary schools, or daycare facilities with an occupancy greater than 250.
3. Colleges or adult education facilities with an occupancy greater than 500.
4. Health-care facilities with an occupancy greater than 50 or more resident patients but not having surgery or emergency treatment facilities.
5. Jails and detention facilities.

6. [Any structure with an occupancy greater than 1,000.](#)
7. [Power-generating stations, water treatment or storage for potable water, wastewater treatment facilities, and other public utility facilities.](#)
8. [Those facilities containing toxic or explosive substances that would be dangerous to the public if released.](#)

[The following buildings and structures are designated as essential facilities, including but not limited to:](#)

1. [Hospitals and other care facilities having surgery or emergency treatment facilities.](#)
2. [Fire, rescue, and police stations and emergency vehicle garages and fueling facilities.](#)
3. [Designated emergency shelters.](#)
4. [Designated emergency preparedness, communications, operation centers, and other facilities required for emergency response.](#)
5. [Power-generating stations and other public utility facilities required as emergency backup facilities for facilities and structures.](#)
6. [Structures containing highly toxic materials as defined by the most recently adopted version of the International Building Code.](#)
7. [Aviation control towers, air traffic centers, and emergency aircraft hangars.](#)
8. [Buildings and other structures having critical national defense functions.](#)
9. [Water treatment and storage facilities which are required to maintain water pressure for fire suppression.](#)

...

TITLE 17 LAND DEVELOPMENT

...

17-4-030: FINAL PLAT; PREPARATION AND REQUIRED INFORMATION:

...

[S. The final plat shall show geologic hazards setbacks and geologic-restricted areas as defined in Section 10-7-20 of this code.](#)

...

TITLE 18
LAND DISTURBANCE

...

18-2-010: LAND DISTURBANCE PERMIT REQUIRED:

...

B. Manufacturing, Commercial, Or Institutional Properties:

1. Except for preliminary geological and geotechnical activities as described in ~~section 9-19-070~~ [Section 10-7-070](#) of this code, no land disturbance permit shall be issued for any site or project in a manufacturing, commercial or institutional zone within the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application](#), ~~of the Draper City geologic hazards ordinance plate A-3 zone~~ or sensitive lands overlay until and unless a final site plan or subdivision plat has been approved and recorded for the site or project.
2. Land disturbance permit applications to improve, construct, disturb or otherwise modify land in manufacturing, commercial or institutional zones not subject to either the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application](#), ~~of the Draper City geologic hazards ordinance plate A-3~~ or a sensitive lands overlay zoning, where the modifications do not require site plan or subdivision plat approval, as determined by the zoning administrator and city engineer, and where the cuts and fills do not exceed thirteen feet (13'), shall be reviewed and processed in accordance with the provisions of this title by the city engineer.

C. Residential And Agricultural Properties:

1. Except for preliminary geological and geotechnical activities described in ~~section 9-19-070~~ [Section 10-7-070](#) of this code, or for city engineer approved placement of excavated material generated by other city approved applications, no land disturbance permit shall be issued for any site or project in a residential or agricultural zone within the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application](#), ~~of the Draper City geologic hazards ordinance plate A-3 zone~~ until and unless a final site plan or subdivision plat has been approved and recorded for the site or project.
2. Land disturbance permit applications to improve, construct, disturb or otherwise modify land in residential and agricultural zones not subject to the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be](#)

[viewed at the City online map portal via the geologic information application](#) ~~of the Draper City geologic hazards ordinance plate A-3~~, a sensitive lands overlay zoning, and where the modifications do not require site plan or subdivision plat approval, as determined by the zoning administrator and city engineer, shall be reviewed and processed in accordance with the provisions of this title by the city engineer. In this particular circumstance, applicants may not submit a subdivision plat or site plan application for at least three (3) months from the date of approval of the land disturbance permit.

3. Land disturbance permit applications to improve, construct, disturb or otherwise modify land in residential and agricultural zones subject to the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application](#), ~~of the Draper City geologic hazards ordinance plate A-3~~ where the modifications do not require site plan or subdivision plat approval, as determined by the zoning administrator and city engineer, shall be denied unless the disturbance is associated with the completion of a condition of subdivision plat approval previously rendered by the Draper City council. In this particular circumstance, applications shall satisfy all provisions of this code.

...



Development Review Committee

1020 East Pioneer Road

Draper, UT 84020

November 24, 2025

To: Draper City Planning Commission
Business Date: December 11, 2025

From: Development Review Committee

Prepared By: Todd Taylor, Planner III
Planning Division
Community Development Department
801-576-6510, todd.taylor@draperutah.gov

Re: City Initiated Geologic Hazards Ordinance – Text Amendment Request

Application No.: 2025-0259-TA

Applicant: Draper City

Project Location: City Wide

Current Zoning: City Wide

Acreage: City Wide

Request: Request for approval of Text Amendment to portions of Draper City Municipal Code (DCMC) Titles 9, 10, 17 and 18 in order to update and move the Geologic Hazards Ordinance.

BACKGROUND AND SUMMARY

This application is a request for approval of a Text Amendment to portions of Draper City Municipal Code (DCMC) Titles 9, 10, 17 and 18. The purpose of the request is to update the text of the Geologic Hazards Ordinance and move it from Title 9, Land Use and Development Regulations, to Title 10, Building Regulations. Additionally, amendments to Title 17, Land Development, will clarify a standard, and amendments to Title 18, Land Disturbance, will update cross-references. Please note that Titles 10 and 18 are not within the Planning Commission's authority, but the text amendments have been included to show all of the changes that are being proposed.

Draper City adopted its Geologic Hazards chapter on December 11, 2007 after an extensive process involving professionals in the field, and an amendment was adopted on June 10,



2010 related to liquefaction. Other minor amendments to the chapter were made in 2015 and 2020. Recently the need for an update based on recommendations by the City's third-party reviewers, Taylor Geotechnical Engineering and Simon Associates, LLC, coincided with the discovery of an error that needed to be fixed.

ANALYSIS

The modifications being proposed to the DCMC are listed and reviewed by section in the report below. The legislative copy of the changes can be found in Exhibit B of this report with additions to the text shown in blue underline, deletions in red strikethrough, and unchanged text in black.

Text Amendments.

DCMC Section 9-5-090: Site Plan Review: This section has been modified to update cross-references and to require geologic-restricted areas be shown on the site plan.

DCMC Section 9-16-020: Scope: This section has been modified to update cross-references.

DCMC Section 9-16-030: Procedure: This section has been modified to update cross-references.

DCMC Section 9-16-050: Development Standards: This section has been modified to update cross-references.

DCMC Chapter 9-19: Geologic Hazards: This entire chapter has been deleted. *The Geologic Hazards Ordinance has been moved to Chapter 10-7.*

DCMC Chapter 10-7: Geologic Hazards: This entire chapter has been added. The chapter includes the updated Geologic Hazards Ordinance which has been moved from Chapter 9-19. The sections within the chapter have been updated to improve clarity for applicants and to include State standards in the Ordinance. The amendments are based upon best engineering practices and insight gained from implementing and interpreting the current ordinance. The Appendices have been removed from the Ordinance and will be added to the Geotechnical Engineering Manual, which will be adopted by the City Council by resolution. See Table 1 for a list of the new and old section numbering for the chapter.

DCMC Section 9-27-085: Retaining Walls: This section has been modified to update the cross-reference.

DCMC Section 17-4-030: Final Plat; Preparation and Required Information: This section has been modified to require geologic-restricted areas be shown on the final subdivision plat.

DCMC Section 18-2-010: Land Disturbance Permit Required: This section has been modified to update cross-references.

Table 1

Existing Section	New Section
9-19-010: Purpose	10-7-010: Purpose
9-19-020: Definitions	10-7-020: Definitions
9-19-030: Applicability	10-7-030: Scope
9-19-040: Responsibility For Geologic Hazard Studies	10-7-040: Responsibility For Geologic Hazard Investigations
9-19-050: Minimum Qualifications Of The Geologist	10-7-050: Minimum Qualifications Of The Geologist
9-19-060: Minimum Qualifications Of The Geotechnical Engineer	10-7-060: Minimum Qualifications Of The Geotechnical Engineer
9-19-070: Preliminary Activities	10-7-070: Preliminary Activities
9-19-080: Geologic Hazards Study Area Maps	10-7-080: Geologic Hazards Special Study Area Maps
9-19-090: Geologic Hazard Studies And Reports Required	10-7-090: Geologic Hazard Investigations And Reports
	10-7-095: Geologic Hazards Study Investigations and Reports Exemptions
9-19-100: Geologic Hazard Reports	10-7-100: Geologic Hazard Study Reports
9-19-110: Review Of Geologic Hazard Reports	10-7-110: Review of Geologic Hazard Study Reports
9-19-120: Disclosure When A Geologic Hazard Report Is Required	10-7-120: Disclosure When A Geologic Hazard Study Report Is Required
9-19-130: Warning And Disclaimer	10-7-130: Warning And Disclaimer
9-19-140: Change Of Use	10-7-140: Change Of Use
9-19-150: Conflicting Regulations	10-7-150: Conflicting Regulations
9-19-160: Table 1	10-7-160: Critical Facilities and Risk Categories III and IV Structures
9-19-161: Appendices	<i>(Appendices have been moved to the Geotechnical Engineering Manual)</i>

Criteria For Approval.

A Text Amendment is a matter committed to the legislative discretion of the City Council and is not controlled by any one standard. However, in making a recommendation to the City Council, the Planning Commission should consider the following factors in DCMC Section 9-5-060(E)(2):

2. *Text Amendments:*

- a. *Whether the proposed amendment is consistent with goals, objectives and policies of the city's general plan;*
- b. *Whether a proposed amendment furthers the specific purpose statements of the zoning ordinance;*
- c. *Whether the proposed amendment is appropriate given the context of the request and there is sufficient justification for a modification to the zoning ordinance;*
- d. *The proposed amendment will not create a conflict with any other section or part of this title or the general plan;*
- e. *Whether the potential effects of the proposed amendment have been evaluated and determined not to be detrimental to public health, safety, or welfare and represents an overall community benefit; and*
- f. *The extent to which a proposed text amendment implements best current, professional practices of urban planning, design, and engineering practices*

REVIEWS

Planning Division Review. The Draper City Planning Division has completed their review of the Text Amendment submission. Comments from this division, if any, can be found in Exhibit A.

Engineering and Public Works Divisions Review. The Draper City Engineering and Public Works Divisions have completed their reviews of the Text Amendment submission. Comments from these divisions, if any, can be found in Exhibit A.

Building Division Review. The Draper City Building Division has completed their review of the Text Amendment submission. Comments from this division, if any, can be found in Exhibit A.

Fire Division Review. The Draper City Fire Marshal has completed his review of the Text Amendment submission. Comments from this division, if any, can be found in Exhibit A.

Geotechnical and Geologic Hazards Review. The City's third-party reviewers, Taylor Geotechnical Engineering and Simon Associates, LLC, have completed their reviews of the Text Amendment submission. Comments from Taylor Geotechnical Engineering and Simon Associates, LLC, if any, can be found in Exhibit A.

Legal Division Review. The Draper City Attorney has completed his review of the Text Amendment submission. Comments from this division, if any, can be found in Exhibit A.

Noticing. Notice has been properly issued in the manner outlined in the City and State Codes.

STAFF RECOMMENDATION

Staff recommends that the Planning Commission review the request, receive public comment, and make a recommendation to the City Council based on the findings listed below and the criteria for approval, or denial, as listed within the staff report.

MODEL MOTIONS

Sample Motion for Positive Recommendation – I move that we forward a positive recommendation to the City Council for the City Initiated Geologic Hazards Ordinance Text Amendment, as requested by Draper City, Application No. 2025-0259-TA, based on the following findings and the criteria for approval as listed in the Staff Report dated November 24, 2025.

Findings for Approval:

1. The proposed amendment is consistent with goals, objectives and policies of the City's General Plan;
2. The proposed amendment is appropriate given the context of the request and there is sufficient justification for a modification to the development codes;
3. The proposed amendment will not create a conflict with any other section or part of the development codes or the General Plan;
4. The potential effects of the proposed amendment have been evaluated and are determined not to be detrimental to public health, safety, or welfare and represents an overall community benefit; and
5. The proposed text amendment implements best current, professional practices of urban planning, design, and engineering practices.

Sample Motion for Modified Positive Recommendation – I move that we forward a positive recommendation to the City Council for the City Initiated Geologic Hazards Ordinance Text Amendment, as requested by Draper City, Application No. 2025-0259-TA, based on the findings and criteria for approval listed in the Staff Report dated November 24, 2025, and as modified by the following additional recommended modifications or findings:

1. (List any additional modifications or findings...)

Sample Motion for Negative Recommendation – I move that we forward a negative recommendation to the City Council for the City Initiated Geologic Hazards Ordinance Text Amendment, as requested by Draper City, Application No. 2025-0259-TA, based on the following findings and the criteria for denial as listed in the Staff Report dated November 24, 2025.

Findings for Denial:

1. The proposed amendment is not consistent with goals, objectives and policies of the City's General Plan;
2. The proposed amendment is not appropriate given the context of the request and there is not sufficient justification for a modification to the development codes;
3. The proposed amendment could create a conflict with another section or part of the development codes or the General Plan; and
4. The potential effects of the proposed amendment have been determined to be detrimental to public health, safety, or welfare or do not represent an overall community benefit.
5. The proposed text amendment is not consistent with best current, professional practices of urban planning, design, and engineering practices.

DEVELOPMENT REVIEW COMMITTEE ACKNOWLEDGEMENT

We, the undersigned, as duly appointed members of the Draper City Development Review Committee, do acknowledge that the application which provides the subject for this staff report has been reviewed by the Committee and has been found to be appropriate for review by the Draper City Planning Commission and/or City Council.

Brien Maxfield

Digitally signed by Brien Maxfield
DN: C=US, E=brien.maxfield@draperutah.gov,
O=Draper, OU=Public Works - Engineering,
CN=Brien Maxfield
Date: 2025.12.08 10:31:18 -0700

Draper City Public Works Department

Don Buckley

Digitally signed by Don Buckley
DN: C=US, E=don.buckley@draper.ut.us,
O=Draper City Fire Department, OU=Fire
Marshal, CN=Don Buckley
Date: 2025.12.08 10:24:30 -0700

Draper City Fire Department

Reid Gerritsen

Digitally signed by Reid Gerritsen
DN: C=US, E=reid.gerritsen@draperutah.gov, OU=Draper
City Building, CN=Reid Gerritsen
Reason: I attest to the accuracy and integrity of this
document
Contact Info: 801.576.6534
Date: 2025.12.08 13:59:46 -0700

Draper City Building Division

Todd Draper

Digitally signed by Todd Draper
DN: C=US,
E=todd.draper@draperutah.gov,
O=Draper City Community
Development Department,
OU=Planning and Zoning,
CN=Todd Draper
Date: 2025.12.08 14:01:37 -0700

Draper City Planning Division

Draper City Legal Counsel

EXHIBIT A DEPARTMENT REVIEWS

REVIEWS ARE NOT MEANT TO BE AN ALL INCLUSIVE LIST OF POSSIBLE COMMENTS OR CONDITIONS.

Planning Division Review.

1. No additional comments received.

Engineering and Public Works Divisions Review.

1. No additional comments received.

Building Division Review.

1. No additional comments received.

Fire Division Review.

1. No additional comments received.

Geotechnical and Geologic Hazards Review

1. No additional comments received.

Legal Division Review.

1. No additional comments received.

EXHIBIT B
LEGISLATIVE DRAFT

TITLE 9
LAND USE AND DEVELOPMENT REGULATIONS

...

9-5-090: SITE PLAN REVIEW:

...

D. Procedure: An application for site plan approval shall be considered and processed as provided in this subsection.

1. A complete application shall be submitted to the office of the zoning administrator in a form established by the administrator, along with any fee established by the city's consolidated fee schedule. The application shall include the following information:

...

- d. A single electronic set of development plans showing the information required in subsections D(1)(d)(1) to D(1)(d)(6) of this section. The information required by each subsection shall be shown on separate sheets. Plans shall be drawn at a scale no smaller than one inch equals one hundred feet (1" = 100'). Plan sets shall be prepared, stamped and signed by the professional, licensed with the state of Utah, who prepared the drawings or is professionally responsible for the drawings content, including the engineering, landscaping and architectural drawings. The development plans shall include:

- (1) Site plan showing the following:

...

[\(H\) Geologic-restricted areas as defined in Section 10-7-20.](#)

...

- e. Soils report, geotechnical reports, and geologic hazard reports as required ~~elsewhere~~ in ~~this~~ Title [10, Chapter 7, of this code.](#)

...

9-16-020: SCOPE:

...

- C. Preliminary Activities: The following requirements shall govern any preliminary surveying, testing, or design related activities conducted within the hillside sensitive lands overlay zone for the purpose of exploring, evaluating and/or establishing locations for any permanent improvements. Preliminary activities associated with the investigation of geologic hazards shall also be subject to the requirements of ~~section 9-19-070~~ [Section 10-7-070](#), "Preliminary Activities", of this ~~title~~ [code](#).

...

9-16-030: PROCEDURE:

...

- C. Preliminary Approval: Following conceptual master plan approval, a preliminary approval shall be obtained. The following information and reports shall be submitted as part of an application for preliminary approval and may be in addition to information required for preliminary approval for a subdivision:

...

4. A geotechnical and geological report in accordance with the provisions of ~~chapter 19~~ [Title 10, Chapter 7](#), "Geologic Hazards", of this ~~title~~ [code](#).

...

9-16-050: DEVELOPMENT STANDARDS:

...

C. Cut And Fill Slopes:

1. Cut and fill slopes shall be provided in accordance with ~~chapter 19 of this title~~ [Title 10, Chapter 7, "Geologic Hazards"](#), ~~slope stability ordinance~~, and title 18, "Land Disturbance", of this code.

...

~~CHAPTER 19~~ ~~GEOLOGIC HAZARDS~~

~~9-19-010: PURPOSE:~~

- ~~A. The purpose of this geologic hazards chapter is to protect the health, safety, and welfare of the citizens of Draper City, protect Draper City's infrastructure and financial health, and minimize adverse effects of geologic hazards to public health, safety, and property by encouraging wise land use.~~

- ~~B. This chapter and its appendices address surface fault rupture, slope stability, liquefaction, debris flow, and rockfall hazards, and present minimum standards and methods for evaluating geologic hazards.~~
- ~~C. Results of geologic hazard studies shall comply with this chapter and its appendices. The standards set forth in the appendices are minimum requirements. More complex projects may require more detailed and in-depth evaluations than outlined herein. In addition, the appendices shall not supersede other more stringent requirements that may be required by other regulatory agents.~~
- ~~D. Section 9-19-161-1, appendix A of this chapter presents geologic hazards study area maps reflecting geological concerns pertaining to development within Draper City. The maps incorporate data obtained from previous geologic hazard studies. Site specific geologic hazard assessments performed by qualified engineering geologists shall be required prior to developing projects located within a geologic hazards study area. In the event known or readily apparent geologic hazards exist in an area subject to a development application, which area is not depicted on the geologic hazards study area maps, the developer shall nevertheless submit the applicable study and the process outlined in this chapter shall be followed.~~

~~9-19-020: DEFINITIONS:~~

~~As used in this chapter:~~

~~ACCEPTABLE AND REASONABLE RISK: No loss or significant injury to occupants, no release of hazardous or toxic substances, and minimal structural damage.~~

~~ACCESSORY BUILDING: Any structure not designed for human occupancy, which may include tool or storage sheds, gazebos, and swimming pools.~~

~~ACTIVE FAULT: A fault displaying evidence of displacement along one or more of its traces during Holocene time, which is approximately ten thousand (10,000) years ago to the present.~~

~~AVALANCHE: A large mass of snow, ice, soil or rock, or a mixture of these materials, falling, sliding, or flowing rapidly under the force of gravity.~~

~~BUILDABLE AREA: Based on an accepted engineering geology report, the portion of a site not impacted by geologic hazards, or the portion of a site where it is concluded the identified geologic hazards can be mitigated to a level where risk to human life, property and city infrastructure are reduced and where structures may be safely sited.~~

~~CITY: The public works director, city engineer, community development director, planning manager, building official, or other Draper City employee.~~

~~CITY COUNCIL: The city council of Draper City.~~

CRITICAL FACILITIES: Essential, hazardous, special occupancy facilities, and occupancy categories III and IV as defined in the currently adopted international building code, and lifelines, such as major utility, transportation, and communication facilities and their connections to critical facilities.

DEBRIS FLOW: A slurry of rock, soil, organic material, and water transported in an extremely fast and destructive flow that flows down channels and onto and across alluvial fans; including a continuum of sedimentation events and processes, including debris flows, debris floods, mudflows, clear water floods, and alluvial fan flooding.

DEVELOPMENT: All critical facilities, subdivisions, single and multi-family dwellings, commercial and industrial buildings; also additions to or intensification of existing buildings, storage facilities, pipelines and utility conveyances, and other land uses.

ENGINEERING GEOLOGIST: A Utah licensed geologist, who, through education, training, and experience, is competent in applying geologic data, geologic techniques, and geologic principles, which includes conducting field investigations, so that geologic conditions and geologic factors affecting engineered works, groundwater resources, and land use planning are recognized, adequately interpreted, and clearly presented for use in engineering practice, land use planning, and for the protection of the public, and who utilizes specialized geologic training and experience to provide quantitative geologic information and recommendations and also works with and for land use planners, environmental specialists, architects, public policymakers, and property owners to provide geologic information on which decisions can be made.

ENGINEERING GEOLOGY: Geologic work that is relevant to engineering and environmental concerns, and the public health, safety, and welfare. "Engineering geology" is the application of geological data, principles, and interpretation so that geological factors affecting planning, design, construction, and maintenance of engineered works, land use planning, and groundwater resources are adequately recognized and properly interpreted for use in engineering, land use planning, and related practice.

ESSENTIAL FACILITY: Buildings and other structures intended to remain operational in the event of an adverse geologic event, including all structures defined in section 9-19-160, "Table 1", of this chapter.

FAULT: A fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other.

FAULT SCARP: A steep slope or cliff formed by movement along a fault.

FAULT SETBACK: An area on either side of a fault within which structures for human occupancy or critical facilities or their structural supports are not permitted.

FAULT TRACE: The intersection of a fault plane with the ground surface, often present as a fault scarp, or detected as a lineament on aerial photographs.

~~FAULT ZONE: A corridor of variable width along one or more fault traces, within which deformation has occurred.~~

~~GEOLOGIC HAZARD: A surface fault rupture, liquefaction, slope stability, landslide, debris flow, and rockfall that may present a risk to life or property.~~

~~GEOLOGIC HAZARD STUDY AREA: A potentially hazardous area as shown on the geologic hazard study area maps within which hazard investigations are required prior to development.~~

~~GEOTECHNICAL ENGINEER: A professional, Utah licensed engineer who, through education, training and experience, is competent in the field of geotechnical engineering.~~

~~GEOTECHNICAL ENGINEERING: The investigation and engineering evaluation of earth materials, including soil, rock, and manmade materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.~~

~~GOVERNING BODY: The city council, or a designee of the city council.~~

~~LANDSLIDE: The downslope movement of a mass of soil, surficial deposits or bedrock, including a continuum of processes between landslides, earth flows, debris flows and debris avalanches, and rockfalls.~~

~~LIQUEFACTION: A process by which certain water saturated soils lose bearing strength because of earthquake related ground shaking and subsequent increase of groundwater pore pressure.~~

~~NONBUILDABLE AREA: That portion of a site which a geologic hazards report has concluded may be impacted by geologic hazards and where the siting of critical facilities is not permitted.~~

~~ROCKFALL: A rock or mass of rock, newly detached from a cliff or other steep slope which moves downslope by falling, rolling, toppling, or bouncing; includes rockslides, rockfall avalanches, and talus.~~

~~SETBACK: An area within which support of critical facilities is not permitted.~~

~~SLOPE STABILITY: The resistance of a natural or artificial slope or other inclined surface to failure by landsliding, usually assessed under both static and dynamic (earthquake induced) conditions.~~

~~SNOW AVALANCHE: A mass of predominantly snow and ice, but also including a mixture of soil or rock and organic debris, falling, sliding, and/or flowing rapidly under the force of gravity.~~

~~STRUCTURE DESIGNED FOR HUMAN OCCUPANCY: Any residential dwelling or any other structure used or intended for supporting or sheltering any use or occupancy, which is expected to have an occupancy rate of at least two thousand (2,000) person hours per year, but does not include an accessory building.~~

~~TALUS: Rock fragments lying at the base of a cliff or a very steep rocky slope.~~

~~9-19-030: APPLICABILITY:~~

~~The regulations contained in this chapter shall apply to all lands in Draper City.~~

~~9-19-040: RESPONSIBILITY FOR GEOLOGIC HAZARD STUDIES:~~

~~Geologic hazard studies often involve both engineering geology and geotechnical engineering. Engineering geologic studies shall be performed under the direct supervision of a qualified engineering geologist. Geotechnical engineering studies shall be performed under the direct supervision of a qualified geotechnical engineer.~~

~~9-19-050: MINIMUM QUALIFICATIONS OF THE GEOLOGIST:~~

~~Engineering geology and the evaluation of geologic hazards is a specialized discipline within the practice of geology requiring technical expertise and knowledge of techniques not commonly used in other geologic investigations. Therefore, geologic hazard investigations involving engineering geologic studies shall only be accepted by Draper City when conducted and signed by a qualified engineering geologist. The minimum qualifications of the engineering geologist who performs geologic hazard investigations are:~~

- ~~A.—An undergraduate or graduate degree in geology, engineering geology, or geological engineering, or closely related field, from an accredited college or university;~~
- ~~B.—Five (5) full years of experience in a responsible position in the field of engineering geology in Utah, or in a state with similar geologic hazards and regulatory environment. This experience must demonstrate the engineering geologist's knowledge and application of appropriate techniques in performing geologic hazard studies; and~~
- ~~C.—A Utah state professional geologist's license.~~

~~9-19-060: MINIMUM QUALIFICATIONS OF THE ENGINEER:~~

~~Evaluation and mitigation of geologic hazards often require contributions from a qualified geotechnical engineer, particularly in the design of mitigation measures. Geotechnical~~

~~engineering is a specialized discipline within the practice of civil engineering requiring technical expertise and knowledge of techniques not commonly used in civil engineering investigations. Therefore, geologic hazard investigations requiring contributions from a qualified geotechnical engineer will only be accepted by Draper City when also signed and sealed by a qualified geotechnical engineer. Minimum qualifications of the geotechnical engineer who participates in geologic hazard investigations are:~~

- ~~A. A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or a B.S. degree in civil engineering with twelve (12) semester hours of post-B.S. credit in geotechnical engineering, or course content related to evaluation of geologic hazards, from an accredited college or university;~~
- ~~B. Five (5) full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazard studies; and~~
- ~~C. A Utah state professional engineer's license.~~

~~9-19-070: PRELIMINARY ACTIVITIES:~~

- ~~A. Development Improvements: This section shall apply to any geologic hazard investigation for the purpose of determining the feasibility of development or for the purpose of exploring, evaluating or establishing locations for permanent improvements.~~
- ~~B. Scoping Meeting: The developer or consultant shall schedule a scoping meeting with the city to evaluate the engineering geologist/geotechnical engineer's investigative approach. At this meeting, the consultant shall present a work plan that includes locations of anticipated geologic hazards and locations of proposed exploratory excavations, such as trenches, borings, and CPT soundings, which meet the minimum standard of practice. The investigation approach should allow for flexibility due to unexpected site conditions. Field findings may require modifications to the work plan. Upon completion of a successful scoping meeting, a land disturbance permit application may be submitted to Draper City.~~
- ~~C. Land Disturbance Permit: As required by title 18 of this code and except as otherwise noted therein, no person shall commence or perform any land disturbance, grading, relocation of earth, or any other land disturbance activity, without first obtaining a land disturbance permit. Application for a land disturbance permit shall be filed with the city engineer on forms furnished by the city for such purposes only after a scoping meeting has taken place.~~

~~D.—Responsible Contact: The applicant shall specify a primary contact responsible for coordination with the city during the land disturbance activity.~~

~~9-19-080: GEOLOGIC HAZARDS STUDY AREA MAPS:~~

- ~~A.—Geologic hazards study area maps are prepared using the best available scientific information but are necessarily generalized and designed only to indicate areas where hazards may exist and where geologic hazards studies are required. Because the geologic hazards study area maps are prepared at a nonsite specific scale, hazards may exist that are not shown on the geologic hazards study area maps. The fact that a site is not in a geologic hazards study area for a particular hazard does not exempt the applicant from considering the hazard if evidence is found that it may exist. If it is subsequently determined that the site has geologic hazards that are not shown on the geologic hazards study area maps, the review process will be pursuant to this chapter.~~
- ~~B.—Geologic hazards study area boundaries shown on the maps will not be systematically adjusted as each individual site specific study indicates whether or not an actual hazard exists at a site because geologic hazards study area maps are meant only to indicate where scientific evidence indicates a hazard may exist. However, geologic hazards study area maps may be updated and amended by the city if found to be inaccurate or in error, or as new methods or data are developed to better define areas of potential hazards.~~
- ~~C.—Where geologic hazards study area maps are thought by an applicant to be inaccurate or in error and require revision, the applicant shall submit to the city technical evidence by a qualified professional supporting the claim and showing the proposed revision. The city will review the information and render a decision. The applicant may appeal that decision to the city council.~~

~~9-19-090: GEOLOGIC HAZARD STUDIES AND REPORTS REQUIRED:~~

~~Any applicant requesting development approval on a parcel of land within a geologic hazard study area or where there are known or readily apparent geologic hazards and the area is not depicted on the geologic hazards study area maps, shall submit to the city two (2) paper copies and one electronic copy of a site specific geologic hazard study report.~~

~~9-19-100: GEOLOGIC HAZARD REPORTS:~~

- ~~A.—Each geologic hazards report shall be site specific and shall identify all known or suspected potential geologic hazards, originating on site or off site, whether previously identified or previously unrecognized, that may affect the subject property. All geologic~~

hazards reports shall include the original or wet signature and professional seal, both in blue ink, of the qualified professional. Geologic hazards reports coprepared by professional geologists and engineers must include both professionals' original signature and seal in blue ink.

- B. ~~Surface fault rupture reports shall contain all requirements as described in section 9-19-161-2, "Appendix B, Minimum Standards For Surface Fault Rupture Hazard Studies", of this chapter. Surface fault rupture studies shall be prepared by a qualified engineering geologist.~~
- C. ~~Slope stability and landslide reports shall contain all requirements as described in section 9-19-161-3, "Appendix C, Minimum Standards For Slope Stability Analysis", of this chapter. Slope stability and landslide studies shall be prepared by a qualified engineering geologist and a qualified geotechnical engineer.~~
- D. ~~Liquefaction reports shall contain all requirements as described in section 9-19-161-4, "Appendix D, Minimum Standards For Liquefaction Investigations And Evaluations", of this chapter. Liquefaction analyses shall be prepared by a qualified geotechnical engineer. Liquefaction investigations are not required for residential construction classified in the international residential code as R-3.~~
- E. ~~Debris flow reports shall contain all requirements as described in section 9-19-161-5, "Appendix E, Minimum Standards For Debris Flow Analyses", of this chapter. Debris flow hazard investigations shall be prepared by a qualified engineering geologist. Mitigation measures will generally require contributions from geotechnical engineers, hydrologists, or civil engineers.~~
- F. ~~Rockfall reports shall contain all requirements as described in section 9-19-161-6, "Appendix F, Minimum Standards For Rockfall Analyses", of this chapter. Rockfall studies shall be prepared by a qualified engineering geologist. Mitigation measures will generally require contributions from geotechnical and/or civil engineers.~~
- G. ~~All geologic hazards reports shall include, at a minimum:~~
 - 1. ~~A one to twenty four thousand (1:24,000) scale geologic map, with references, showing the general surface geology (landslides, alluvial fans, etc.), bedrock geology where exposed, bedding attitudes, faults, and other geologic structural features;~~
 - 2. ~~A detailed site map of the subject area, at a scale equal to or more detailed than one inch equals two hundred feet (1" = 200'), showing the locations of subsurface investigations and site specific geologic mapping performed as part of the geologic investigation, including boundaries and features related to any geologic hazards, topography, and drainage. The site map must show the location and boundaries of the property, geologic hazards, delineation of any recommended setback distances from hazards, and recommended locations for structures. Buildable and nonbuildable areas shall be clearly identified;~~

- ~~3. Trench logs, when applicable, prepared in the field and presented in the geologic hazard report at a scale equal to or more detailed than one inch equals five feet (1" = 5');~~
 - ~~4. Boring logs when applicable, prepared with standard geologic nomenclature;~~
 - ~~5. Listing of aerial photographs used and other supporting information, as applicable;~~
 - ~~6. Conclusions, clearly supported by adequate data included in the report, that summarize the characteristics of the geologic hazards, and that address the potential effects of the geologic conditions and geologic hazards on the proposed development and occupants thereof, particularly in terms of risk and potential damage;~~
 - ~~7. Specific recommendations for additional or more detailed studies, as may be required to understand or quantify a geologic hazard;~~
 - ~~8. An evaluation of whether or not mitigation measures are required, including an evaluation of multiple mitigation options;~~
 - ~~9. Specific recommendations for avoidance or mitigation of the effects of the hazards, consistent with the purposes set forth in section 9-19-010 of this chapter, including design or performance criteria for engineered mitigation measures and all supporting calculations, analyses, modeling or other methods, and assumptions. Final design plans and specifications for engineered mitigation must be signed and stamped by a qualified geotechnical, civil and/or structural engineer, as appropriate;~~
 - ~~10. Data upon which recommendations and conclusions are based, shall be clearly stated in the report; and~~
 - ~~11. A statement shall be provided regarding the suitability of the proposed development from a geologic hazard perspective.~~
- ~~H. When a submitted report does not contain adequate data to support its findings, additional or more detailed studies shall be required to explain or quantify a particular geologic hazard or to describe how mitigation measures recommended in the report are appropriate and adequate.~~

~~9-19-110: REVIEW OF GEOLOGIC HAZARD REPORTS:~~

- ~~A. Scope: The city shall review any proposed land use which requires preparation of a geologic hazards report under this chapter to determine the possible risks to the safety of persons, property and city infrastructure from geologic hazards.~~

- ~~B. Submittal: Prior to consideration of any request for preliminary plat approval or site plan approval, the geologic hazards report, if required, shall be submitted to the city for review.~~
- ~~C. Time Frame For Review: The city will complete each review in a reasonable time frame, not to exceed forty five (45) days.~~
- ~~D. Costs Borne By Applicant: All direct costs associated with the review of geologic hazard studies shall be paid by the applicant.~~
- ~~E. Records: The city shall retain a copy of each geologic report in the planning division project file.~~
- ~~F. Standards: The city shall determine whether the report complies with all of the following standards:~~
- ~~1. A suitable geologic hazard report has been prepared by qualified professionals.~~
 - ~~2. The proposed land use does not present an unreasonable risk to the health, safety, and welfare of persons or property, including buildings, storm drains, public streets, culinary water facilities, utilities or critical facilities, whether off site or on site, or to the aesthetics and natural functions of the landscape, such as slopes, streams or other waterways, drainage, or wildlife habitat, whether off site or on site, because of the presence of geologic hazards or because of modifications to the site due to the proposed land use.~~
 - ~~3. The proposed land use demonstrates that, consistent with the state of the practice, the identified geologic hazards can be mitigated to a level where the risk to human life and damage to property are reduced to an acceptable and reasonable level in a manner which will not violate applicable federal, state, or local statutes, ordinances or regulations. Mitigation measures should consider, in their design, the intended aesthetic functions of other governing ordinances, such as the sensitive lands overlay zone. The applicant must include with the geologic hazards report a mitigation plan that defines how the identified hazards or limitations will be addressed without impacting or adversely affecting off site areas. Mitigation measures must be reasonable and practical to implement especially if such measures require ongoing maintenance by property owners.~~
- ~~G. Additional Requirements: The city may set other requirements as are necessary to overcome any geologic hazards and to ensure that the purposes of this chapter are met. These requirements may include, but are not limited to:~~
- ~~1. Additional or more detailed studies to understand or quantify the hazard or determine whether mitigation measures recommended in the report are adequate;~~
 - ~~2. Specific mitigation requirements; establishing buildable and nonbuildable areas; limitations on slope grading and controls on grading, or revegetation;~~

- ~~3. Grading plans, when required, shall be prepared, signed and sealed by a licensed professional engineer. As built grading plans, when required, shall be signed and sealed by the project geotechnical engineer as well as the professional engineer that prepared the grading plans. Grading plans, when required, shall include, at a minimum, the following:
 - ~~a. Maps of existing and proposed contours;~~
 - ~~b. Present and proposed slopes for each graded area;~~
 - ~~c. Existing and proposed drainage patterns;~~
 - ~~d. Location and depth of all proposed cuts and fills;~~
 - ~~e. Description of methods to be employed to achieve stabilization and compaction;~~
 - ~~f. Location and capacities of proposed drainage, structures, and erosion control measures based on maximum runoff for a 100-year storm;~~
 - ~~g. Location of existing buildings or structures on or within one hundred feet (100') of the site, or which may be affected by proposed grading and construction; and~~
 - ~~h. Plan for monitoring and documentation of testing, field inspections during grading, and reporting to the city.~~~~
 - ~~4. Installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions, including groundwater levels; and~~
 - ~~5. Other requirements such as time schedules for completion of the mitigation and phasing of development.~~
- ~~H. Condition Of Approval: Draper City may also set requirements necessary to protect the health, safety, and welfare of the citizens of Draper City, protect Draper City's infrastructure and financial health, and minimize potential adverse effects of geologic hazards to public health, safety, and property as a condition of approval of any development which requires a geologic hazards report.~~
- ~~I. On Site Professional; Final Inspection: Draper City may require a qualified professional be on site, at the cost of the developer, during certain phases of construction, particularly during grading phases and the construction of retaining walls. For any real property with respect to which development has proceeded on the basis of a geologic or geotechnical report which has been accepted by the city, no final inspection shall be completed or certificate of occupancy issued or performance bond released until the geotechnical engineer or engineering geologist who signed and approved the report certifies, in writing, that the completed improvements and structures conform to the descriptions and requirements contained in said report.~~

~~J.—Appeal: An applicant may appeal any decision made under the provisions of this chapter only after the city has issued a written review of a report, and shall set forth the specific grounds or issues upon which the appeal is based. The appeal shall be submitted in writing to the director of community development within thirty (30) days of the issuance of the written review or other decision. The city shall assemble a professional panel of three (3) qualified experts to serve as the appeal authority for any technical dispute. The panel shall consist of an expert designated by the city, an expert designated by the applicant, and an expert chosen by the city's and the applicant's designated experts. If the city's and the applicant's designated experts cannot reach a consensus of the third expert within thirty (30) days, the city shall select the third expert. Decisions of the panel will be binding and will be based on the majority decision of the panel. The costs of the appeal process shall be paid by the applicant.~~

~~9-19-120: DISCLOSURE WHEN A GEOLOGIC HAZARD REPORT IS REQUIRED:~~

~~A.—Form Of Disclosure: Whenever a geologic hazards report is required under this chapter, the owner of the parcel shall record a notice running with the land in a form satisfactory to Draper City prior to the approval of any development or subdivision of such parcel. Disclosure shall include signing a disclosure and acknowledgment form provided by the city, which includes:~~

- ~~1.—Notice that the parcel is located within a geologic hazards study area as shown on the geologic hazards study area map or as otherwise defined in this chapter; and~~
- ~~2.—Notice that a geologic hazards report was prepared and is available for public inspection in the city's files.~~

~~B.—Additional Notification On Plat: Where geologic hazards and related setbacks are delineated in a subdivision, the owner shall also place additional notification on the plat stating the above information, prior to final approval of the plat.~~

~~9-19-130: WARNING AND DISCLAIMER:~~

~~The geologic hazards study area maps represent only those potentially hazardous areas known to Draper City and should not be construed to include all possible potential hazard areas. This chapter and the geologic hazards study area maps may be amended as new information becomes available pursuant to procedures set forth in section 9-5-060 of this title. The provisions of this chapter do not in any way assure or imply that areas outside the geologic hazards study area maps boundaries are free from the possible adverse effects of geologic hazards. This chapter shall not create any liability on the part of Draper City, any Draper City officer, Draper City reviewer, or Draper City employee thereof, for any damages~~

~~from geologic hazards that result from reliance on this chapter or any administrative requirement or decision lawfully made hereunder.~~

~~9-19-140: CHANGE OF USE:~~

~~No change in use which results in the conversion of a building or structure from one not used for human occupancy to one that is so used shall be permitted unless the building or structure complies with the provisions of this chapter.~~

~~9-19-150: CONFLICTING REGULATIONS:~~

~~In cases of conflict between the provisions of existing zoning classifications, building code, subdivision ordinance, or any other ordinance of Draper City and the geologic hazards ordinance codified in this chapter, the most restrictive provision shall apply.~~

~~9-19-160: TABLE 1:~~

~~In the event of failure, the following buildings and structures represent a substantial hazard to human life:~~

- ~~1. Those where more than 300 people congregate in one area;~~
- ~~2. Elementary schools, secondary schools, or daycare facilities with an occupancy greater than 250;~~
- ~~3. Those colleges or adult education facilities with an occupancy greater than 500;~~
- ~~4. Healthcare facilities with an occupancy greater than 50 or more resident patients but not having surgery or emergency treatment facilities;~~
- ~~5. Jails and detention facilities;~~
- ~~6. Any structure with an occupancy greater than 1,000;~~
- ~~7. Power generating stations, water treatment or storage for potable water, wastewater treatment facilities and other public utility facilities; and~~
- ~~8. Those containing toxic or explosive substances that would be dangerous to the public if released.~~

~~The following buildings and structures are designated as essential facilities, including, but not limited to:~~

- ~~1. Hospitals and other care facilities having surgery or emergency treatment facilities;~~

- ~~2. Fire, rescue and police stations and emergency vehicle garages and fueling facilities;~~
- ~~3. Designated emergency shelters;~~
- ~~4. Designated emergency preparedness, communications, and operation centers and other facilities required for emergency response;~~
- ~~5. Power generating stations and other public utility facilities required as emergency backup facilities for facilities and structures included in this table;~~
- ~~6. Structures containing highly toxic materials as defined by the most recently adopted version of the IBC;~~
- ~~7. Aviation control towers, air traffic centers and emergency aircraft hangars;~~
- ~~8. Buildings and other structures having critical national defense functions; and~~
- ~~9. Water treatment and storage facilities required to maintain water pressure for fire suppression.~~

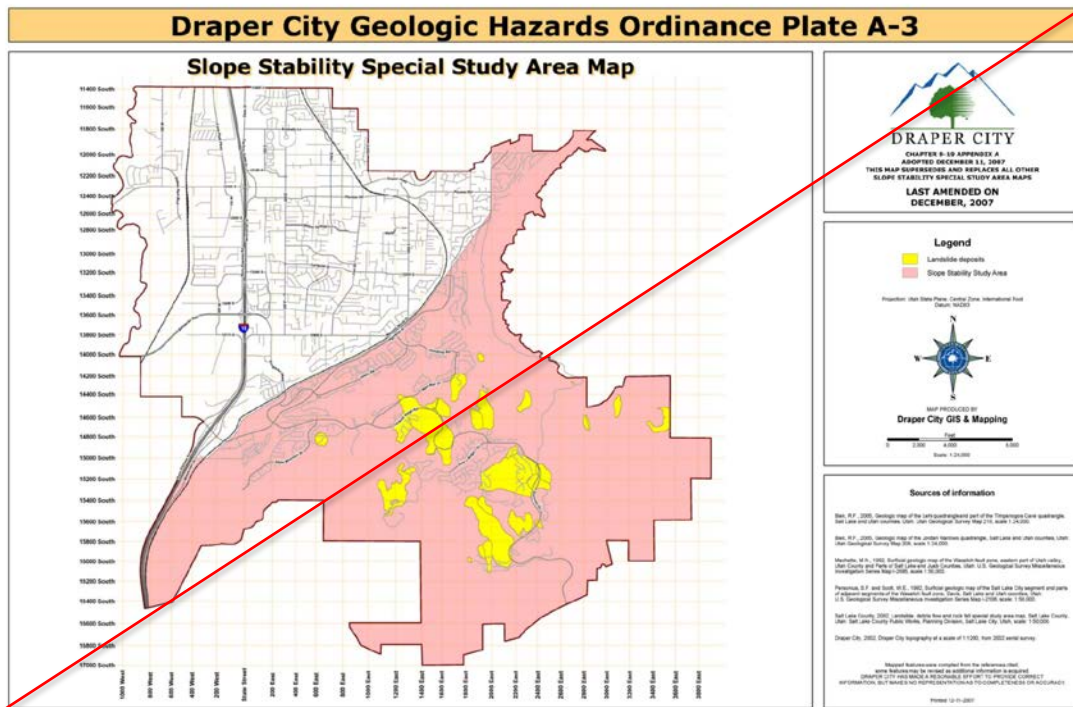
~~9-19-161: APPENDICES:~~

~~9-19-161-1: APPENDIX A, GEOLOGIC HAZARDS STUDY AREA MAPS:~~

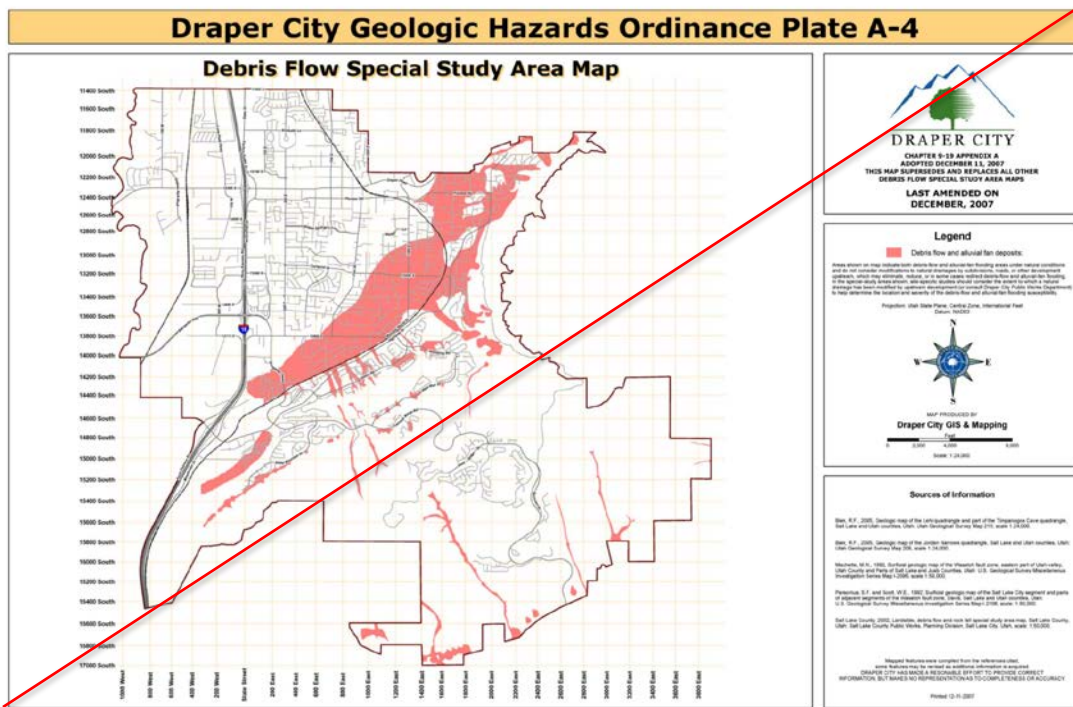
~~— PLATE A-1: SURFACE FAULT RUPTURE HAZARD SPECIAL STUDY AREA MAP~~

~~PLATE A-2: LIQUEFACTION SPECIAL STUDY AREA MAP~~

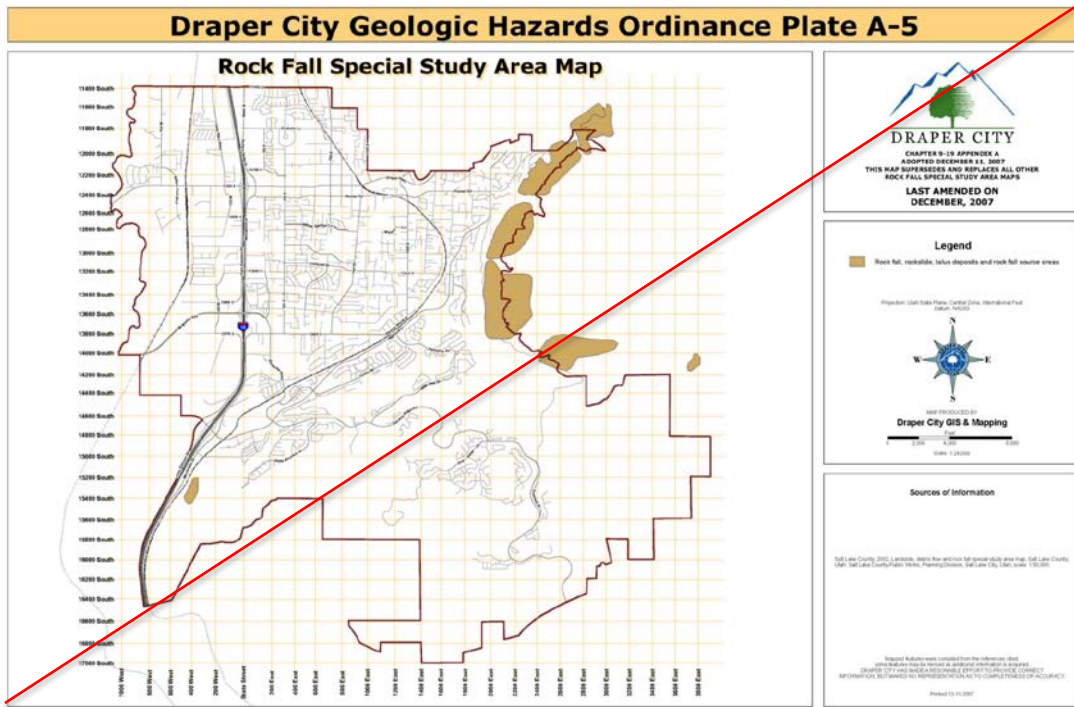
~~—PLATE A-3: SLOPE STABILITY SPECIAL STUDY AREA MAP~~



~~—PLATE A-4: DEBRIS FLOW SPECIAL STUDY AREA MAP~~



~~PLATE A-5: ROCKFALL SPECIAL STUDY AREA MAP~~



~~9-19-161-2: APPENDIX B, MINIMUM STANDARDS FOR SURFACE FAULT RUPTURE HAZARD STUDIES:~~

~~1.0 INTRODUCTION~~

The Wasatch Fault Zone (WFZ) is a major tectonic feature in the western United States, extending for about 230 miles from near Fayette, Utah at the south to near Malad, Idaho at the north. Surface faulting has occurred along the WFZ in northern Utah throughout late Pleistocene and Holocene time (Lund, 1990; Black and others, 2003). "Surface faulting" is fault-related offset or displacement of the ground surface that may occur in an earthquake.

The WFZ consists of a series of normal-slip fault segments with relative movement down to the west and up to the east. Ten major fault segments are recognized along the WFZ (Machette and others, 1992), which are believed to be independent in regard to their potential for surface faulting. These segments have distinct geomorphic expression and are clearly visible on aerial photographs.

In Salt Lake Valley, the WFZ is represented by the Salt Lake City segment which extends for 23± miles along the eastern edge of the valley (Lund, 1990). A portion of the Salt Lake City segment of the WFZ is present within the east part of the City (Personius and Scott, 1992; Machette, 1992).

Repeated Holocene movement has been well documented along the Salt Lake City segment. Studies along Wasatch Boulevard near the mouth of Little Cottonwood Canyon and at South Fork Dry Creek indicate at least four major earthquake events in the last 6,000 years (Black and others, 2003).

If a fault were to break the ground surface beneath a building, significant damage could occur, perhaps resulting in injuries or loss of life. To reduce risk from surface-fault-rupture hazards and to protect public health and safety, the City has defined Surface-Fault-Rupture Special Study Areas. Quaternary faults located within the Surface-Fault-Rupture Special Study Areas should be considered active until proven otherwise.

To ensure that buildings are not sited across Holocene-age (active) faults, the Draper City Geologic Hazards Ordinance (Article 4, chapter 9-19 of the Draper City Municipal Code) requires a site-specific geologic investigation of the portion of the property situated within the Surface-Fault-Rupture Special Study Area. The primary purposes of the geologic investigation are to assess the surface-fault-rupture potential of the property and to assess the suitability of the property for the proposed development from the standpoint of surface-fault-rupture. If a fault is discovered and determined (or presumed) to be Holocene-age (i.e., "active"), appropriate building setbacks from the fault are required such that structures are not located astride the fault trace. Building setbacks must be established prior to development of sites located within the Surface-Fault-Rupture Special Study Area.

A site-specific surface-fault-rupture hazard study includes a field investigation (usually involving the excavation and geologic documentation of a trench) and report. This appendix describes the minimum standards required by the City for surface-fault-rupture hazard studies.

The purpose of establishing minimum standards for surface fault rupture hazard studies is to:

- (a) Protect the health, safety, welfare, and property of the public by minimizing the potentially adverse effects of surface fault rupture and related hazards;
- (b) Assist property owners and land developers within the Surface-Fault-Rupture Special Study Area in conducting reasonable and adequate studies;
- (c) Provide consulting engineering geologists with a common basis for preparing proposals, conducting investigations, and recommending setbacks; and,
- (d) Provide an objective framework for review of fault study report.

The procedures outlined herein are intended to provide the developer and consulting engineering geologist with an outline of appropriate exploration methods, standardized report information, and expectations of the City.

~~These standards constitute the minimum level of effort required in conducting surface-fault-rupture-hazard special studies in the City. Considering the complexity of evaluating surface and near-surface faults, additional effort beyond the minimum standards may be required at some sites to adequately address the fault hazard. The information presented herein does not relieve the engineering geologist from his/her duty to perform additional geologic or engineering services he/she believes are necessary to assess the fault rupture potential at a site.~~

~~1.1—References and Sources~~

~~The minimum standards presented herein were developed from the following sources:~~

- ~~(a) Guidelines for Evaluating Surface Fault Rupture Hazards in Utah (AEG, 1987).~~
- ~~(b) Guidelines to geologic and seismic reports, (CDMG, 1986a).~~
- ~~(c) Guidelines for preparing engineering geologic reports (CDMG, 1986b).~~
- ~~(d) Guidelines for Evaluating Potential Surface Fault Rupture/Land Subsidence Hazards in Nevada (Nevada Earthquake Safety Council, 1998).~~
- ~~(e) Fault Setback Requirements to Reduce Fault Rupture Hazards in Salt Lake County (Batatian and Nelson, 1999).~~
- ~~(f) Salt Lake County Geologic Hazards Ordinance (2002).~~
- ~~(g) Draper City geologic hazard ordinance (2003).~~
- ~~(h) Guidelines for evaluating surface-fault-rupture hazards in Utah: Christenson and others (2003).~~

~~1.2—Properties Requiring a Fault Investigation~~

~~A fault study is required, prior to approval of any land use, for properties situated within Surface Fault Rupture Study Areas, as shown on the Surface Fault Rupture Study Area map (Plate A-1). This map identifies known active faults in the City, and defines special study areas where site-specific geologic investigations are required. Development of any parcel within a Surface Fault Rupture Study Areas requires submittal and review of a site-specific fault study prior to receiving a land use or building permit from the City. It is the responsibility of the applicant to retain a qualified engineering geologist to perform the fault study (see Draper City Geologic Hazards Ordinance 9-19).~~

~~In addition, a fault investigation may be required if on-site or nearby fault-related features not shown on the Surface Fault Rupture Study Area map are identified during the course of other geologic or geotechnical studies performed on or near the site or during construction.~~

2.0—MINIMUM STANDARDS FOR FAULT STUDIES

Following are the minimum standards for a comprehensive fault investigation. Fault investigations may be reported in conjunction with other geological and geotechnical investigations, or may be submitted separately. See Draper City Geologic Hazards Ordinance (9-19) for supplemental requirements.

2.1—Scoping Meeting

The developer's consultant must schedule a scoping meeting with the City to evaluate the fault investigation approach. At this meeting, the consultant should present a site plan that includes: proposed building locations (if known); expected fault location(s) and orientation; and the proposed trench locations, orientation, length, and depth (see section 2.3, Fault Investigation Method). The investigative approach should allow for flexibility due to unexpected site conditions; field findings may require modifications to the work plan.

2.2—Fault Investigation Method

Inherent in fault study methods is the assumption that future faulting will recur along pre-existing faults and in a manner consistent with past displacement. The focus of fault investigations is therefore to accurately locate existing faults. If faults are documented, the investigation shall also 1) evaluate the age of movement along the fault trace(s), and 2) estimate amounts of past displacement, which is required in order to derive fault setbacks.

2.2.1—Previous Studies and Aerial Photograph Review

A fault investigation shall include review of available literature pertinent to the site and vicinity, including previous published and unpublished geologic/soils reports, and interpretation of available stereo-paired aerial photographs. The photographs reviewed should include more than one set and should include pre-urbanization aerial photographs, if available. Efforts must be made to accurately plot the locations of mapped or inferred fault traces on the property as shown by previous studies in the area.

2.2.2—Exploration Methods

Subsurface exploration consisting of trenching is required. The engineering geologist shall clean and document ("log") trench exposures as described in section 2.3.5. Existing faults may also be identified and mapped in the field by direct observation of young, fault-related geomorphic features, and by examination of aerial photographs. When trenching is not feasible (i.e., the presence of shallow ground water, excessive thickness of fill, etc.), supplemental methods such as closely spaced Cone Penetration Test (CPT) soundings may be employed. Such supplemental methods must be discussed with the City prior to implementation and should be clearly described in the report.

In lieu of conventional trenching or the CPT method, an alternative subsurface exploration program may be acceptable, depending upon site conditions. Such a program may consist

of a sufficient number of closely spaced downhole-logged bucket-auger borings, geophysical exploration techniques, or a combination of techniques.

When an alternative exploration program is proposed, a written description of the proposed exploration program along with an exploration plan should be submitted to the City for review, prior to the exploration. The plan must include, at a minimum, a map of suitable scale showing the site limits, surface geologic conditions within several thousand feet of the site boundary, the location and type of the proposed alternative subsurface exploration, and the anticipated earth materials present at depth on the site.

The actual subsurface exploration program to be used on any specific parcel will be determined on an individual basis, considering the current state of technical knowledge about the fault zone and information gained from previous exploration on adjacent or nearby parcels. At all times, consideration must be given to safety, and trenching should comply with all applicable safety regulations.

2.2.3—Trench Siting

Exploratory trenches must be oriented approximately perpendicular to the anticipated trend of known fault traces. The trenches shall provide the minimum footage of trenching necessary to explore the portion of the property situated in the surface fault rupture special study area, such that the potential for surface fault rupture may be adequately assessed. When trenching to determine if faults might affect a proposed building site, the trench should extend beyond the building footprint at least the minimum setback distance for the building type (see Table A-1).

Test pits or potholes alone are neither adequate nor acceptable. In some instances more than one trench may be required to cover the entire building area, particularly if the proposed development involves more than one building. Where feasible, trenches shall be located outside the proposed building footprint, as the trench is generally backfilled without compaction, which could lead to differential settlement beneath the footings. Supplemental trenching may be required in order to: 1) further refine fault locations (or the absence thereof); 2) accurately define building restriction areas, and/or; 3) provide additional exposures for evaluating the age of movement along fault traces.

2.2.4—Location Determination

All trenches and fault locations must be surveyed by a registered professional land surveyor. Fault locations should be surveyed with an accuracy of about 0.1 foot or better, so that structural setbacks can be developed.

2.2.5—Depth of Excavation

The depth of the trenches will ultimately depend on the trench location, occurrence of ground water, stability of subsurface deposits, and the geologic age of the subsurface geologic units. As a minimum, however, trenches shall extend substantially below the A

~~and B soil horizons and well into distinctly bedded Pleistocene-age materials, if possible. Where possible, the trenches should extend below Holocene deposits and should expose contacts between Holocene materials and the underlying older materials.~~

~~Appropriate safety measures pertaining to trench safety for ingress, egress, and working in or in the vicinity of the trench must be implemented and maintained. It is the responsibility of the person in the field directing trench excavation to ensure that fault trenches are excavated in compliance with current Occupational Safety and Health Administration excavation safety regulations.~~

~~Trench backfilling methods and procedures should be documented in order to establish whether additional corrective excavation, backfilling, and compaction should be performed at the time of site grading.~~

~~In cases where Holocene (i.e., active) faults may be present, but pre-Holocene deposits are below the practical limit of excavation, the trenches must extend at least through sediments that are clearly older than several fault recurrence intervals. The practical limitations of the trenching must be acknowledged in the report and recommendations must reflect resulting uncertainties.~~

~~2.2.6 Documenting Trench Exposures~~

~~Trench walls shall be cleaned of debris and backhoe smear prior to documentation. Trench logs shall be carefully drawn in the field at a minimum scale of 1-inch equals 5-feet (1:60) following standard and accepted fault trench investigation practices. Vertical and horizontal control must be used and shown on trench logs. Trench logs must document all significant geologic information from the trench and should graphically represent the geologic units observed; see section 2.6.3(E). The strike, dip, and net vertical displacement (or minimum displacement) of faults must be noted.~~

~~2.2.7 Age Dating~~

~~The engineering geologist shall interpret the ages of geologic units exposed in the trench. When necessary, radiocarbon or other age determinations methods shall be used. If evidence of faulting is documented, efforts shall be made to date the time of latest movement (to determine whether recent (Holocene) displacement has occurred) using appropriate geologic and/or soil stratigraphic dating techniques. When necessary, obtain radiocarbon or other age determinations. If soil stratigraphic dating techniques are used, a geologist experienced in using the techniques and soil development rates in the area should perform them.~~

~~Many of the surficial deposits within Salt Lake Valley were deposited during the last pluvial lake cycle, referred to as the Bonneville lake cycle. Although late-stage Bonneville lake cycle sediments do not correspond to the Pleistocene-Holocene boundary (i.e., Bonneville lake cycle deposits are older than 10,000 years old), for purposes of evaluating fault activity,~~

these deposits provide a useful regional datum (particularly so when the entire Holocene sequence of sediments is not present).

For practical purposes, and due to documented Holocene displacement along the Salt Lake segment of the Wasatch fault, any fault which displaces late-stage Bonneville Lake Cycle deposits should be considered active unless the Bonneville deposits are overlain by clearly unfaulted early Holocene-age deposits. Conversely, the presence of demonstrably unbroken, undeformed, and stratigraphically continuous Bonneville sediments constitutes reasonable geologic evidence for the absence of active faulting.

2.3 Field Review

A field review by the City is required during exploratory trenching. The applicant must provide a minimum of 48 hours notice to schedule the field review with the City. The trenches should be open, safe, cleaned, and a preliminary log completed at the time of the review. The field review allows the City to evaluate the subsurface data (i.e., age and type of sediments; presence/absence of faulting, etc.) with the consultant. Discussions about questionable features or an appropriate setback distance are encouraged, but the City will not help log the trench, explain the stratigraphy, or give verbal approval of the proposed development during the field review.

2.4 Recommendations for Fault Setbacks

To address wide discrepancies in fault setback recommendations, the City has adopted the fault setback calculation methodology for normal faults of Batatian and Nelson (1999) and Christenson and others (2003). The consultant should use this method to establish the recommended fault setback for critical facilities and structures designed for human occupancy. If another fault setback method is used, the consultant must provide justification in the report for the method used. Faults and fault setbacks must be clearly identified on site plans and maps.

Minimum setbacks are based on the type and occupancy of the proposed structures (see Table A-1). A setback should be calculated using the formulas presented below, and then compared to the minimum setback established in Table A-1. The greater of the two shall be used as the setback. Minimum setbacks apply to both the hanging wall and footwall blocks.

Top of slope and/or toe of slope setbacks required by the local Building Code must also be considered; again, the greater setback must be used.

Downthrown Fault Block (Hanging Wall)

The fault setback for the downthrown block will be calculated using the following formula:
 $S = U(2D + F/\tan)$ where:

-

- S = Setback within which structures for human occupancy are not permitted;
- U = Criticality Factor, based on the proposed occupancy of the structure (see Table A-4)
- D = Expected fault displacement per event (assumed to be equal to the net vertical displacement measured for each past event)
- F = Maximum depth of footing or subgrade portion of the building
- = Dip of the fault (degrees)

-

Uprhrown Fault Block (Footwall)

The dip of the fault and depth of the subgrade portion of the structure are irrelevant in calculating the setback on the upthrown fault block. Therefore, the setback for the upthrown side of the fault will be calculated as:

$$S = U \times 2D$$

The setback is measured from the portion of the building closest to the fault, whether subgrade or above grade. Minimum setbacks apply as discussed above.

2.5—Small Displacement Faults

Small displacement faults are not categorically exempt from setback requirements. Some faults having less than 4 inches (100 mm) of displacement ("small displacement faults") may be exempt from setback requirements.

Specific structural risk reduction options such as foundation reinforcement may be acceptable for some small displacement faults in lieu of setbacks. Structural options must minimize structural damage.

Fault studies must still identify faults and fault displacements (both net vertical displacements and horizontal extension across the fault or fault zone), and consider the possibility that future displacement amounts may exceed past amounts. If structural risk reduction measures are proposed for small displacement faults, the following criteria must be addressed:

- (a) Reasonable geologic data indicating that future surface displacement along the particular fault will not exceed 4 inches.
- (b) Specific structural mitigation to minimize structural damage.
- (c) A structural engineer must provide appropriate designs and the City shall review the designs.

2.6—Required Outline for Surface Fault Rupture Hazard Studies

~~The information described herein may be presented as a separate surface-fault-rupture-potential report or it may be incorporated within other geology or engineering reports that may be required for the property.~~

~~The report shall contain a conclusion regarding the potential risk of surface fault rupture on the subject property and a statement addressing the suitability of the proposed development from a surface-fault-rupture-hazard perspective. If exploration determines that there is a potential for surface rupture due to faulting, or if gradational contacts or other uncertainties associated with the exploration methods preclude the determination of absence of small fault offsets, the report should provide estimates of the amplitude of fault offsets that might affect habitable structures.~~

~~Surface-fault-rupture-hazard reports submitted to the City are expected to follow the outline and address the subjects presented below. However, variations in site conditions may require that additional items be addressed, or permit some of the subjects to be omitted (except as noted).~~

~~2.6.1.—Report~~

~~(a) Purpose and scope of work: The report shall contain a clear and concise statement of the purpose of the investigation and the scope of work performed for the investigation.~~

~~(b) Geologic and tectonic setting: The report shall contain a clear and concise statement of the general geologic and tectonic setting of the site vicinity. The section should include a discussion of active faults in the area, paleoseismicity of the relevant fault system(s), and should reference relevant published and unpublished geologic literature.~~

~~(c) Site description and conditions: The report shall include information on geologic units, graded and filled areas, vegetation, existing structures, and other factors that may affect site development, choice of investigative methods, and the interpretation of data.~~

~~(d) Methods of investigation:~~

~~(1) Review of published and unpublished maps, literature and records concerning geologic units, faults, surface and ground water, and other factors.~~

~~(2) Stereoscopic interpretation of aerial photographs to detect fault-related topography, vegetation or soil contrasts, and other lineaments of possible fault origin. Reference the photograph source, date, flightline numbers, and scale. Salt Lake County has an excellent collection of stereoscopic aerial photographs dating back to 1937 (including 1937, 1940, 1958, 1964, and 1985).~~

~~(3) Observations of surface features, both on-site and off site, including mapping of geologic and soil units; geomorphic features such as scarps, springs, and seeps (aligned or not); faceted spurs, offset ridges or drainages; and geologic structures. Locations and relative ages of other possible earthquake-induced features such as sand blows, lateral spreads, liquefaction, and ground settlement should be mapped and described. Slope~~

~~failures, although they may not be conclusively tied to earthquake causes, should also be noted.~~

~~(4) Subsurface investigations: The report shall include a description of the program of subsurface exploration, including trench logs, purpose of trench locations, and a summary of trenching or other detailed, direct observation of continuously exposed geologic units, soils, and geologic structures. All trench logs shall be at a scale of at least 1-inch equals five-feet.~~

~~The report must describe the criteria used to evaluate the ages of the deposits encountered in the trench, and clearly evaluate the presence or absence of active (Holocene) faulting.~~

~~(e) Conclusions: Conclusions must be supported by adequate data and shall contain, at a minimum:~~

~~(1) Summary of data upon which conclusions are based.~~

~~(2) Location of active faults, including orientation and geometry of faults, amount of net slip along faults, anticipated future offset, and delineation of setback areas.~~

~~(3) Degree of confidence in and limitations of data and conclusions.~~

~~(f) Recommendations: Recommendations must be supported by adequate geologic data and appropriate reasoning behind each statement. Minimum recommendations shall include:~~

~~(1) Recommended setback distances per section 2.5. Supporting calculations must be included. Faults and setbacks must be shown on site maps and final recorded plat maps.~~

~~(2) Other recommended building restrictions or use limitations (i.e., placement of detached garages, swimming pools, or other non-habitable structures).~~

~~(3) Need for additional or future studies to confirm buildings are not sited across active faults, such as inspection of building footing or foundation excavations by the consultant.~~

~~2.6.2. Report References~~

~~Reports must include citations of literature and records used in the study, referenced aerial photographs or images interpreted (air-photo source, date and flight number, scale), and any other sources of data and information, including well logs, personal communications, etc.~~

~~2.6.3. Illustrations:~~

~~At a minimum, reports must include the following illustrations:~~

~~(a) Location Map: A site location map depicting topographic and geographic features and other pertinent data. Generally a 1:24,000-scale USGS topographic base map will suffice.~~

(b) ~~Geologic Map: A regional-scale map (1:24,000 to 1:50,000 scale) is generally adequate. Depending on site complexity, a site-scale geologic map (1 inch = 200 ft or more detailed) may also be necessary. The map should show Quaternary and bedrock geologic units, faults, seeps or springs, soil or bedrock slumps, and other geologic and soil features existing on and adjacent to the project site. Geologic cross-sections may be included as needed to illustrate 3-dimensional relationships.~~

(c) ~~Site Plan: A detailed site plan is required. The site plan should be at a scale of at least 1 inch = 200 feet (or more detailed) and should clearly show site boundaries, proposed building footprints, existing structures, streets, slopes, drainages, exploratory trenches, boreholes, test pits, geophysical traverses, and any other data pertinent data.~~

(d) ~~Site Specific Fault Map: If faulting is documented at a parcel, the report shall include a site-specific fault map. The fault map should be at a scale of at least 1 inch = 200 feet and should clearly show the surveyed locations of trenches (and any other exploratory techniques), surveyed location(s) of faults documented in the trenches, inferred location of the faults between trenches, recommended fault setback distance on each side of the faults, topographic contours, and proposed building locations, if known.~~

(e) ~~Exploratory Trench Logs: Trench logs are required for each trench excavated as part of the study. Trench logs shall accurately depict all observed geologic features and conditions. Trench logs shall not be generalized or diagrammatic. The minimum scale is 1 inch = 5 feet (1:60) with no vertical exaggeration. Trench logs must accurately reflect the features observed in the trench (see section 2.3.6).~~

~~—Trench logs shall include: trench orientation and indication of which trench wall was logged; trench top and bottom; stratigraphic contacts; stratigraphic unit descriptions including lithology, USCS soil classification, genesis (geologic origin), age, and contact descriptions; soil (pedogenic) horizons; marker beds; and deformation or offset of sediments, faults, and fissures. Other features of tectonic significance such as buried scarp free-faces, colluvial wedges, in-filled soil cracks, drag folds, rotated clasts, lineations, and liquefaction features including dikes, sand blows, etc. should also be shown. Interpretations of the age and origin of the deposits and any faulting or deformation must be included, based on depositional sequence. Fault orientation and geometry (strike and dip), and amount of net displacement must be measured and noted.~~

(f) ~~Exploratory boreholes and CPT soundings: Should boreholes or CPT soundings be utilized as part of the investigation, reports shall include the logs of the borings/soundings. Borehole logs must include lithology descriptions, interpretations of geologic origin, USCS soil classification or other standardized engineering soil classification (include an explanation of the classification scheme), sample intervals, penetrative resistance values, static ground-water depths and dates measured, total depth of borehole, and identity of the person logging the borehole. Electronic copies of CPT data files should be provided to the City's reviewer, upon request.~~

(g) ~~Geophysical data: All geophysical data, showing stratigraphic interpretations and fault locations, must be included in the report, along with correlations to trench or borehole logs to confirm interpretations.~~

(h) ~~Photographs: Photographs of scarps, trench walls, or other features that enhance understanding of site conditions and fault-related conditions are not required but should be included when deemed appropriate. Composited, rectified digital photographs of trench walls may be used as background for trench logs, but features as outlined in section F above must still be delineated.~~

~~—REFERENCES~~

~~Batatian, L.D., and Nelson, C.V., 1999, Fault setback requirements to reduce fault rupture hazards in Salt Lake County: AEG Abstracts with Programs, 42nd Annual Meeting, Salt Lake City, p. 59.~~

~~Biek, R.F., 2005, Geologic map of the Lehi quadrangle and part of the Timpanogos Cave quadrangle, Salt Lake and Utah Counties, Utah: Utah Geological Survey Map 210, scale 1:24,000.~~

~~Black, B.D., Hecker, S., Hylland, M.D., Christenson, G.E., and McDonald, G.N., 2003, Quaternary fault and fold database and map of Utah: Utah Geological Survey Map 193DM.~~

~~Black, B.D., Lund, W.R., Schwartz, D.P., Gill, H.E., and Mayes, B.H., 1996, Paleoseismic investigation on the Salt Lake City segment of the Wasatch fault zone at the South Fork Dry Creek and Dry Gulch Sites, Salt Lake County, Utah: Utah Geological Survey Special Study 92, 22 p.~~

~~Bonilla, M.G., and Lienkaemper, J.J., 1991, Factors affecting the recognition of faults exposed in exploratory trenches: U.S. Geological Survey Bulletin 1947.~~

~~Bonilla, M.G., 1970, Surface faulting and related effects, in Wiegel, R.L., editor, Earthquake Engineering: Englewood Cliffs, N.J., Prentice-Hall, Inc., p. 47-74. (Contains an extensive bibliography on surface faulting, fault patterns and types, width of fault zones, and creep).~~

~~Bonilla, M.G., 1982, Evaluation of potential surface faulting and other tectonic deformation: U.S. Geological Survey Open-File Report 82-732, 58 p.~~

~~California Department of Conservation, Division of Mines and Geology, 1986a (revised), Guidelines to geologic and seismic reports: DMG Note 42, 2 p.~~

~~California Department of Conservation, Division of Mines and Geology, 1986b (revised), Guidelines for preparing engineering geologic reports: DMG Note 44, 2 p.~~

~~Chase, G.W., and Chapman, R.H., 1976, Black-box geology - uses and misuses of geophysics in engineering geology: California Geology, v. 29, p. 8-12.~~

Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey, Miscellaneous Publication 03-6, 14 p.

Christenson, G.E., 1993, The Wasatch Front County Hazards Geologist Program, in Gori, P.L., editor, Applications of research from the U.S. Geological Survey Program, Assessment of Regional Earthquake Hazards and Risk Along the Wasatch Front, Utah; U. S. Geological Survey Professional Paper 1519, p. 114-120.

Christenson, G.E., and Purcell, C.R., 1985, Correlation and age of Quaternary alluvial-fan sequences, Basin and Range Province, southwestern United States, in Soils and Quaternary Geology of the Southwestern United States, Weide, D.L., editor: Geological Society of America Special Paper 203, p. 1-21.

Cluff, L.S., Brogan, G.E., and Glass, E.E., 1970, Wasatch fault, northern portion, earthquake fault investigation and evaluation, a guide to land use planning: Oakland, California, Woodward-Clyde and Associates, unpublished report for the Utah Geological and Mineral Survey, variously paginated.

Crittenden, M.D., Jr., 1965, Geology of the Draper quadrangle, Utah: U.S. Geological Survey Map GQ 377, scale 1:24000.

Davis, F.D., 1983, Geologic map of the central Wasatch Front, Utah: Utah Geological and Mineral Survey Map 54A - Wasatch Front Series, scale 1:100,000.

Draper City, 2003, Article 4 - Special purpose and overlay zones, chapter 9-19, Geologic Hazards Ordinance, adopted December 30, 2003 - Ord. 547, effective January 13, 2004.

Draper City, 2003, Appendix A, Minimum standards for surface fault rupture hazard studies: July 2003, Draper City Geologic Hazards Ordinance, chapter 9-19.

Gilbert, G.K., 1875, Report upon the geology of portions of Nevada, Utah, California, and Arizona, Examined in the years 1871 and 1872, in Wheeler, G.M., editor, Report upon geographical and geological exploration and surveys west of the 100th meridian, vol 3: Geology, published by the Washington D.C., government printing office, p. 17-187.

Gilbert, G.K., 1890, Lake Bonneville: U.S. Geological Survey Monograph 1, 438 p.

Hart, E.W., 1992 (revised), Fault-rupture hazard zones in California: California Department of Conservation, Division of Mines and Geology, Special Publication 42, 32 p. (Revised periodically; information on state law and zoning program for regulating development near hazardous faults.

Hart, E.W., and Williams, J.W., 1978, Geologic review process: California Geology, v. 31, no 10, p. 235-236.

Hatheway, A. W., and Leighton, F.B., 1979, Trenching as an exploratory tool, in Hatheway, A. W., and McClure, C.R., Jr., editors, Geology in the siting of nuclear power plants: Geologic Society of America, Reviews in Engineering Geology, v. IV, p. 169-195.

Joint Committee on Seismic Safety, California Legislature, 1974, Meeting the earthquake challenge: California Division of Mines and Geology, Special Publication 45, 223 p.

Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p.

Lund, W.R., 1990, editor, Engineering geology of the Salt Lake City metropolitan area, Utah: Utah Geological Survey Bulletin 126, 66 p.

Machette, M.N., 1989, Preliminary surficial geologic map of the Wasatch fault zone, eastern part of Utah valley, Utah County and parts of Salt Lake and Juab Counties, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-2109, scale 1:50,000.

Machette, M.N., 1992, Surficial geologic map of the Wasatch fault zone, eastern part of Utah valley, Utah County and parts of Salt Lake and Juab Counties, Utah: U.S. Geological Survey Miscellaneous Investigation Series Map I-2095, scale 1:50,000.

Machette, M.N., Personius, S.F., Nelson, A.R., Schwartz, D.P., and Lund, W.R., 1991, The Wasatch fault zone, Utah—segmentation and history of Holocene earthquakes: Journal of Structural Geology, v. 13, no. 2, p. 137-149.

Machette, M.N., Personius, S.F., and Nelson, A.R., 1992, Paleoseismology of the Wasatch fault zone: a summary of recent investigations, interpretations, and conclusions, in Gori, P.L. and Hays, W.W., eds., Assessment of regional earthquake hazards and risk along the Wasatch Front, Utah: U.S. Geological Survey Professional Paper 1500, p. A1-A71.

Madsen, D.B., 2000, Late quaternary paleoecology in the Bonneville basin: Utah Geological Survey Bulletin 130, p. 190.

Madsen, D.B., and Currey, D.R., 1979, Late Quaternary glacial and vegetation changes, Little Cottonwood Canyon area, Wasatch Mountains, Utah: Quaternary Research, v. 12, p. 254-270.

McCalpin, James P., 2002, New age control from the Wasatch fault megatrench of 1999: Abstracts with Programs, Geological Society of America, Rocky Mountain section.

McCalpin, James P., 1996, editor, Paleoseismology: Academic Press, 588 p.

McCalpin, James P., 1987, Recommended setbacks from active normal faults, in McCalpin, James, editor, Proceedings of the 23rd Annual Symposium on Engineering Geology and Soils Engineering: Logan, Utah State University, April 6-8, 1987, p. 35-56.

Miller, R.D., 1980, Surficial geologic map along part of the Wasatch Front, Salt Lake valley, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-1198, scale, 1:100,000.

National Research Council, 1986, Studies in geophysics-active tectonics: National Academy Press, Washington, D.C., 266 p. (contains several articles evaluating active faulting).

Nevada Earthquake Safety Council, 1998, Guidelines for Evaluating Potential Surface Fault Rupture/Land Subsidence Hazards in Nevada; Available online at <http://www.nbmng.unr.edu/nesc/guidelines.html>

Nelson, C.V., 1987, Surface fault rupture and liquefaction hazard areas, map compiled for public information and planning: Salt Lake County Planning Division, Salt Lake City, Utah.

Noller, J.S., Sowers, J.M., and Lettis, W.R., editors, Quaternary geochronology, methods and applications: Washington D.C., American Geophysical Union AGU Reference Shelf 4, 582 p.

Occupational Safety and Health Administration, 1989, Federal Register, Tuesday October 31, 1989. 29 CFR Part 1926. For updates: www.osha-slc.gov/SLTC/constructiontrenching/index.html.

Oviatt, C.G., and Thompson, R.S., 2002, Recent developments in the study of Lake Bonneville since 1980, in Gwynn, J.W., editor, Great Salt Lake 2000—An Overview of Change: Utah Geological Survey Miscellaneous Publication XX, p. XX.

Oviatt, C.G., Currey, D.R., and Sack, D., 1992, Radiocarbon chronology of Lake Bonneville, Eastern Great Basin, U.S.A.: Paleogeography, Paleoclimatology, and Paleoecology, v. 99, p. 225-241.

Personius, S.F., and Scott, W.E., 1992, Surficial geologic map of the Salt Lake City segment and parts of adjacent segments of the Wasatch fault zone, Davis, Salt Lake, and Utah Counties, Utah: U.S. Geological Survey Map I-2106.

Salt Lake County, 2002a, Geologic hazards ordinance, chapter 19.75 of the Salt Lake County zoning code of ordinances, adopted July 2002: Salt Lake County Planning and Development Services Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, 11p.

Salt Lake County, 2002b, Minimum standards for surface fault rupture hazard studies, Appendix A, Geologic hazards ordinance, chapter 19.75 of the Salt Lake County zoning code of ordinances, adopted July 2002: Salt Lake County Planning and Development Services Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, 9p.

Salt Lake County, 2001, Liquefaction: a guide to land use planning, Geologic Hazards Ordinance chapter 19.75 Appendix B: Salt Lake County Planning and Development Services Division, 6 p.

Salt Lake County, 1995, Surface rupture and liquefaction potential special study areas map, Salt Lake County, Utah, adopted March 1989, revised July 1995: Salt Lake County Public Works, Planning Division, 2001 South State Street, Suite N3700, Salt Lake City, Utah, 84190-4200, scale: 1:43,547.

Schwartz, D.P., and Coppersmith, K.J., 1984, Fault behavior and characteristic earthquakes: examples from the Wasatch and San Andreas fault zones: *Journal of Geophysical Research*, v. 89, no. B-7, July 10, 1984, p. 5681-5698.

Scott, W.E., and Shroba, R.R., 1985, Surficial geologic map of an area along the Wasatch fault zone in the Salt Lake Valley, Utah: U.S. Geol. Survey Open-File Report 85-448, 18 p.

Scott, W.E., McCoy, W.D., Shroba, R.R., and Rubin, M., 1983, Reinterpretation of the exposed record of the last two cycles of Lake Bonneville, Western United States: *Quaternary research*, v. 20, p. 261-285.

Sherard, J.L., Cluff, L.S., and Allen, C.R., 1974, Potentially active faults in dam foundations: *Geotechnique*, Institute of Civil Engineers, London, v. 24, no. 3, p. 367-428.

Simon, D.B., and Shlemon, R.J., 1999, The Holocene "Downtown Fault" in Salt Lake City, Utah, 1999: Association of Engineering Geologists, 1999 Annual Meeting, Abstract Volume, Salt Lake City, Utah, p. 85.

Simon, D.B., Bartlett, S.J., and Shlemon, R.J., 1999, Holocene ground failure in downtown Salt Lake City, Utah: *Geological Society of America, Cordilleran section, Abstracts with Program*, v. 31, no. 6, p. A-95.

Slemmons, D.B., 1977, State-of-the-art for assessing earthquake hazards in the United States: Report 6, faults and earthquake magnitude: U.S. Army Engineer Waterways Experiment Station Miscellaneous Paper S-73-1, 129 p., 37 p. appendix (Summarizes fault evaluation techniques; extensive bibliography).

Slemmons, D.B., and dePolo, C.M., 1992, Evaluation of active faulting and associated hazards: in *Studies in Geophysics-Active Tectonics*: National Research Council, p. 45-62.

Taylor, C.L., and Cluff, L.S., 1973, Fault activity and its significance assessed by exploratory excavation, in *Proceedings of the Conference on Tectonic Problems of the San Andreas Fault System*; Stanford University Publication, Geological Sciences, v. XIII, September 1973, p. 239-247.

Wallace, R.E., 1977, Profiles and ages of young fault scarps, north-central Nevada: *Geological Society of America Bulletin*, v. 88, p. 1267-1281.

Youd, T.L., 1980, Ground failure displacement and earthquake damage to buildings: *American Society of Civil Engineers Conference on Civil Engineering and Nuclear Power*, 2nd, Knoxville, Tennessee, v. 2, p. 7-6-2 to 7-6-26.

TABLE A-1

SETBACK RECOMMENDATIONS AND CRITICALITY FACTORS (U) FOR IBC OCCUPANCY CLASSES

(International Code Council, 2003)

Class (IBC)	Occupancy Group	Criticality	U	Minimum Setback
Class (IBC)	Occupancy Group	Criticality	U	Minimum Setback
A	Assembly	2	2.0	25 feet
B	Business	2	2.0	20 feet
E	Educational	1	3.0	50 feet
F	Factory/Industrial	2	2.0	20 feet
H	High hazard	1	3.0	50 feet
I	Institutional	1	3.0	50 feet
M	Mercantile	2	2.0	20 feet
R	Residential (R-1, R-2, R-4)	2	2.0	20 feet
R-3	Residential (R-3, includes single family homes)	3	1.5	15 feet
S	Storage	-	1	0
U	Utility and misc.	-	1	0
-	Table A-2	1	3.0	50 feet

TABLE A-2

ADDITIONAL STRUCTURES REQUIRING GEOLOGIC INVESTIGATION

Buildings and other structures that represent a substantial hazard to human life in the event of failure, but not limited to:

1. Buildings and other structures where more than 300 people congregate in one area.
2. Buildings and other structures with elementary school, secondary school or day care facilities with occupancy greater than 250.
3. Buildings and other structures with occupancy greater than 500 for colleges or adult education facilities.
4. Health care facilities with occupancy greater than 50 or more resident patients but not having surgery or emergency treatment facilities.
5. Jails and detention facilities.
6. Any other occupancy with occupancy greater than 1000.

~~7. Power generating stations, water treatment or storage for potable water, waste water treatment facilities and other public utility facilities.~~

~~8. Buildings and other structures containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.~~

~~Buildings and other structures designed as essential facilities including, but not limited to:~~

~~1. Hospitals and other care facilities having surgery or emergency treatment facilities.~~

~~2. Fire, rescue and police stations and emergency vehicle garages and fueling facilities.~~

~~3. Designated emergency shelters.~~

~~4. Designated emergency preparedness, communications, and operation centers and other facilities required for emergency response.~~

~~5. Power generating stations and other public utility facilities required as emergency backup facilities for facilities and structures included in this table.~~

~~6. Structures containing highly toxic materials as defined by the most recently adopted version of the IBC where the quantity of the material exceeds the maximum allowable quantities defined by the most recently adopted version of the IBC.~~

~~7. Aviation control towers, air traffic centers and emergency aircraft hangars.~~

~~8. Buildings and other structures having critical national defense functions.~~

~~9. Water treatment and storage facilities required to maintain water pressure for fire suppression.~~

~~9-19-161-3: APPENDIX C, MINIMUM STANDARDS FOR SLOPE STABILITY ANALYSIS:~~

~~1.0 INTRODUCTION~~

~~The procedures outlined herein are intended to provide consultants with a general outline for performing quantitative slope stability analyses and to clarify the expectations of Draper City. These standards constitute the minimum level of effort required in conducting quantitative slope stability analyses in Draper City. Considering the complexity inherent in performing slope stability analyses, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address slope stability. The information presented herein does not relieve consultants of their duty to perform additional geologic or engineering analyses they believe are necessary to assess the stability of slopes at a site.~~

~~The evaluation of landslides generally requires quantitative slope stability analyses. Therefore, the standards presented herein are directly applicable to landslide investigation,~~

~~and also constitute the minimum level of effort when performing landslide investigations. This appendix does not address debris flows (see appendix E) or rock falls (see appendix F).~~

~~The purposes for establishing minimum standards for slope stability analyses are to:~~

- ~~(a) Protect the health, safety, welfare, and property of the public by minimizing the potentially adverse effects of unstable slopes and related hazards;~~
- ~~(b) Assist property owners and land developers in conducting reasonable and adequate studies;~~
- ~~(c) Provide consulting engineering geologists and geotechnical engineers with a common basis for preparing proposals, conducting investigations, and mitigation; and,~~
- ~~(d) Provide an objective framework for regulatory review of slope stability reports.~~

~~1.1 References and Sources~~

~~The minimum standards presented herein were developed, in part, from the following sources:~~

- ~~(a) Guidelines for Evaluating Landslide Hazards in Utah (Hylland, 1996).~~
- ~~(b) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California (Blake et al., 2002).~~
- ~~(c) CDMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California~~
- ~~(d) Salt Lake County Geologic Hazards Ordinance (2002).~~
- ~~(e) Holladay City, Utah Natural Hazards Areas Provision (2006).~~
- ~~(f) Cottonwood Heights, Utah Code of Ordinances (2005).~~
- ~~(g) Centerville City Planning and Zoning Ordinance, section 12-330-2 Hillside Overlay District (1995).~~
- ~~(h) City of Camarillo, California 2003 Guidelines for the preparation of geotechnical and geologic studies, prepared by Fugro, dated June 18, 2003.~~
- ~~(i) City of Palmdale, California, Guidelines for preparation of geotechnical reports, prepared by GeoDynamics, Inc., dated April 2006 (draft copy).~~
- ~~(j) City of Malibu, California, Guidelines for the preparation of engineering geologic and geotechnical engineering reports and procedure for report submittal, prepared by Bing Yen and Associates) dated April, 2006.~~

1.2—Areas Requiring Slope Stability Analyses

Slope stability analyses shall be performed for all sites located within the Slope Stability Study Area Map (Plate A-3) and for all slopes that may be affected by the proposed development which meet the following criteria:

- (a) Cut and/or fill slopes steeper than about 2 horizontal (h) to 1 vertical (v).
- (b) Natural slopes steeper than or equal to 3 horizontal (h) to 1 vertical (v).
- (c) Natural and cut slopes with potentially adverse geologic conditions (e.g., bedding, foliation, or other structural features that are potentially adverse to the stability of the slope).
- (d) Natural and cut slopes which include a geologic hazard such as a landslide, irrespective of the slope height or slope gradient.
- (e) Buttresses and stability fills.
- (f) Cut, fill, or natural slopes of water retention basins or flood control channels.
- (g) In hillside areas (Plate A-3), investigations shall address the potential for surficial instability, debris/mudflows (see Appendix E), rock falls (see Appendix F), and soil creep on all slopes that may affect the proposed development or be affected by the proposed development.
- (h) When evaluating site conditions to determine the need for slope stability analyses, off-property conditions shall be considered (both up-slope to the top(s) of adjacent ascending slopes and down-slope to and beyond the toe(s) of adjacent descending slopes). Also, the consultant shall demonstrate that the proposed hillside development will not affect adjacent sites or limit adjacent property owners' ability to develop their sites.

1.3—Roles of Engineering Geologist and Engineering

The investigation of the static and seismic stability of slopes is an interdisciplinary practice. To provide greater assurance that the hazards are properly identified, assessed, and mitigated, involvement of both an engineering geologist and geotechnical engineer is required. Analyses shall be performed only by or under the direct supervision of licensed professionals, qualified and competent in their respective area of practice. An engineering geologist shall provide appropriate input to the geotechnical engineer with respect to the potential impact of the geology, stratigraphy, and hydrologic conditions on the stability of the slope. The shear strength and other geotechnical earth material properties shall be evaluated by the geotechnical engineer. Qualified engineering geologists, geological engineers and geotechnical engineers may assess and quantitatively evaluate slope stability. However, the geotechnical engineer shall perform all design stability calculations. Ground motion parameters for use in seismic stability analysis may be provided by either the engineering geologist or geotechnical engineer.

~~1.4 Minimum Qualifications of the Licensed Professional~~

~~Slope stability analyses must be performed by qualified engineering geologists and qualified geotechnical engineers (see sections 9-19-050 and 9-19-060 of the Draper City Geologic Hazards Ordinance, chapter 9-19).~~

~~2.0 GENERAL REQUIREMENTS~~

~~Except for the derivation of the input ground motion for pseudostatic and seismic deformation analyses (see section 12), slope stability analyses and evaluations should be performed in general accordance with the latest version of Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California (Blake et al., 2002). Procedures for developing input ground motions to be used in Draper City are described in section 12.1. See Draper City Geologic Hazard Ordinance, chapter 9-19, for supplemental requirements.~~

~~3.0 SUBMITTALS~~

~~Submittals for review shall include boring logs; geologic cross sections; trench and test pit logs; laboratory data (particularly shear strength test results, including individual stress-deformation plots from direct shear tests); discussions pertaining to how idealized subsurface conditions and shear strength parameters used for analyses were developed; analytical results, including computer output files (if requested); and summaries of the slope stability analyses and conclusions regarding slope stability.~~

~~Subsurface geologic and groundwater conditions must be illustrated on geologic cross sections and must be utilized by the geotechnical engineer for the slope stability analyses. If on-site sewage or storm water disposal exists or is proposed, the slope stability analyses shall include the effects of the effluent plume on slope stability.~~

~~The results of any slope stability analyses must be submitted with pertinent backup documentation (i.e., calculations, computer output, etc.). Printouts of input data, output data (if requested), and graphical plots must be submitted for each computer-aided slope stability analysis. In addition, input data files, recorded on diskettes, CDs, or other electronic media may be requested to facilitate the City's review.~~

~~4.0 FACTORS OF SAFETY~~

~~The minimum acceptable static factor of safety is 1.5 for both gross and surficial slope stability. The minimum acceptable factor of safety for a calibrated pseudostatic analysis is 1.0 using the method of Stewart and others (2003) (see section 12.2).~~

~~5.0 LANDSLIDES~~

~~The evaluation of landslides generally requires quantitative slope stability analyses. Therefore, the standards presented herein are directly applicable to landslide investigation, and also constitute the minimum level of effort when performing landslide investigations.~~

~~Evaluation of landslides shall be performed in the preliminary phase of hillside developments. Where landslides are present or suspected, sufficient subsurface exploration will be required to determine the basic geometry and stability of the landslide mass and the required stabilization measures. The depth of geologic exploration shall consider the regional geologic structure, the likely failure mode of the suspected failure, and past geomorphic conditions.~~

~~6.0 SITE INVESTIGATION AND GEOLOGIC STUDIES~~

~~Adequate evaluation of slope stability for a given site requires thorough and comprehensive geologic and geotechnical engineering studies. These studies are a crucial component in the evaluation of slope stability. Geologic mapping and subsurface exploration are normal parts of field investigation. Samples of earth materials are routinely obtained during subsurface exploration for geotechnical testing in the laboratory to determine the shear strength parameters and other pertinent engineering properties.~~

~~In general, geologic studies for slope stability consist of the following fundamental phases:~~

- ~~(a) Study and review of published and unpublished geologic information (both regional and site specific).~~
- ~~(b) Review and interpretation of available stereoscopic and oblique aerial photographs, DEMs, and LiDAR.~~
- ~~(c) Geologic field mapping, including, but not necessarily limited to, measurement of bedding, foliation, fracture, and fault attitudes and other parameters.~~
- ~~(d) Documentation and evaluation of subsurface groundwater conditions (including effects of seasonal and longer term natural fluctuations as well as landscape irrigation), surface water, on-site sewage disposal, and/or storm water disposal.~~
- ~~(e) Subsurface exploration.~~
- ~~(f) Analysis of the geologic failure mechanisms that could occur at the site (e.g., mode of failure and construction of the critical geologic cross sections).~~
- ~~(g) Presentation and analysis of the data, including an evaluation of the potential impact of geologic conditions on the project.~~

~~Geologic/geotechnical reports shall demonstrate that each of these phases has been adequately performed and that the information obtained has been considered and logically evaluated. Minimum criteria for the performance of each phase are described and discussed in Blake and others (2002).~~

~~7.0 SUBSURFACE EXPLORATION~~

~~The purpose of subsurface exploration is to identify potentially significant geologic materials and structures at a site and to provide samples for detailed laboratory~~

characterization of materials from potentially critical zones. Subsurface exploration is almost always required and may be performed by a number of widely known techniques such as bucket-auger borings, conventional small-diameter borings, cone penetration testing (CPT), test pits, trenches, and/or geophysical techniques (see section 4.2 of Blake et al., 2002). A discussion of the applicability of some subsurface exploration techniques follows.

7.1—Trenching

Subsurface exploration consisting of trenching has proven, in some cases, to be necessary when uncertainty exists regarding whether or not a particular landform is a landslide. Care must be exercised with this exploration method because landslides characteristically contain relatively large blocks of intact geologic units, which in a trench exposure could give the false impression that the geologic unit is "in-place." Although limited to a depth of about 15 feet below existing grades, trenching has also proven to be a useful technique for verifying margins of landslides, although the geometry of a landslide can generally be readily determined from evaluation of stereoscopic aerial photographs. Once a landslide is identified, conventional subsurface exploration drilling techniques will be required (see section 7.2 and 7.3). Slope stability analyses based solely on data obtained from trenches will not be accepted.

7.2—Methods for Bedded Formations

Conventional subsurface exploration techniques involving continuous core drilling with an oriented core barrel, test pits, and deep bucket-auger borings may be used to assess the subsurface soil and geologic conditions, particularly for geologic units with inclined bedding that includes weak layers.

Although not commonly utilized in Utah, a 24-inch-diameter bucket-auger boring with down-hole logging can provide valuable data (provided the consultant has determined the drill hole is safe to enter). The evaluation of safety of the proposed subsurface exploration program will be the responsibility of the consultant.

Particular attention must be paid to the presence or absence of weak layers (e.g., clay, claystone, silt, shale, or siltstone units) during the exploration. Unless adequately demonstrated (through comprehensive and detailed subsurface exploration) that weak (clay, claystone, silt, shale, or siltstone) layers (even as thin as 1/16-inch or less) are not present, a weak layer shall be assumed to possibly occur anywhere in the stratigraphic profile (i.e., ubiquitous weak clay beds).

The depth of the subsurface exploration must be sufficient to assess the conditions at or below the level of the deepest potential failure surface possessing a factor of 1.5 or less. A preliminary slope stability analysis may need to be performed to assist in the planning of the subsurface exploration program.

7.3—Other Geologic Units

For alluvium, fill materials, or other soil units that do not contain weak interbeds, other exploration methods such as small-diameter borings (e.g., rotary wash or hollow-stem-auger) or cone penetration testing may be suitable.

8.0—SOIL PARAMETERS

Soil properties, including unit weight and shear strength parameters (cohesion and friction angle), may be based on conventional field and laboratory tests as well as on field performance. Where appropriate (i.e., for landslide slip surfaces, along bedding planes, for surficial stability analyses, etc.), laboratory tests for saturated, residual shear strengths must be performed. Estimation of the shear resistance along bedding (or landslide) planes normally requires an evaluation of saturated residual along-bedding strength values of the weakest interbedded (or slide-plane) material encountered during the subsurface exploration, or in the absence of sufficient exploration, the weakest material that may be present, consistent with site geologic conditions. Strength parameters derived solely from CPT data may not be appropriate for slope stability analysis in some cases, particularly for strengths along existing slip surfaces where residual strengths have developed. Additional guidance on the selection of strength parameters for slope stability analyses is contained in Blake et al. (2002).

8.1—Residual Shear Strength Parameters

Residual strength parameters may be determined using the direct shear or ring shear testing apparatus; however ring shear tests are preferred. If performed properly, direct shear test results may approach ring shear test results. The soil specimen must be subjected to a sufficient amount of deformation (e.g., a significant number of shearing cycles in the direct shear test or a significant amount of rotation in the ring shear test) to assure that residual strength has been developed. In the direct shear and ring shear tests, stress-deformation curves can be used to determine when a sufficient number of cycles of shearing have been performed by showing that no further significant drop in shear strength results with the addition of more cycles or more rotation. The stress-deformation curves obtained during the shear tests must be submitted with the other laboratory test results. It shall be recognized that for most clayey soils, the residual shear strength envelope is curved and passes through the origin (i.e., at zero normal stress there is zero shear strength). Any "apparent shear strength" increases resulting from a non-horizontal shear surface (i.e., ramping) or "bulldozing" in residual direct shear tests shall be discounted in the interpretation of the strength parameters.

8.2—Interpretation

The engineer will need to use considerable judgment in the selection of appropriate shear test methods and in the interpretation of the results to develop shear strength parameters commensurate with slope stability conditions to be evaluated. Scatter plots of shear strength data may need to be presented to allow for assessment of idealized parameters.

The report shall summarize shear strength parameters used for slope stability analyses and describe the methodology used to interpret test results and estimate those parameters.

Peak shear strengths may be used to represent across-bedding failure surfaces or compacted fill, in situations where strength degradations are not expected to occur (see guidelines in Blake et al., 2002). Where peak strengths cannot be relied upon, fully softened (or lower) strengths shall be used.

Ultimate shear strength parameters shall be used in static slope stability analyses when there has not been past deformation. Residual shear strength parameters shall be used in static slope stability analyses when there has been past deformation.

Averaged strength parameters may be appropriate for some across-bedding conditions, if sufficient representative samples have been carefully tested. Analyses for along-bedding or along-existing-landslide slip surfaces shall be based on lower-bound interpretations of residual shear strength parameters and comparison of those results to correlations, such as those of Stark and others (2005).

8.3—Default Soil Parameters

In the Traverse Mountain area, failure surfaces for known landslides commonly occur within the Tertiary volcanics. Those failure surfaces typically are along clay layers formed by the in situ alteration of tuff deposits. In cases when the failure surface has been sampled and tested, relatively low residual shear strength values have been obtained; these values are cohesion equal to 0 psf and a friction angles equal to 11 to 12 degrees. Similar values have also been reported from the Springhill landslide in North Salt Lake that is in a similar tuffaceous volcanic formation of Tertiary age.

To assist in understanding shear strengths of these materials, the following shear strength parameters for landslide failure surfaces and along weak layers within the Tertiary volcanics shall be used; cohesion equal to 0 psf and a friction angle equal to 11 degrees, unless otherwise demonstrated. If site-specific testing produces lower residual shear strength than these values, the site-specific test results should be used. If site-specific testing produces higher values, documentation must be provided to demonstrate that the weakest materials were retrieved and tested and that the materials retrieved truly represent the basal landslide slip surface.

9.0—SOIL CREEP

The potential effects of soil creep shall be addressed where any proposed structure is planned in close proximity to an existing fill slope or natural slope. The potential effects on the proposed development shall be evaluated and mitigation measures proposed, including appropriate setback recommendations. Setback recommendations shall consider the potential affects of creep forces.

~~All reports in hillside areas shall address the potential for surficial instability, debris/mudflow (Appendix E), rock falls (Appendix F), and soil creep on all slopes that may affect the proposed development or be affected by the proposed development. Stability of slopes along access roads shall be addressed.~~

~~10.0—GROSS STATIC STABILITY~~

~~Gross stability includes rotational and translational deep-seated failures of slopes or portions of slopes existing within or outside of but potentially affecting the proposed development. The following guidelines, in addition to those in the Blake and others (2002) document, shall be followed when evaluating slope stability:~~

- ~~(a) Stability shall be analyzed along cross-sections depicting the most adverse conditions (e.g., highest slope, most adverse bedding planes, shallowest likely ground-water table, and steepest slope). Often analyses are required for different conditions and for more than one cross-section to demonstrate which condition is most adverse. When evaluating the stability of an existing landslide, analyses must also address the potential for partial reactivation. Inclinometers may be used to help determine critical failure surfaces and, along with high-resolution GPS, the state of activity of existing landslides. The critical failure surfaces on each cross-section shall be identified, evaluated, and plotted on the large-scale cross-section.~~
- ~~(b) If the long-term, static factor of safety is less than 1.5, mitigation measures will be required to bring the factor of safety up to the required level or the project may be redesigned to achieve a minimum factor of safety of 1.5.~~
- ~~(c) The temporary stability of excavations shall be evaluated and mitigation measures shall be recommended as necessary to obtain a minimum factor of safety of 1.3.~~
- ~~(d) Long-term stability shall be analyzed using the highest known or anticipated groundwater level based upon a groundwater assessment performed under the requirements of section 6.0.~~
- ~~(e) Where back-calculation is appropriate, shear strengths utilized for design shall be no higher than the lowest strength computed using back-calculation. If a consultant proposes to use shear strengths higher than the lowest back-calculated value, justification shall be required. Assumptions used in back-calculations regarding pre-sliding topography and groundwater conditions at failure must be discussed and justified.~~
- ~~(f) Reports shall describe how the shear strength testing methods used are appropriate in modeling field conditions and long-term performance of the subject slope. The utilized design shear strength values shall be justified with laboratory test data and geologic descriptions and history, along with past performance history, if known, of similar materials.~~

~~(g) Reports shall include shear strength test plots consisting of normal stress versus shear resistance (failure envelope). Plots of shear resistance versus displacement shall be provided for all residual and fully softened (ultimate) shear tests.~~

~~(h) The degree of saturation for all test specimens shall be reported. Direct shear tests on partially saturated samples may grossly overestimate the cohesion that can be mobilized when the material becomes saturated in the field. This potential shall be considered when selecting shear strength parameters. If the rate of shear displacement exceeds 0.005 inches per minute, the consultant shall provide data to demonstrate that the rate is sufficiently slow for drained conditions.~~

~~(i) Shear strength values higher than those obtained through site-specific laboratory tests generally will not be accepted.~~

~~(j) If direct shear or triaxial shear testing is not appropriate to model the strength of highly jointed and fractured rock masses, the design strengths shall be evaluated in a manner that considers overall rock mass quality and be consistent with rock mechanics practice.~~

~~(k) Shear strengths used in slope stability analyses shall be evaluated considering the natural variability of engineering characteristics inherent in earth materials. Multiple shear tests on each site material are likely to be required.~~

~~(l) Direct shear tests do not always provide realistic strength values (Watry and Lade, 2000). Correlations between liquid limit, percent clay fraction, and strength (fully softened and residual) with published data (e.g., Stark and McCone, 2002) shall be performed to verify tested shear strength parameters. Strength values used in analyses that exceed those obtained by the correlation must be appropriately justified.~~

~~(m) Shear strengths for proposed fill slopes shall be evaluated using samples mixed and remolded to represent anticipated field conditions. Confirming strength testing may be required during grading.~~

~~(n) Where bedding planes are laterally unsupported on slopes, potential failures along the unsupported bedding planes shall be analyzed. Similarly, stability analyses shall be performed where bedding planes form a dip-slope or near-dip-slope using composite potential failure surfaces that consist of potential slip surfaces along bedding planes in the upper portions of the slope in combination with slip surfaces across bedding planes in the lower portions of the slope.~~

~~(o) The stability analysis shall include the effect of expected maximum moisture conditions on soil unit weight.~~

~~(p) For effective stress analyses, measured groundwater conditions adjusted to consider likely unfavorable conditions with respect to anticipated future groundwater levels, seepage, or pore pressure shall be included in the slope stability analyses.~~

~~(q) Tension crack development shall be considered in the analyses of potential failure surfaces. The height and location of the tension crack shall be determined by searching.~~

~~(r) Anticipated surcharge loads as well as external boundary pressures from water shall be included in the slope stability evaluations, as deemed appropriate.~~

~~(s) Analytical chart solutions may be used provided they were developed for conditions similar to those being analyzed. Generally though, computer-aided searching techniques shall be used, so that the potential failure surface with the lowest factor of safety can be located. Examples of typical searching techniques are illustrated on figures 9.1a through 9.1f in Blake and others (2002). However, verification of the reasonableness of the analytical results is the responsibility of the geotechnical engineer and/or engineering geologist.~~

~~(t) The critical potential failure surface used in the analysis may be composed of circles, wedges, planes, or other shapes considered to yield the minimum factor of safety most appropriate for the geologic site conditions. The critical potential failure surface having the lowest factor of safety with respect to shearing resistance must be sought. Both the lowest factor of safety and the critical failure surface shall be documented.~~

~~11.0 SURFICIAL STABILITY OF SLOPES~~

~~Surficial slope stability refers to slumping and sliding of near- surface sediments and is most critical during the snowmelt and rainy season or when excessive landscape water is applied. The assessment of surficial slope stability shall be based on analysis procedures for stability of an infinite slope with seepage parallel to the slope surface or an alternate failure mode that would produce the minimum factor of safety. The minimum acceptable depth of saturation for surficial stability evaluation shall be four feet.~~

~~11.1 Applicability and Procedures~~

~~Conclusions shall be substantiated with appropriate data and analyses. Residual shear strengths comparable to actual field conditions shall be used in completing surficial stability analyses. Surficial stability analyses shall be performed under rapid draw-down conditions where appropriate (e.g., for debris and detention basins).~~

~~Where 2:1 or steeper slopes have soil conditions that can result in the development of an infinite slope with parallel seepage, calculations shall be performed to demonstrate that the slope has a minimum static factor of safety of 1.5, assuming a fully saturated 4-foot thickness. If conditions will not allow the development of a slope with parallel seepage, surficial slope stability analyses may not be required (provided the geologic/geotechnical reviewer concurs).~~

~~Surficial slope stability analyses shall be performed for fill, cut, and natural slopes assuming an infinite slope with seepage parallel to the slope surface or other failure mode that~~

would yield the minimum factor of safety against failure. A suggested procedure for evaluating surficial slope stability is presented in Blake et al. (2002).

11.2—Soil Properties

Soil properties used in surficial stability analyses shall be determined as noted in section 8.1. Residual shear strength parameters for surficial slope stability analyses shall be developed for a stress range that is consistent with the near-surface conditions being modeled. As indicated in section 8.1, it shall be recognized that for most clayey soils, the residual shear strength envelope is curved and passes through the origin (i.e., at zero normal stress there is zero shear strength). For sites with deep slip surfaces, the guidelines given by Blake and others (2002) should be followed.

11.3—Seepage Conditions

The minimum acceptable vertical depth for which seepage parallel to the slope shall be applied is four feet for cut or fill slopes. Greater depths may be necessary when analyzing natural slopes that have significant thicknesses of loose surficial material.

12.0—SEISMIC SLOPE STABILITY

In addition to static slope stability analyses, slopes shall be evaluated for seismic slope stability as well. Acceptable methods for evaluating seismic slope stability using calibrated pseudo-static limit-equilibrium procedures and simplified methods (e.g., those based on Newmark, 1965) to estimate permanent seismic slope movements are summarized in Blake and others (2002).

Nonlinear, dynamic finite element/finite difference numerical methods also may be used to evaluate slope movements resulting from seismic events as long as the procedures, input data, and results are thoroughly documented, and deemed acceptable by the City.

12.1—Ground Motion for Pseudostatic and Seismic Deformation Analyses

The two controlling faults that would most affect Draper City are the Salt Lake City and Provo segments of the Wasatch fault zone (WFZ). Repeated Holocene movement has been well documented along both segments (Black and others, 2003). Studies along the Provo segment of the WFZ indicate a recurrence interval of about 1150 years (Olig, and others, 2006; later revised, Olig, 2007) and the most recent event being about 500 to 650 years ago (Black and others, 2003; Olig, and others, 2006). Studies along the Salt Lake City segment of the WFZ indicate a recurrence interval of about 1300 years and the most recent event being about 1300 years ago (Lund, 2005). Based on the paleoseismic record of the Salt Lake City segment and assuming a time-dependent model, McCalpin (2002) estimates a conditional probability (using a log-normal renewal model) of 16.5% in the next 100 years (8.25% in the next 50 years) for a $M > 7$ surface-faulting earthquake. Therefore, using a time-dependent rather than Poisson or random model for earthquake recurrence, the likelihood of a large surface-faulting earthquake on the Salt Lake City segment of the WFZ is relatively

high and therefore the Salt Lake City segment is considered the primary controlling fault for deterministic analyses.

In regards to design ground accelerations for seismic slope stability analyses, Draper City prefers a probabilistic approach to determining the likelihood that different levels of ground motion will be exceeded at a particular site within a given time period. In order to more closely represent the seismic characteristics of the WFZ and better capture this possible high likelihood of a surface-faulting earthquake on the Salt Lake City segment, design ground motion parameters for seismic slope stability analyses shall be based on the peak accelerations with a 3.5 percent probability in 50 years (1,400-year return period). Peak bedrock ground motions can be readily obtained via the internet from the United States Geological Survey (USGS) National Seismic Hazard Maps, Data and Documentation web page (USGS, 2002), which is based on Frankel and others (2002). PGAs obtained from the USGS (2002) web page should be adjusted for effects of soil/rock (site-class) conditions in accordance with Seed and others (2001). Site specific response analysis may also be used to develop PGA values as long as the procedures, input data, and results are thoroughly documented, and deemed acceptable by the City.

12.2 Pseudo-Static Evaluations

Pseudo-static methods for evaluating seismic slope stability are acceptable as long as minimum factors of safety are satisfied, and due consideration is given in the selection of the seismic coefficient, k_h , reduction in material shear strengths, and the factor of safety for pseudo-static conditions.

Pseudo-static seismic slope stability analyses can be performed using the "screening analysis" procedure described in Blake et al. (2002). For that procedure a k_h value is selected from seismic source characteristics (modal magnitude, modal distance, and firm rock peak ground acceleration) and an acceptable level of deformation (5 cm) is specified. For that procedure, a factor of safety of 1.0 or greater is considered acceptable; otherwise, an analysis of permanent seismic slope deformation shall be performed.

12.3 Permanent Seismic Slope Deformation

For seismic slope stability analyses, estimates of permanent seismic displacement are preferred and may be performed using the procedures outlined in Blake and others (2002). It should be noted that Bray and Rathje (1998), referenced in Blake and others (2002), has been updated and superseded by Bray and Travarasrou (2007), which is the City's currently preferred method. For those analyses, calculated seismic displacements shall be 5 cm or less, or mitigation measures shall be proposed to limit calculated displacements to 5 cm or less.

For specific projects, different levels of tolerable displacement may be possible, but site-specific conditions, which shall include the following, must be considered:

~~(a) The extent to which the displacements are localized or broadly distributed – broadly distributed shear deformations would generally be less damaging and more displacement could be allowed.~~

~~(b) The displacement tolerance of the foundation system – stiff, well-reinforced foundations with lateral continuity of vertical support elements would be more resistant to damage (and hence could potentially tolerate larger displacements) than typical slabs-on-grade or foundation systems with individual spread footings.~~

~~(c) The potential of the foundation soils to experience strain softening – slopes composed of soils likely to experience strain softening should be designed for relatively low displacements if peak strengths are used in the evaluation of k_y due to the potential for progressive failure, which could involve very large displacements following strain softening.~~

~~In order to consider a threshold larger than 5 cm, the project consultant shall provide prior, acceptable justification to the City and obtain the City's approval. Such justification shall demonstrate, to the satisfaction of the City, that the proposed project will achieve acceptable performance 1–.~~

~~13.0 WATER RETENTION BASINS AND FLOOD CONTROL CHANNELS~~

~~For cut, fill, or natural slopes of water retention basins or flood control channels, slope stability analyses shall be performed. In addition to analyzing typical static and seismic slope stability, those analyses shall consider the effects of rapid drawdown, if such a condition could develop.~~

~~14.0 MITIGATION~~

~~When slope stability hazards are determined to exist on a project, measures to mitigate impacts from those hazards shall be implemented. Some guidance regarding mitigation measures is provided in Blake et al. (2002). Slope stability mitigation methods include 1) hazard avoidance, 2) grading to improve slope stability, 3) reinforcement of the slope or improvement of the soil within the slope, and (4) reinforcement of the structure built on the slope to tolerate anticipated slope displacements.~~

~~Where mitigation measures that are intended to add stabilizing forces to the slope are to be implemented, consideration may need to be given to strain compatibility. For example, if a compacted fill buttress is proposed to stabilize laterally unsupported bedding or a landslide, the amount of deformation needed to mobilize the recommended shear strength in the buttress shall be considered to confirm that it will not result in adverse movements of the upslope bedding or landslide deposits. Similarly, if a series of drilled soldier piers is to be used to support a potentially unstable slope and a residential structure will be built on the piers, pier deformations resulting from movements needed to mobilize the soil's shear strength shall be compared to tolerable deflections in the supported structure.~~

14.1—Full Mitigation

Full mitigation of slope stability hazards shall be performed for developments in the City. Remedial measures that produce static factors of safety in excess of 1.5 and acceptable seismic displacement estimates shall be implemented as needed.

14.2—Partial Mitigation for Seismic Displacement Hazards

On some projects or portions thereof (such as small structural additions, residential "infill projects", non-habitable structures, and non-structural natural slope areas), full mitigation of seismic slope displacements may not be possible, due to physical or economic constraints. In those cases, partial mitigation, to the extent that it prevents structural collapse, injury, and loss of life, may be possible if it can be provided consistent with IBC philosophies, and if it is approved by Draper City. The applicability of partial mitigations to specific projects will be evaluated on a case-by-case basis.

15.0—Notice of Geologic Hazard and Waiver of Liability

For developments where full mitigation of seismic slope displacements is not implemented, a Notice of Geologic Hazard shall be recorded with the proposed development describing the displacement hazard at issue and the partial mitigation employed. The Notice shall clearly state that the seismic displacement hazard at the site has been reduced by the partial mitigation, but not totally eliminated.

In addition, the owner shall assume all risks, waive all claims against the City and its consultants, and indemnify and hold the City and its consultants harmless from any and all claims arising from the partial mitigation of the seismic displacement hazard.

—APPENDIX C - REFERENCES

Black, B.D., Hecker, Suanne, Hylland, M.D., Christenson, G.E., and McDonald, G.N. (2003), Quaternary fault and fold database and map of Utah, Utah Geological Survey Map 193DM, CD.

Blake, T.F., Hollingsworth, R.A. and Stewart, J.P., Editors (2002), Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for analyzing and mitigating landslide hazards in California: organized by the Southern California Earthquake Center, available for download at:
<http://www.scec.org/resources/catalog/hazardmitigation.html#land>.

California Division of Mines and Geology (CDMG) (1997), Guidelines for evaluating and mitigating seismic hazards in California, CDMG Special Publication (SP) 117.

FEMA (1997), NEHRP guidelines for the seismic rehabilitation of buildings: FEMA-273/October,

Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rukstales, K.S. (2002),

Documentation for the 2002 update of the National Seismic Hazard Maps, USGS Open-File Report 02-420.

IBC (2006), International Building Code, International Code Council, Inc., 658 p

Lund, W.R. (2005), Consensus preferred recurrence interval and vertical slip rate estimates- Review of Utah paleoseismic trenching data by the Utah Quaternary Fault Parameters Working Group, Utah Geological Survey Bulletin 134, CD.

McCalpin, J.P. (2002), Post-Bonneville paleoearthquake chronology of the Salt Lake City segment, Wasatch fault zone, from the 1999 "megatrench" site, Utah Geological Survey Miscellaneous Publication 02-7, 38 p.

Newmark, N.M. (1965), Effects of earthquakes on dams and embankments, *Geotechnique*, v. 25, no. 4.

Olig, S.S. (2007), written communication, August 16, 2007: URS Corp, Oakland, California.

Olig, S.S., McDonald, G., Black, B., DuRoss, C., and Lund, W.R. (2006), A longer and more complete paleoseismic record for the Provo segment of the Wasatch fault zone, Utah, (abs.), *Seismological Research Letters*, v. 77, p. 274.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F. (2001), Recent advances in soil liquefaction engineering and seismic site response evaluation, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, University of Missouri-Rolla, Rolla, Missouri, 2001, Paper No. SPL-2, 45 p.

Stark, T.D., Choi, H., and McCone, S. (2005), "Drained shear strength parameters for analysis of landslides," *Journal of Geotechnical and Geoenvironmental Engineering*, v. 131, no. 5, pp. 575-588.

Stewart, J.P., Blake, T.M., and Hollingsworth, R.A. (2003), Development of a screen analysis procedure for seismic slope stability: *Earthquake Spectra*, 19 (3), pp. 697-712.

USGS (2002), National Seismic Hazard Maps, Data and Documentation web page: <http://eqhazmap.usgs.gov>. For obtaining a pga for a specific probability or return period see <http://earthquake.usgs.gov/research/hazmaps/design/>.

Watry, S.M. and Lade, P.V. (2000), "Residual shear strengths of bentonites on Palos Verdes Peninsula, California," *Proceedings of the session of Geo-Denver 2000, American Society of Civil Engineers*, pp. 323-342.

-

Notes

1. The SP117 Guidelines Committee (Blake and others, 2002) struggled in its deliberations regarding this issue and was unable to reach unanimous consensus. However, it was the judgment of all but one of the committee members (14 out of the 15) that when the critical slip surface from slope stability analysis daylights within a structure that is likely to be occupied by people during an earthquake, and if calculated median displacements (u) can be maintained at less than 5 cm, it is unlikely that the building would be damaged sufficiently to significantly threaten its structural integrity. One of the committee members felt that the calculated median seismic displacements through occupied structures should be maintained at less than 15 cm, but other than having that opinion, he did not offer a specific justification for that choice. Neither of those values (5 or 15 cm) is necessarily the "correct" median value, because they are judgment-based.

-

Ideally, allowable displacements for analyses would be established from a database in which observed slope displacements from earthquakes are correlated to measures of damage in structures. Unfortunately, however, such data do not exist in sufficient quantity to be useful, and hence there is an insufficient basis for selecting allowable displacements empirically. Accordingly, allowable displacement levels are established from engineering judgment. A number of factors affect the degree to which slope displacements will be damaging to structures. Displacements that occur beneath occupied structures are more critical than those in garden areas or streets. Displacements that occur abruptly across a narrow shear surface can be more damaging than those that are broadly distributed across a wide zone of deformation. Moreover, different structural systems will have different tolerances to differential movements beneath their foundation.

-

In their recent paper, Bray and Travasarou (2007) describe displacements of 1 cm or less as "negligible" and displacements of 5 cm or less as "minor." In an oral presentation made to the Los Angeles section of ASCE (on November 15, 2007), Jonathan Bray described seismic displacements of 15 cm to 1 m as "moderate" and those larger than 1 m as "large," but he cautioned that such general classifications depend on things such as the foundation system, consequences of displacement, the soil behavior, etc.

9-19-161-4: APPENDIX D, MINIMUM STANDARDS FOR LIQUEFACTION INVESTIGATIONS AND EVALUATIONS:

1.0 INTRODUCTION

The procedures outlined herein are intended to provide consultants with a general outline for performing liquefaction investigations and to specify the expectations of Draper City. These standards constitute the minimum level of effort required in conducting liquefaction investigations in Draper City. Considering the complexity inherent in performing liquefaction investigations, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address the liquefaction potential at the site. The information presented herein does not relieve consultants of their duty to perform additional geologic or geotechnical engineering analyses they believe are necessary to adequately assess the liquefaction potential at a site.

The purpose of establishing minimum standards for liquefaction investigations is to:

- (a) Protect the health, safety, welfare, and property of the public by minimizing the potentially adverse effects of liquefaction and related hazards;
- (b) Assist property owners and land developers in conducting reasonable and adequate studies;
- (c) Provide consulting engineering geologists and geotechnical engineers with a common basis for preparing proposals, conducting investigations, and mitigation; and,
- (d) Provide an objective framework for regulatory review of liquefaction investigation reports.

1.1 References and Sources

The minimum standards presented herein were developed, in part, from the following sources:

- (a) CDMG Special Publication 117, Guidelines for evaluating and mitigating seismic hazards in California (1997).
- (b) Recommended procedures for implementation of DMG special publication 117, guidelines for analyzing and mitigating liquefaction hazards in California (Martin and Lew, 1999).
- (c) Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils, Technical Report NCEER-97-0022 (Youd and Idriss, 1997).
- (d) Liquefaction Resistance of Soils: Summary Report from the 1996 and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Environmental Engineering, (Youd et al., 2001).
- (e) Salt Lake County geologic hazards ordinance (2002).
- (d) Draper City geologic hazard ordinance (2003).

~~(e) City of Camarillo, California 2003 Guidelines for the preparation of geotechnical and geologic studies, prepared by Fugro, dated June 18, 2003.~~

~~(f) City of Palmdale, California, Guidelines for preparation of geotechnical reports, prepared by GeoDynamics, Inc., dated April 2006 (draft copy).~~

~~(g) City of Malibu, California, Guidelines for the preparation of engineering geologic and geotechnical engineering reports and procedure for report submittal, prepared by Bing Yen and Associates) dated April, 2006.~~

~~1.2 Properties Requiring Liquefaction Analyses~~

~~Plate A-2 (Appendix A of the Draper City Geologic Hazards Ordinance, chapter 9-19), Liquefaction Special Study Area Map, depicts generalized liquefaction susceptibility for the city, and shall be used to determine whether or not a site-specific liquefaction assessment is required for a particular project.~~

~~The Liquefaction Special Study Area map is based on a regional-scale investigation of Salt Lake County. These maps may not identify all areas that have potential for liquefaction; a site located outside of a zone of required investigation is not necessarily free from liquefaction hazard. The zone does not always include lateral spread run-out areas. The Liquefaction Special Study Area map is available from the Draper City Planning Department.~~

~~The Draper City Geologic Hazards Ordinance requires a site-specific liquefaction investigation to be performed prior to approval of a project based on the land-use/liquefaction potential matrix shown in the following table.~~

~~-~~

~~Type Of Facility~~	~~Liquefaction Study Area~~	~~Acceptable Factor Of Safety~~
~~Critical facilities (essential facilities, hazardous facilities, and special occupancy structures as defined in section 9-19-20~~	~~YES~~	~~1.3~~
~~Category III and IV in table 1604.58 of the most recently adopted edition of the IBC.~~	~~YES~~	~~1.3~~
~~Industrial and commercial buildings.~~	~~YES~~	~~1.25~~
~~Residential structures and subdivisions~~	~~NO~~	~~-~~

~~-~~

~~1.3 Roles of Engineering Geology and Geotechnical Engineering~~

~~The investigation of liquefaction hazard is an interdisciplinary practice. The site investigation report must be prepared by a qualified engineering geologist or geotechnical~~

engineer, who must have competence in the field of seismic hazard evaluation and mitigation, and be reviewed by a qualified engineering geologist or geotechnical engineer, also competent in the field of seismic hazard evaluation and mitigation.

Because of the differing expertise and abilities of qualified engineering geologists and geotechnical engineers, the scope of the site investigation report for the project may require that both types of professionals prepare and review the report, each practicing in the area of their expertise. Involvement of both a qualified engineering geologist and geotechnical engineer will generally provide greater assurance that the hazard is properly identified, assessed, and mitigated.

Liquefaction analyses are the responsibility of the geotechnical engineer, although the engineering geologist should be involved in the application of screening criteria (section 3.0, steps 1 and 2) and general geologic site evaluation (section 4.1) to map the likely extent of liquefiable deposits and shallow groundwater. Engineering properties of earth material shall be evaluated by the geotechnical engineer. The performance of the quantitative liquefaction analysis resulting in a numerical factor of safety and quantitative assessment of settlement and liquefaction-induced permanent ground displacement shall be performed by geotechnical engineers. The geotechnical and civil engineers shall develop all mitigation and design recommendations. Ground motion parameters for use in quantitative liquefaction analyses may be provided by either the engineering geologist or geotechnical engineer.

1.4—Minimum Qualifications of the Licensed Professional

Liquefaction analyses must be performed by qualified engineering geologists and qualified geotechnical engineers (see sections 9-19-050 and 9-19-060 of the Draper City Geologic Hazards Ordinance).

—2.0—GENERAL REQUIREMENTS

Except for the derivation of input ground motion (see section 5.0), liquefaction investigations should be performed in general accordance with the latest version of Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California (Martin and Lew, 1999). Additional protocol for liquefaction investigations is provided in Youd and Idriss (1997). See Draper City Geologic Hazard Ordinance (Chapter 9-19) for supplemental requirements. Acceptable factors of safety are shown on the table in section 1.2.

3.0—PRELIMINARY SCREENING FOR LIQUEFACTION

The Liquefaction Study Area map is based on broad regional studies and does not replace site-specific studies. The fact that a site is located within a Liquefaction Study Area does not mean that there is a significant liquefaction potential at the site, only that a study shall be performed to determine if there is.

Soil liquefaction is caused by strong seismic ground shaking where saturated, cohesionless, granular soil undergoes a significant loss in shear strength that can result in settlement and permanent ground displacement. Surface effects of liquefaction include: settlement, bearing capacity failure, ground oscillations, lateral spread and flow failure. It has been well documented that soil liquefaction may occur in clean sands, silty sands, and sandy silt, non-plastic silts and gravelly soils. The following conditions must be present for liquefaction to occur:

- (a) Soils must be submerged below the water table;
- (b) Soils must be loose to moderately dense;
- (c) Ground shaking must be relatively intense; and
- (d) The duration of ground shaking must be sufficient for the soils to generate seismically-induced excess pore water pressure and lose their shearing resistance.

The following screening criteria may be applied to determine if further quantitative evaluation of liquefaction hazard is required:

- (a) If the estimated maximum past-, current-, and maximum- future-groundwater levels (i.e., the highest groundwater level applicable for liquefaction analyses) are determined to be deeper than 50 feet below the existing ground surface or proposed finished grade (whichever is deeper), liquefaction assessments are not required. For soil materials that are located above the level of the groundwater, a quantitative assessment of seismically induced settlement is required.
- (b) If "bedrock" or similar lithified formational material underlies the site, those materials need not be considered liquefiable and no analysis of their liquefaction potential is necessary.
- (c) If the corrected standard penetration blow count, $(N_1)_{60}$, is greater than or equal to 33 in all samples with a sufficient number of tests, liquefaction assessments are not required. If cone penetration test soundings are made, the corrected cone penetration test tip resistance, qc_{1N} , should be greater than or equal to 180 in all soundings in sand materials, otherwise liquefaction assessments are needed.

If plastic soil ($PI \geq 20$) materials are encountered during site exploration, those materials may be considered non-liquefiable. Additional acceptable screening criteria regarding the effects of plasticity on liquefaction susceptibility are presented in Boulanger and Idriss (2004), Bray and Sancio (2006), and Seed and others (2003).

If the screening investigation clearly demonstrates the absence of liquefaction hazards at a project site and the City concurs, the screening investigation will satisfy the site investigation report requirement for liquefaction hazards. If not, a quantitative evaluation is required to assess the liquefaction hazards.

4.0—FIELD INVESTIGATIONS

Geotechnical field investigations are routinely performed for new projects as part of the normal development and design process. Geologic reconnaissance and subsurface explorations are normally performed as part of the field exploration program even when liquefaction does not need to be investigated.

4.1—Geologic Reconnaissance

Geologic research and reconnaissance are important to provide information to define the extent of unconsolidated deposits that may be prone to liquefaction. Such information should be presented on geologic maps and cross sections and provide a description of the formations present at the site that includes the nature, thickness, and origin of Quaternary deposits with liquefaction potential. There also should be an analysis of groundwater conditions at the site that includes the highest recorded water level and the highest water level likely to occur under the most adverse foreseeable conditions in the future.

During the field investigation, the engineering geologist should map the limits of unconsolidated deposits with liquefaction potential. Liquefaction typically occurs in cohesionless silt, sand, and fine-grained gravel deposits of Holocene to late Pleistocene age in areas where the groundwater is shallower than about 50 feet.

Shallow groundwater may exist for a variety of reasons, some of which are of natural and or manmade origin. Landscape irrigation, on-site sewage disposal, and unlined manmade lakes reservoirs, and storm-water detention basins may create a shallow groundwater table in sediments that were previously unsaturated.

4.2—Subsurface Explorations

Subsurface explorations shall consist of drilled borings and/or cone penetration tests (CPTs). The exploration program shall be planned to determine the soil stratigraphy, groundwater level, and indices that could be used to evaluate the potential for liquefaction by either in situ testing or by laboratory testing of soil samples. Borings and CPT soundings must penetrate a minimum of 50 feet below final ground surface. If a standard penetration test (SPT) is used, sampling intervals shall not exceed 2.5 feet.

For saturated cohesionless soils where the SPT (N₁)₆₀ values are less than 15, or where CPT tip resistances are below 60 tsf, grain-size analyses, hydrometers tests, and Atterberg Limits tests shall be performed on these soils to further evaluate their potential for permanent ground displacement (Youd et al., 2002) and other forms of liquefaction-induced ground failure and settlement.

Where a structure may have subterranean construction or deep foundations (e.g., caissons or piles), the depth of investigation should extend to a depth that is a minimum of 20 feet (6 m) below the lowest expected foundation level (e.g., caisson bottom or pile tip) or 50 feet (15 m) below the existing ground surface or lowest proposed finished grade, whichever is

deeper. If, during the investigation, the indices to evaluate liquefaction indicate that the liquefaction potential may extend below that depth, the exploration should be continued until a significant thickness (at least 10 feet or 3 m, to the extent possible) of nonliquefiable soils are encountered.

5.0—GROUND MOTION FOR LIQUEFACTION SUSCEPTIBILITY AND GROUND DEFORMATION ANALYSES

The two controlling faults that would most affect Draper City are the Salt Lake City and Provo segments of the Wasatch Fault Zone (WFZ). Repeated Holocene movement has been well documented along both segments (Black and others, 2003). Studies along the Provo segment of the WFZ indicate a recurrence interval of about 1150 years (Olig, and others, 2006; later revised, Olig, 2007) and the most recent event being about 500 to 650 years ago (Black and others, 2003; Olig, and others, 2006). Studies along the Salt Lake City segment of the WFZ indicate a recurrence interval of about 1300 years and the most recent event being about 1300 years ago (Lund, 2005). Based on the paleoseismic record of the Salt Lake City segment and assuming a time-dependent model, McCalpin (2002) estimates a conditional probability (using a log-normal renewal model) of 16.5% in the next 100 years (8.25% in the next 50 years) for a $M > 7$ surface-faulting earthquake. Therefore, using a time-dependent rather than Poisson or random model for earthquake recurrence, the likelihood of a large surface-faulting earthquake on the Salt Lake City segment of the WFZ is relatively high and therefore the Salt Lake City segment is considered the primary controlling fault for deterministic analyses.

In regards to design ground accelerations for liquefaction analyses, Draper City prefers a probabilistic approach to determining the likelihood that different levels of ground motion will be exceeded at a particular site within a given time period. In order to more closely represent the seismic characteristics of the WFZ and better capture this possible high likelihood of a surface-faulting earthquake on the Salt Lake City segment, design ground motion parameters for liquefaction analyses shall be based on the peak accelerations with a 3.5 percent probability in 50 years (1,400-year return period). Peak bedrock ground motions can be readily obtained via the internet from the United States Geological Survey (USGS) National Seismic Hazard Maps, Data and Documentation web page (USGS, 2002), which is based on Frankel and others (2002). PGAs obtained from the USGS (2002) web page should be adjusted for effects of soil/rock (site-class) conditions in accordance with Seed and others (2001) or other appropriate methods that consider the site-specific soil conditions and their potential for amplification/deamplification of the high frequency strong motion.

6.0—REMEDIAL DESIGN

Sites, facilities, buildings, structures and utilities that are founded on or traverse liquefiable soils may require further remedial design and/or relocation to avoid liquefaction-induced damage. These should be investigated and evaluated on a site-specific basis with sufficient geologic and geotechnical evaluations to support the remedial design and/or mitigative

~~plan. This design or plan may include: changes/modifications to the soil, foundation system, structural frame or support of the building, etc. and should be reviewed and approved by the City.~~

~~7.0 SUBMITTALS~~

~~Submittals for review shall include: boring logs; geologic cross sections; laboratory data; discussions pertaining to how idealized subsurface conditions and parameters used for analyses were developed; analytical results, including computer output files (on request); and summaries of the liquefaction analyses and conclusions regarding liquefaction potential and likely types and amounts of ground failure.~~

~~Subsurface geologic and groundwater conditions must be illustrated on geologic cross-sections and must be utilized by the geotechnical engineer for the liquefaction analyses. If on-site sewage or storm water disposal exists or is proposed, the liquefaction analyses shall include the effects of the effluent plume on liquefaction potential.~~

~~The results of any liquefaction analyses must be submitted with pertinent backup documentation (i.e., calculations, computer output, etc.). Printouts of input data, output data (on request), and graphical plots must be submitted for each computer-aided liquefaction analysis. In addition, input data files, recorded on diskettes, CDs, or other electronic media, may be requested to facilitate the City's review.~~

~~—Appendix D—References~~

~~Bartlett, S.F. and Youd, T. L., (1995), Empirical prediction of liquefaction-induced lateral spread: Journal of Geotechnical Engineering, Vol. 121, No. 4, April, A.S.C.E., pp. 316-329.~~

~~Black, B.D., Hecker, S., Hylland, M.D., Christenson, G.E., and McDonald, G.N., (2003), Quaternary fault and fold database and map of Utah, Utah Geological Survey Map 193DM.~~

~~Boulanger, R.W., and Idriss I.M., (2004), "Evaluating the potential for liquefaction resistance or cyclic failures of silts and clays, Report UCD/CGM-04/01 University of California, Davis California.~~

~~Bray J. D. and Sancio R. B., (2006), Assessment of Liquefaction Susceptibility of Fine-Grained Soils, ASCE Journal of Geotechnical and Geoenvironmental Engineering, September 2006.~~

~~California Division of Mines and Geology (CDMG), (1997), Guidelines for evaluating and mitigating seismic hazards in California, CDMG Special Publication (SP) 117.~~

~~Lund, W.R. (2005), Consensus preferred recurrence interval and vertical slip-rate estimates- Review of Utah paleoseismic trenching data by the Utah Quaternary Fault Parameters Working Group, Utah Geological Survey Bulletin 134, CD.~~

~~McCalpin, J., (2002), Post-Bonneville paleoearthquake chronology of the Salt Lake City segment, Wasatch fault zone, from the 1999 (mega-trench) site, Utah Geological Survey Miscellaneous Publication 02-7.~~

Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rukstales, K.S., (2002), Documentation for the 2002 Update of the National Seismic Hazard Maps, U.S.G.S. Open-File Report 02-420, 33p.

Martin, G.R. and Lew, M., eds., (1999), Recommended procedures for implementation of DMG special publication 117, guidelines for analyzing and mitigating liquefaction potential in California, Southern California Earthquake Center (SCEC), University of Southern California, 63 p.

Olig, Susan S., McDonald, Greg, Black, Bill D., DuRoss, Christopher B., and Lund, William R., (2006), A longer and more complete paleoseismic record for the Provo segment of the Wasatch fault zone, Utah, 2006 Seismological Society of America Annual Meeting in San Francisco, California, April 17-22, 2006.

Olig, (2007), URS Corp, Oakland, California; written communication, August, 2007.

Seed, H.B., and Idriss, I.M., (1982), Ground motion and soil liquefaction during earthquakes: Earthquake Engineering Research Institute, Oakland, California, 135 p.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F., (2001), Recent advances in soil liquefaction engineering and seismic site response evaluation, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, University of Missouri-Rolla, Rolla, Missouri, 2001, Paper No. SPL-2, 45 p.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F. (2001) Recent Advances in Soil Liquefaction Engineering and Seismic Site Response Evaluation, Proceedings, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics and Symposium in Honor of Professor W.D. Liam Finn, San Diego, California, March 26-31, 2001, 45 pp.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F., Sancio, R.B., Bray, J.D., Kayen, R.E., and Faris, A. (2003) Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework, 26th Annual ASCE Los Angeles Geotechnical Spring Seminar, Keynote Presentation, H.M.S. Queen Mary, Long Beach, California, April 30, 2003, 71 pp.

Youd, T.L., and Idriss, I.M., eds., (1997), Proceedings of the NCEER workshop on evaluation of liquefaction resistance of soils: National Center for Earthquake Engineering Research Technical Report NCEER 97-0022.

Youd, T.L., and Gilstrap, S.D., (1999), Liquefaction and deformation of silty and fine-grained soils: Proceedings of the Second International Conference on Earthquake Geotechnical Engineering, Lisboa, Portugal, 21-25 June 1999, Seco e Pinto (ed.), pp. 1013-1020.

~~Youd, T.C., Hansen, C.M., and Bartlett, S.F., (2002), Revised MLR equations for predicting lateral spread displacement, ASCE Journal of Geotechnical and Geoenvironmental Engineering, December 2002.~~

~~9-19-161-5: APPENDIX E, MINIMUM STANDARDS FOR DEBRIS FLOW ANALYSES:~~

~~Debris-flow reports shall follow general guidance contained in "Guidelines for the geologic evaluation of debris-flow hazards on alluvial fans in Utah," Utah Geological Survey Miscellaneous Publication 05-6. Debris-flow hazard analyses and mitigation measures may require contributions from hydrologists as well as qualified engineering geologists and geotechnical engineers.~~

~~9-19-161-6: APPENDIX F, MINIMUM STANDARDS FOR ROCKFALL ANALYSES:~~

~~Useful methods to evaluate rock-fall hazards are outlined in: Evans, S.G., and Hungr, O., 1993, The assessment of rockfall hazard at the base of talus slopes: Canadian Geotechnical Journal, v. 30, p. 620-636; Jones, C.L., Higgins, J.D., and Andrew, R.D., 2000, Colorado rockfall simulation program, version 4.0: Report prepared for the Colorado Department of Transportation, 127 p.; and Wieczorek, G.F., Morrissey, M.M., Iovine, G., and Godt, J., 1998, Rock-fall hazards in the Yosemite Valley: U.S. Geological Survey Open-File Report 98-467, 7 p., 1 pl., scale 1:12,000. Rock-fall studies shall be prepared by a qualified engineering geologist and may require contributions from a qualified geotechnical engineer, particularly in the design of mitigation measures.~~

...

9-27-085: RETAINING WALLS:

...

- D. Geologic Hazard Ordinance Applicability: The Draper City geologic hazard ordinance, [section 9-19-161-3 Title 10, Chapter 7](#), and "Appendix C, "Minimum Standards For Slope Stability Analysis", of [this title, section 1.2 the Geotechnical Engineering Manual](#), requires global stability analysis of modified natural slopes steeper than three horizontal to one vertical (3H:1V) and cut or fill slopes of two horizontal to one vertical (2H:1V) or greater.

...

TITLE 10
BUILDING REGULATIONS

...

CHAPTER 7
GEOLOGIC HAZARDS

10-7-010: PURPOSE:

- A. The purpose of the Draper City (the City) geologic hazards ordinance is to protect the health, safety, welfare, and property of the citizens of the City, protect the city's infrastructure and financial health and minimize adverse effects of geologic hazards to public health, safety, and property by encouraging wise land use.
- B. This chapter and the appendices of the Geotechnical Engineering Manual address fault activity, slope stability, liquefaction, debris-flow, and rockfall hazards and present minimum standards and methods for evaluating geologic hazards.
- C. All persons required to comply with this chapter shall present the results of geologic hazard investigations in compliance with this chapter and the appendices of the Geotechnical Engineering Manual. The standards set forth in the appendices of the Geotechnical Engineering Manual are minimum requirements. More complex projects may require more detailed and in-depth evaluations than outlined herein. In addition, the appendices of the Geotechnical Engineering Manual shall not supersede other, more-stringent requirements that may be required by other regulatory agencies.
- D. Geologic hazards special study area maps reflecting geological concerns pertaining to development within the City may be viewed at the City online map portal via the geologic information application. The maps incorporate data obtained from previous geologic hazard study investigations performed in the City. Site-specific geologic hazards assessments performed by engineering geologists shall be required before developing projects located within a geologic hazards study area. In the event known or readily apparent geologic hazards exist in an area subject to a development application, which area is not depicted on the geologic hazards special study area maps, the applicant shall nevertheless submit the applicable investigation and the process outlined in this chapter shall be followed.

10-7-015: ESTABLISHMENT OF STANDARDS AND SPECIFICATIONS:

The city manager, with the advice and consent of the city council through resolution, shall establish certain standards and specifications that shall be applicable to this chapter. All

such standards and specifications shall be published in the Geotechnical Engineering Manual on file with the building division for public inspection and review.

10-7-020: DEFINITIONS:

As used in this chapter:

ACCEPTABLE AND REASONABLE RISK: no loss of life or significant injury to occupants, no release of hazardous or toxic substances, and structural damage following an earthquake, rockfall, debris flow or other natural hazard that retains a margin against the onset of partial or total collapse.

ACCESSORY BUILDING: any structure not designed for human occupancy, which may include tool or storage sheds, gazebos, and swimming pools.

ALLUVIAL FAN: a gently sloping fan-shaped landform (in plan view), created over time by stream deposition of eroded sediments where the stream emerges from a narrow drainage onto a plain or broad valley.

APPLICANT: any person, including a person's agents or consultants, required to act in compliance with this chapter. The city and its agents and consultants are not applicants.

BUILDABLE AREA:

1. The part of a site that may be developed after required setbacks have been deducted and open space requirements of title 9 of this code have been met, and
2. If applicable, based on an accepted geologic hazard study report, the part of a site not impacted by geologic hazards, or the part of a site where the identified geologic hazards can be mitigated to an acceptable risk.

CITY: the city council, mayor, city manager, public works director, city engineer, community development director, planning manager, building official, or other city employee.

CRITICAL FACILITIES: essential, hazardous, special occupancy facilities, and Risk Categories III and IV as defined in the currently adopted International Building Code, and lifelines such as major utility, transportation, and communication facilities and their connections to critical facilities.

DEBRIS FLOW: a slurry of rock, soil, organic material, and water transported in an extremely fast and destructive flow that flows down channels and onto and across alluvial fans, including a continuum of sedimentation events and processes including debris flows, debris floods, mudflows, clear-water floods, and alluvial-fan flooding.

DEVELOPMENT: all critical facilities, subdivisions, single- and multi-family dwellings, commercial and industrial buildings, retaining walls, and public right-of-way improvements, also additions to or intensification of existing buildings, storage facilities, pipelines, and utility conveyances, and other land uses.

ENGINEERING GEOLOGIST: a Utah-licensed geologist, who, through education, training, and experience, is competent in applying geologic data, techniques, and principles, such that geologic conditions and factors affecting engineered works are recognized, adequately interpreted, and clearly presented for use in engineering practice, land use planning, and the protection of the public, safety, and welfare.

The individual must meet the following qualifications:

1. An undergraduate or graduate degree in geology, engineering geology, or geological engineering, or closely related field, from an accredited college or university.
2. Five full years of experience in a responsible position in the field of engineering geology in Utah, or in a state with similar geologic hazards and regulatory environments.

ENGINEERING GEOLOGY: geologic work relevant to engineering and environmental concerns, and public health, safety, welfare, and property. Engineering geology is the application of geological data, principles, and interpretation so geological factors affecting planning, design, construction, and maintenance of engineered works, land use planning, and groundwater resources are adequately recognized and properly interpreted for use in engineering, land-use planning, and related practice.

ESSENTIAL FACILITY: buildings and other structures intended to remain operational in the event of an adverse geologic event, including all structures defined in section 10-7-160 of this chapter.

FAULT: a fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other.

GEOLOGIC HAZARD: a surface-fault rupture, liquefaction, slope instability, landslide, debris flow, and rockfall that may present a risk to life or property.

GEOLOGIC HAZARD STUDY REPORT: a report containing the results of the geologic hazard study including maps, figures, data, and calculations that substantiate all conclusions and recommendations.

GEOLOGIC HAZARD STUDY AREA: a potentially hazardous area as shown on the geologic hazard special study area maps within which geologic hazard investigations are required prior to development.

GEOLOGIC RESTRICTED AREA: 1) an area of a property not included in a site-specific geologic hazard investigation, and 2) where a geologic hazard investigation must be performed before development and/or issuance of building permits for habitable structures.

GEOTECHNICAL ENGINEER: a Utah-licensed civil engineer who, through education, training, and experience, is competent in the field of geotechnical engineering for use in engineering practice, land use planning, and the protection of the public, safety, and welfare.

The individual must meet the following qualifications:

1. A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or an undergraduate degree in civil engineering with twelve (12) semester hours of graduate level education in geotechnical engineering, or course content related to evaluation of geologic hazards, from an accredited college or university.
2. Five (5) full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazard investigations, including slope stability analyses.

GEOTECHNICAL ENGINEERING: the investigation and engineering evaluation of earth materials including soil, rock, and man-made materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.

GEOTECHNICAL ENGINEERING REPORT: reports prepared to provide data on the physical properties of surface and subsurface soil conditions for the development of a property that contain the findings of field investigations, including maps, plans, figures, data, calculations, etc. necessary to substantiate all geotechnical engineering conclusions and recommendations.

LANDSLIDE: the downslope movement of a mass of soil, surficial deposits, or bedrock, including a continuum of processes between landslides, earth-flows, debris flows, debris avalanches, and rockfalls.

LIQUEFACTION: a process by which certain water-saturated soils lose bearing strength because of earthquake-related ground shaking and subsequent increase of groundwater pore pressure.

NON-BUILDABLE AREA: the portion of a site which a geologic hazard study report has concluded may be impacted by geologic hazards and cannot be reasonably mitigated to an acceptable level, and where the siting of structures designed for human occupancy, structures requiring a building permit, or critical facilities is not permitted.

ROCKFALL: a rock or mass of rock, newly detached from a cliff or other steep slope which moves downslope by falling, rolling, toppling, or bouncing; includes rockslides, rockfall avalanches, and talus.

SETBACK: an area subject to risk from a geologic hazard, within which construction of critical facilities and structures designed for human occupancy are not permitted.

SLOPE STABILITY: the resistance of a natural or artificial slope or other inclined surface to failure by landsliding, usually assessed under both static and dynamic (earthquake-induced) conditions.

SLOPE STABILITY ANALYSIS: the analysis of the static and seismic stability of engineered and natural slopes of soil and rock.

STRUCTURE DESIGNED FOR HUMAN OCCUPANCY: any building or structure containing a habitable space, or classified as an assembly, business, educational, factory and industrial, institutional, mercantile, or residential occupancy classification under the adopted International Building Code and/or any residential dwelling or any other structure containing a habitable space used or intended for supporting or sheltering any use or occupancy, which is expected to have an occupancy rate of at least 2000 person-hours per year but does not include an accessory building.

10-7-030: SCOPE:

- A. The regulations contained in this chapter shall apply to all lands in the City.
- B. This chapter shall apply to any geologic hazard investigation for the purpose of determining the feasibility of development or for exploring, evaluating, or establishing locations for permanent improvements.

10-7-040: RESPONSIBILITY FOR GEOLOGIC HAZARDS STUDY INVESTIGATIONS:

Geologic hazards investigations often involve both engineering geology and geotechnical engineering. Geologic hazards investigations shall be performed under the direct supervision of an engineering geologist (see Section 10-7-050). Geotechnical engineering investigations shall be performed under the direct supervision of a geotechnical engineer (see Section 10-7-060).

10-7-050: MINIMUM QUALIFICATIONS OF THE GEOLOGIST:

Engineering geology and the evaluation of geologic hazards is a specialized discipline within

the practice of geology requiring technical expertise and knowledge of techniques not commonly used in other geologic investigations. Therefore, geologic hazards investigations shall only be accepted by the City when conducted and signed and sealed by a Utah-licensed geologist meeting the qualifications of an engineering geologist as defined in Section 10-7-020.

10-7-060: MINIMUM QUALIFICATIONS OF THE GEOTECHNICAL ENGINEER:

Evaluation and mitigation of geologic hazards often require contributions from a geotechnical engineer, particularly in the design of mitigation measures. Geotechnical engineering is a specialized discipline within the practice of civil engineering requiring technical expertise and knowledge of techniques not commonly used in civil engineering investigations. Therefore, geologic hazards investigations requiring contributions from a geotechnical engineer will only be accepted by the City when also signed and sealed by a Utah-licensed civil engineer meeting the qualifications of a geotechnical engineer as defined in Section 10-7-020.

10-7-070: PRELIMINARY ACTIVITIES:

This section shall apply to the investigation of any geologic hazard as defined herein.

- A. Scoping Meeting: The applicant or consultant shall schedule a scoping meeting with the City to evaluate the engineering geologist's and geotechnical engineer's (if applicable) investigative approach. Before scheduling the scoping meeting, the applicant's engineering geologist consultant and geotechnical engineering consultant (if applicable) shall present a written work plan which includes a site plan depicting anticipated geologic hazards and proposed explorations, such as trenches, borings, cone penetration test, proposed cross-section(s) for slope stability analysis as applicable that meet the requirements of the City Geologic Hazards Ordinance, and any other information upon request. All work plans shall include the original or electronic signature and professional seal, both in blue ink, of the qualified professional(s) responsible for the work plan.

The investigation approach should allow for flexibility due to unexpected site conditions. Field findings may require modifications to the work plan. Upon completion of a successful scoping meeting, a land disturbance permit application may be submitted to the City. A work plan approval letter will be issued by the City after acceptance of the consultants' work plan.

- B. Land Disturbance Permit: As required by Title 18 of this code and except as otherwise noted therein, no person shall commence or perform any land disturbance, grading, relocation of earth, or any other land disturbance activity, without first obtaining a land disturbance permit. For geologic hazard investigations, an application for a land

disturbance permit shall be filed with the City Engineer on forms furnished by the City for such purposes only after a scoping meeting has taken place.

- C. Responsible Contact: The applicant shall specify a primary contact responsible for coordination with the City during the land disturbance activity.

10-7-080: GEOLOGIC HAZARDS SPECIAL STUDY AREA MAPS:

- A. Geologic hazards special study area maps are prepared using the best available scientific information but are necessarily generalized and intended only to indicate areas where hazards may exist and where geologic hazards investigations are required. Because the City geologic hazards special study area maps are prepared at a non-site-specific scale, geologic hazards special study area maps may exist that are not shown on the geologic hazards special study area maps. The fact that a site is not in a geologic hazards study area map for a particular hazard does not exempt the applicant from considering the hazard if evidence is found that it may exist. If it is subsequently determined that the site has geologic hazards that are not shown on the geologic hazards special study area maps, the review process will be pursuant to this chapter.
- B. Geologic hazards special study area boundaries shown on the maps will not be systematically adjusted as each individual site-specific study indicates whether an actual hazard exists at a site because geologic hazards-study-area maps are meant only to indicate where scientific evidence indicates a hazard may exist. However, geologic hazards special study area maps may be updated and amended by the City if found to be inaccurate or in error, or as new methods or data are developed to better define areas of potential hazards.
- C. Where geologic hazards special study area maps are thought by an applicant to be inaccurate or in error and require revision, the applicant shall submit to the City technical evidence by a qualified professional supporting the claim and showing the proposed revision. The City will review the information and render a decision. The applicant may appeal the decision using the process outlined in Section 10-7-110(L).

10-7-090: GEOLOGIC HAZARDS STUDY INVESTIGATIONS AND GEOLOGIC HAZARDS STUDY REPORTS:

Except as provided in 10-7-095, any applicant requesting development approval on a parcel or lot of land within a geologic hazards study area or where there are known, or readily apparent geologic hazards and the area is not depicted on the geologic hazards special study area maps, the applicant shall:

1. Perform a geologic hazards investigation, and,

2. Submit one electronic copy and two paper copies of site-specific geologic hazard study report to the City. Only electronic copies of geologic hazard study reports are retained by the City. Paper copies of geologic hazard study reports are only provided for use by the City geologic and geotechnical engineering consultants to facilitate the review process.

For sites outside the slope stability special study areas shown in the City online Geologic Information Application, slope stability analyses shall be completed in accordance with Appendix B of the Geotechnical Engineering Manual when proposed development includes:

1. Cut and/or fill slopes steeper than 2 horizontal (h) to 1 vertical (v); and,
2. Natural slopes steeper than or equal to 3 horizontal (h) to 1 vertical (v).

10-7-095: GEOLOGIC HAZARDS STUDY INVESTIGATIONS AND REPORTS EXEMPTIONS:

- A. Any applicant requesting development on a lot that has been included in a subdivision plat prior to the adoption of this section may apply for a building permit for that lot without submitting a geologic hazards study unless the subdivision plat notes for the lot indicate that inclusion in the plat does not guarantee a right to develop.
- B. Any applicant requesting development on a lot that has been included in a subdivision plat after the adoption of this section does not need to conduct or submit a geologic hazards study within the first five (5) years after the plat has been recorded.
- C. In order to qualify for an exemption under this section, an applicant for a building permit must acknowledge geologic hazards that may apply to the lot in a form provided by the city.

10-7-100: GEOLOGIC HAZARDS STUDY REPORTS:

- A. Each geologic hazards study report shall be site-specific and shall identify all known or suspected potential geologic hazards, originating on-site or off-site, whether previously identified or previously unrecognized, that may affect the subject property.
- B. All geologic hazards study reports shall include the original or electronic signature and professional seal, both in blue ink, of the engineering geologist and geotechnical engineer. Geologic hazards reports co-prepared by professional geologists and geotechnical engineers must include both professionals' original or electronic signatures and professional seals in blue ink.
- C. All final geologic maps, geologic cross-sections, sketches, drawings, plans, etc., prepared by, or under the supervision of, the engineering geologist shall bear the signature and

seal, both in blue ink, of the engineering geologist when submitted to the City.

- D. Geologic hazard study reports for fault activity investigations shall contain all requirements as described in Appendix A, *Minimum Standards for Fault Activity Investigations*, of the Geotechnical Engineering Manual. Fault activity investigations shall be prepared by an engineering geologist.
- E. Geologic hazard study reports for slope stability and landslide investigations shall contain all requirements as described in Appendix B, *Minimum Standards for Slope-Stability Analysis*, of the Geotechnical Engineering Manual. Slope-stability and landslide investigations shall be prepared by an engineering geologist and a geotechnical engineer.
- F. Geologic hazard study reports for liquefaction investigations shall contain all requirements as described in Appendix C, *Minimum Standards for Liquefaction Investigations and Evaluations*, of the Geotechnical Engineering Manual. Liquefaction analyses shall be prepared by a geotechnical engineer.
- G. Geologic hazard study reports for debris-flow investigations shall contain all requirements as described in Appendix D, *Minimum Standards for Debris-Flow Investigations*, of the Geotechnical Engineering Manual. Debris-flow-hazard investigations shall be prepared by an engineering geologist. Mitigation measures will generally require contributions from geotechnical engineers, hydrologists, and/or civil engineers.
- H. Geologic hazard study reports for rockfall investigations shall contain all requirements as described in Appendix E, *Minimum Standards for Rockfall Investigations*, of the Geotechnical Engineering Manual. Rockfall investigations shall be prepared by an engineering geologist. Mitigation measures will generally require contributions from geotechnical and/or civil engineers.
- I. All geologic hazards reports shall include, at a minimum:
 - 1. A discussion of:
 - a) the proposed development.
 - b) geologic hazards present within and adjacent to the proposed development.
 - c) field investigation program.
 - d) laboratory testing program.
 - 2. Conclusions based on adequate and substantiated data regarding the presence or absence of geologic hazards within and adjacent to the proposed development.
 - 3. A vicinity map, with a north arrow and bar scale, depicting major streets, roadways, geographic features, and other pertinent data to locate and orient the site.

4. A site plan at a scale of at least 1 inch = 200 feet (or more detailed), with a north arrow and bar scale, clearly depicting site boundaries, contours labeled at a minimum of 10-foot intervals, proposed buildable area, existing structures, streets, slopes, drainages, subsurface explorations, geophysical traverses, etc., and all other pertinent data.
5. A regional geologic map, with a north arrow and bar scale, contours, and references, depicting the general surface geology (landslides, alluvial fans, etc.), bedrock geology where exposed, bedding attitudes, faults, and other geologic structural features near the site (generally a 1:24,000 scale map is adequate); geologic cross-sections may be included as deemed appropriate to illustrate three-dimensional relations. The map shall include a legend defining all items noted on the map.
6. A site-specific geologic map of the subject area, with a north arrow and bar scale, at a scale equal to or more detailed than 1 inch = 200 feet, depicting the locations of subsurface explorations and site-specific geologic mapping performed as part of the geologic investigation, including boundaries and features related to all geologic hazards, topography, contours labeled at a minimum of 10-foot intervals, and drainage.

The site geologic map must show the location and boundaries of the property, geologic hazards, delineation of any recommended setbacks from hazards, geologic-restricted areas, and recommended locations for structures. Buildable and non-buildable areas must be clearly identified. The map shall include a legend defining all items noted on the map.

All bedding, jointing, and other geologic structures must be shown on the site plan and/or geologic map following the Federal Geographic Data Committee (FGDC) Standard Geologic Map Symbolization.

7. Trench and test pit logs, when applicable, prepared in the field by an engineering geologist, and presented in the geologic hazard study report at a scale equal to or more detailed than 1 inch = 5 feet.
8. Geologic boring logs when applicable, prepared with standard geologic nomenclature.
9. Geologic cross-section(s), when applicable, prepared by an engineering geologist.
10. All final geologic maps, geologic cross-sections, sketches, drawings, plans, etc., shall be prepared by, or under the supervision of, an engineering geologist.
11. Citations of literature and records used in the investigation, referenced aerial photographs interpreted (air-photo source, date and flight number, scale), referenced lidar images interpreted and any other sources of data and information, including water-well logs, personal communications, etc.

12. Conclusions, clearly supported by adequate and substantiated data included in the geologic hazards study report, summarizing the characteristics of the geologic hazards, and addressing the potential effects of the geologic conditions and geologic hazards on the proposed development and occupants thereof, particularly in terms of risk and potential damage.
 13. Specific recommendations for additional or more detailed investigations, as may be required to understand or quantify a geologic hazard.
 14. An evaluation of whether mitigation measures are required, including an evaluation of multiple mitigation options.
 15. Specific recommendations for avoidance or mitigation of the effects of identified hazards, consistent with the purposes set forth in this chapter, including design or performance criteria for engineered mitigation measures, including all supporting calculations, analyses, modeling, or other methods, and assumptions. Final design plans and specifications for engineered mitigation must be signed and sealed in blue ink by a geotechnical, civil and/or structural engineer, as appropriate.
 16. Data upon which recommendations and conclusions are based shall be clearly stated in the geologic hazards study report.
 17. A statement that the proposed development and buildable area depicted on the site plan meet the requirements of the geologic hazards ordinance and the proposed development and buildable area are suitable for development from a geologic and geotechnical engineering perspective.
- J. When a submitted geologic hazard study report does not contain adequate and substantiated data to support the findings in the geologic hazards study report, additional or more detailed investigations shall be required to explain or quantify a particular geologic hazard or to describe how mitigation measures recommended in the geologic hazards study report are appropriate and adequate.

10-7-110: REVIEW OF GEOLOGIC HAZARDS STUDY REPORTS:

- A. Scope: All geologic hazards study reports performed in the City will be reviewed by the City's retained consultants and permanently filed with the City. The City's consultants will evaluate geologic hazards study investigations and geologic hazards study reports for conformance with the City geologic hazards ordinance and applicable City codes and advise the City regarding the conformance of the consultant geologic hazards study investigation and geologic hazards study reports with the City geologic hazards ordinance and applicable City codes.

The City consultants will not approve consultant documents or the supporting data in

consultant documents. The City consultants will recommend the City either consider a consultant submittal complete or incomplete in accordance with applicable City codes and ordinances. The City consultants will not deviate from applicable City codes and ordinances.

The City shall review any proposed land use that requires the preparation of a geologic hazards study report under this chapter to determine the possible risks to the safety of persons, property, and City infrastructure from geologic hazards.

- B. Submittal: Before the consideration of any request for preliminary plat approval or site plan approval, the geologic hazards study report shall be submitted to the City for review.
- C. Time Frame For Review: The City will complete each review in a reasonable time frame, not to exceed 21 working days.
- D. Costs Borne By Applicant: All direct costs associated with the review of geologic hazard investigations shall be paid by the applicant.
- E. Records: The City shall retain an electronic copy of each geologic hazards study report.
- F. Standards: The City shall determine whether geologic hazards study investigations and geologic hazards study reports comply with all the following standards:
 - 1. The City Geologic Hazard Ordinance and applicable City codes.
 - 2. The City Geotechnical Engineering Manual, if the geologic hazard study report contains geotechnical engineering recommendations.
 - 3. The geologic hazards study report has been prepared, signed, and sealed by a Utah-licensed geologist meeting the qualifications of an engineering geologist as defined in Section 10-7-020.
 - 4. The geologic hazards study report has been prepared, signed, and sealed by a Utah-licensed civil engineer meeting the qualifications of a geotechnical engineer as defined in Section 10-7-020, if the geologic hazards study report contains geotechnical engineering recommendations.
 - 5. All final geologic maps, geologic cross-sections, sketches, drawings, plans, etc., prepared by, or under the supervision of the engineering geologist, and shall bear the signature and seal, both in blue ink, of the engineering geologist when submitted to the City.
 - 6. The proposed land use does not present an unreasonable risk to the health, safety, and welfare of persons or property, including buildings, storm drains, public streets, culinary water facilities, utilities, or critical facilities, whether off-site or on-site, or to the aesthetics and natural functions of the landscape, such as slopes, streams or other waterways, drainage, or wildlife habitat, whether off-site or on-site, because of

the presence of geologic hazards or because of modifications to the site due to the proposed land use.

7. Identified geologic hazards can be mitigated to an Acceptable and Reasonable Risk in a manner that will not violate applicable federal, state, or local statutes, ordinances, or regulations. Mitigation measures shall consider, in their design, the intended aesthetic functions of other governing ordinances such as the Sensitive Lands Overlay Zone.
 8. The geologic hazards study report contains a mitigation plan defining how the identified hazards or limitations will be addressed without impacting or adversely affecting off-site areas, if applicable.
 9. Whether mitigation measures are reasonable and practical to implement, especially if such measures require ongoing maintenance by property owners.
- G. When a geologic hazards investigation and geologic hazards study report complies with the City geologic hazards ordinance and applicable City codes, the City reviewers will prepare a report to the City recommending the City consider the geologic hazards investigation and geologic hazards study report complete.
- H. The City reviewers do not approve consultant documents or the supporting data in consultant documents. The City reviewers recommend the City either consider a consultant submittal complete or incomplete in accordance with applicable City codes and ordinances.
- I. Additional Requirements: The City may, at the City's discretion, set other requirements as are necessary to mitigate any geologic hazards and to ensure the purposes of this chapter are met. These requirements may include, but are not limited to:
1. Additional or more detailed investigations to understand or quantify the hazard or determine whether mitigation measures recommended in the geologic hazards study report are adequate.
 2. Field reviews of exploratory excavations.
 3. Specific mitigation requirements; establishing buildable and non-buildable areas; limitations on slope grading and controls on grading, or re-vegetation.
 4. Grading plans, when required, shall be prepared, signed, and sealed in blue ink by a licensed professional engineer. As-built grading plans, when required, shall be signed and sealed in blue ink by the project geotechnical engineer as well as the Utah-licensed civil engineer responsible for the preparation of the grading plans. Grading plans, when required, shall include, at a minimum, the following:
 - a. Maps of existing and proposed contours with the contours labeled at a minimum

- of 10-foot intervals.
- b. Present and proposed slopes for each graded area.
 - c. Existing and proposed drainage patterns.
 - d. Location and depth of all proposed cuts and fills.
 - e. Description of methods to be employed to achieve stabilization and compaction.
 - f. Location and capacities of proposed drainage, structures, and erosion control measures based on maximum runoff for a 100-year storm.
 - g. Location of existing buildings or structures on or within 100 feet of the site, or which may be affected by proposed grading and construction.
 - h. Plan for monitoring and documentation of testing, field inspections during grading, and reporting to the City.
- 5. Installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions, including groundwater levels.
 - 6. Other requirements such as time schedules for completion of the mitigation and phasing of development.
- J. Condition of Approval: The City may also set requirements necessary to protect the public health, safety, welfare, and property of the citizens of the City, protect the City's infrastructure and financial health, and minimize potential adverse effects of geologic hazards to public health, safety, welfare, and property as a condition of approval of any development which requires a geologic hazards study report.
 - K. On-Site Professional: The City may require an engineering geologist and/or geotechnical engineer to be on-site, at the cost of the applicant, during certain phases of construction, particularly during grading phases and the construction of retaining walls. For any real property to which development has proceeded based on a geologic hazards study or a geotechnical engineering report that has been accepted by the City, no final inspection shall be completed, or certificate of occupancy issued, or performance bond released until the geotechnical engineer and/or engineering geologist who signed and approved the geologic hazards study or a geotechnical engineering report certifies, in writing, the completed improvements and structures conform to the descriptions and requirements contained in said geologic hazards study or a geotechnical engineering report.
 - L. Appeal: An applicant may appeal any decision made under the provisions of this chapter only after the City has issued a written review of a geologic hazards study report. The applicant shall set forth the specific grounds or issues upon which the appeal is based. The appeal shall be submitted in writing to the Community Development Director within 30 days of the issuance of the City's written review or other decision.

The City shall assemble a professional panel of three engineering geologists and/or geotechnical engineers, qualified as defined in this ordinance, to serve as the appeal authority for any technical dispute. The appeal panel shall consist of an engineering geologist and/or geotechnical engineer (if applicable) designated by the City, an engineering geologist and/or geotechnical engineer (if applicable) designated by the applicant, and an engineering geologist and/or geotechnical engineer (if applicable) designated by the City's and the applicant's designated engineering geologists and/or geotechnical engineers (if applicable). If the City's and the applicant's designated engineering geologists and/or geotechnical engineers cannot reach a consensus on the third engineering geologist and/or geotechnical engineer within thirty days, the City shall select the third engineering geologist and/or geotechnical engineer.

The costs of the appeal process shall be paid by the applicant. Decisions of the appeal panel will be binding and based on the majority decision of the appeal panel. Before commencement of appeal panel activities, the City will issue a scope of work outlining the specific purpose and goals of the appeal panel.

10-7-120: DISCLOSURE WHEN A GEOLOGIC HAZARDS STUDY REPORT IS REQUIRED:

- A. Form of Disclosure: Whenever a geologic hazards study report is required under this chapter, the owner of the parcel shall record a notice running with the land in a form satisfactory to the City before the approval of any development or subdivision of such parcel. Disclosure shall include signing a Disclosure and Acknowledgment Form provided by the City, which includes:
1. Notice the parcel is located within a City geologic hazard special study area as shown on the geologic hazards special study area maps or as otherwise defined in this chapter.
 2. Notice a geologic hazards study report was prepared and is available for public review in the City's files.
- B. Additional Notification on Plat: Where geologic hazards and related setbacks are delineated in a subdivision, the applicant shall also place additional notification on the plat stating the above information, prior to final approval of the plat.

10-7-130: WARNING AND DISCLAIMER:

The geologic hazards special study area maps, which may be viewed at the City online map portal via the geologic information application, represent only those potentially hazardous areas known to the City and should not be construed to include all possible potential hazard areas. The City geologic hazards ordinance and the geologic hazards special study area maps

may be amended as new information becomes available. The provisions of this chapter do not in any way assure or imply areas outside the geologic hazards special study area maps boundaries are free from the possible adverse effects of geologic hazards. This chapter shall not create any liability on the part of the City, any City officer, City consultants, or City employee thereof for any damages from geologic hazards that result from reliance on this chapter, or any administrative requirement or decision lawfully made hereunder.

10-7-140: CHANGE OF USE:

No change in use that results in the conversion of a building or structure from one not used for human occupancy to one that is so used shall be permitted unless the building or structure complies with the provisions of this chapter.

10-7-150: CONFLICTING REGULATIONS:

In cases of conflict between the provisions of existing zoning classifications, building code, subdivision ordinance, or any other ordinance of the City and the geologic hazards ordinance codified in this chapter, the most restrictive provision shall apply.

10-7-160: CRITICAL FACILITIES AND RISK CATEGORIES III AND IV STRUCTURES:

Critical Facilities means essential, hazardous, special occupancy facilities, and Risk Categories III and IV as defined in the currently adopted International Building Code, and lifelines such as major utility, transportation, and communication facilities and their connections to critical facilities.

In the event of failure, the following buildings and structures represent a substantial hazard to human life:

1. Those where more than 300 people congregate in one area.
2. Elementary schools, secondary schools, or daycare facilities with an occupancy greater than 250.
3. Colleges or adult education facilities with an occupancy greater than 500.
4. Health-care facilities with an occupancy greater than 50 or more resident patients but not having surgery or emergency treatment facilities.
5. Jails and detention facilities.
6. Any structure with an occupancy greater than 1,000.

7. [Power-generating stations, water treatment or storage for potable water, wastewater treatment facilities, and other public utility facilities.](#)
8. [Those facilities containing toxic or explosive substances that would be dangerous to the public if released.](#)

[The following buildings and structures are designated as essential facilities, including but not limited to:](#)

1. [Hospitals and other care facilities having surgery or emergency treatment facilities.](#)
2. [Fire, rescue, and police stations and emergency vehicle garages and fueling facilities.](#)
3. [Designated emergency shelters.](#)
4. [Designated emergency preparedness, communications, operation centers, and other facilities required for emergency response.](#)
5. [Power-generating stations and other public utility facilities required as emergency backup facilities for facilities and structures.](#)
6. [Structures containing highly toxic materials as defined by the most recently adopted version of the International Building Code.](#)
7. [Aviation control towers, air traffic centers, and emergency aircraft hangars.](#)
8. [Buildings and other structures having critical national defense functions.](#)
9. [Water treatment and storage facilities which are required to maintain water pressure for fire suppression.](#)

...

TITLE 17 LAND DEVELOPMENT

...

17-4-030: FINAL PLAT; PREPARATION AND REQUIRED INFORMATION:

...

[S. The final plat shall show geologic-restricted areas as defined in Section 10-7-20 of this code.](#)

...

TITLE 18
LAND DISTURBANCE

...

18-2-010: LAND DISTURBANCE PERMIT REQUIRED:

...

B. Manufacturing, Commercial, Or Institutional Properties:

1. Except for preliminary geological and geotechnical activities as described in ~~section 9-19-070~~ [Section 10-7-070](#) of this code, no land disturbance permit shall be issued for any site or project in a manufacturing, commercial or institutional zone within the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application.](#) ~~of the Draper City geologic hazards ordinance plate A-3 zone~~ or sensitive lands overlay until and unless a final site plan or subdivision plat has been approved and recorded for the site or project.
2. Land disturbance permit applications to improve, construct, disturb or otherwise modify land in manufacturing, commercial or institutional zones not subject to either the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application.](#) ~~of the Draper City geologic hazards ordinance plate A-3~~ or a sensitive lands overlay zoning, where the modifications do not require site plan or subdivision plat approval, as determined by the zoning administrator and city engineer, and where the cuts and fills do not exceed thirteen feet (13'), shall be reviewed and processed in accordance with the provisions of this title by the city engineer.

C. Residential And Agricultural Properties:

1. Except for preliminary geological and geotechnical activities described in ~~section 9-19-070~~ [Section 10-7-070](#) of this code, or for city engineer approved placement of excavated material generated by other city approved applications, no land disturbance permit shall be issued for any site or project in a residential or agricultural zone within the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application.](#) ~~of the Draper City geologic hazards ordinance plate A-3 zone~~ until and unless a final site plan or subdivision plat has been approved and recorded for the site or project.
2. Land disturbance permit applications to improve, construct, disturb or otherwise modify land in residential and agricultural zones not subject to the slope stability study area, [as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application](#) ~~of the Draper City geologic hazards ordinance plate A-3~~, a sensitive lands overlay zoning, and where the modifications do not require site plan or subdivision plat approval, as determined by the zoning

administrator and city engineer, shall be reviewed and processed in accordance with the provisions of this title by the city engineer. In this particular circumstance, applicants may not submit a subdivision plat or site plan application for at least three (3) months from the date of approval of the land disturbance permit.

3. Land disturbance permit applications to improve, construct, disturb or otherwise modify land in residential and agricultural zones subject to the slope stability study area, as shown on the Geologic Hazards Study Area Map, which may be viewed at the City online map portal via the geologic information application, ~~of the Draper City geologic hazards ordinance plate A-3~~ where the modifications do not require site plan or subdivision plat approval, as determined by the zoning administrator and city engineer, shall be denied unless the disturbance is associated with the completion of a condition of subdivision plat approval previously rendered by the Draper City council. In this particular circumstance, applications shall satisfy all provisions of this code.

...

MEMO



To: City Council
From: Todd Taylor
Date: 2025-12-16
Re: Approve Resolution #25-74

Comments:

Draper City adopted text amendments to the Draper City Municipal Code regarding the Geologic Hazards Ordinance. Within the ordinance, Section 10-7-015 calls for the City Manager to establish certain standards and specifications that shall be applicable to the Geologic Hazards Ordinance. With the help of qualified professional reviewers, the City has included such standards and specifications in the Geotechnical Engineering Standards document, which will be kept on file with the Building Division for public inspection and review. The purpose of this resolution is to adopt these standards.

ATTACHMENTS:

[Resolution No. 25-74.pdf](#)

RESOLUTION NO. 25-74

A RESOLUTION OF THE DRAPER CITY COUNCIL ADOPTING THE GEOTECHNICAL ENGINEERING STANDARDS FOR DRAPER CITY.

WHEREAS, the City Council recognizes that it is essential that geological investigations be conducted within areas of geologic hazards; and

WHEREAS, the City Council has contracted with qualified professional reviewers to evaluate the risk to public health, safety, and welfare of certain proposed development projects within areas of geologic hazards; and

WHEREAS, the City Council desires a mechanism to ensure a consistent scope and quality of geotechnical and geohazard studies; and

WHEREAS, the quality of the geotechnical and geohazard studies is essential for an appropriate investigation and mitigation of hazards; and

WHEREAS, the City Council had updated the Geologic Hazards Ordinance which calls for the City Manager to establish a Geotechnical Engineering Standards document.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Adoption. The City Council hereby adopts the Geotechnical Engineering Standards as shown in Exhibit A attached hereto and incorporated herein by reference.

Section 2. Correction of Editing Errors. The city attorney is authorized to correct any punctuation, spelling, formatting, clerical, or de minimis errors in Exhibit A.

Section 3. Effective Date. This Resolution shall become effective immediately upon its passage.

IT IS FURHTER RESOLVED, that the City Manager is hereby authorized to make modifications or additions to said Geotechnical Engineering Standards as advised by the City's qualified professional reviewers.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE 16th DAY OF DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Draper City
Geotechnical Engineering Standards

December 16, 2025

Draper City
Geotechnical Engineering Standards

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	DEFINITIONS	2
3.0	MINIMUM QUALIFICATIONS	6
4.0	GENERAL.....	6
5.0	SCOPING MEETING.....	7
6.0	LAND DISTURBANCE PERMIT.....	7
7.0	SUBSURFACE EXPLORATION.....	7
8.0	LABORATORY TESTING.....	9
9.0	GEOTECHNICAL ENGINEERING STUDY REPORTS REQUIRED.....	10
10.0	GEOTECHNICAL ENGINEERING STUDY REPORTS	10
11.0	AMENDED AND UPDATED GEOTECHNICAL ENGINEERING STUDY REPORTS	13
12.0	DRAPER CITY REVIEW	14
13.0	CHANGE OF CONSULTANT LETTER.....	15
14.0	REFERENCES.....	16

APPENDIX A: Minimum Standards for Fault Activity Investigations

APPENDIX B: Minimum Standards for Slope Stability Analyses

APPENDIX C: Minimum Standards for Liquefaction Investigations

APPENDIX D: Minimum Standards for Debris Flow Investigations

APPENDIX E: Minimum Standards for Rockfall Hazard Investigations

1.0 INTRODUCTION

These Standards present the requirements for geotechnical engineering reports performed in Draper City (the City). Civil engineering projects requiring geotechnical engineering studies (or a “soils report”) are stipulated in Titles 9, 10, 11, 17, and 18 of the Draper City Municipal Code. When a geotechnical engineering report is required, the geotechnical engineering report shall be submitted to the City Building Division.

The applicant and their consultants shall present the results of geotechnical engineering studies in compliance with these Standards. The standards outlined herein constitute the minimum level of effort required in conducting geotechnical engineering studies in the City.

Considering the complexity inherent in evaluating geotechnical engineering parameters at a property, additional effort beyond the minimum standards presented herein may be required at some sites. The information presented herein does not relieve consultants of their responsibility to perform additional geotechnical engineering analyses they believe are necessary to assess the geotechnical engineering parameters at a site. It is not the intent of these Standards to supplant the judgment of the geotechnical engineer. In addition, these Standards shall not supersede other more stringent requirements that may be required by other regulatory agencies or the City.

Non-compliance with these Standards may lengthen the geotechnical engineering review process and delay project approval. The purpose of establishing minimum standards for performing geotechnical engineering studies and preparing geotechnical engineering study reports is to:

1. Provide consulting geotechnical engineers with a common basis for preparing proposals, conducting studies, and preparing geotechnical engineering reports, including conclusions and recommendations.
2. Provide an objective framework for the City review of geotechnical engineering study reports.

The City policies, standards, and municipal codes are subject to periodic revision and the most current versions may not be represented in this document. Consequently, these Standards may be periodically updated. The City Building Division may notify consultants of substantive changes via direct mail, or publication in local society newsletters (e.g., American Society of Civil Engineers, Earthquake Engineering Research Institute). If questions arise, it is recommended geotechnical engineering consultants contact the City directly for clarification.

2.0 DEFINITIONS

As used in these Standards:

Acceptable and reasonable risk means no loss of life or significant injury to occupants, no release of hazardous or toxic substances, and structural damage following an earthquake, rockfall, debris flow, or other natural hazard that retains a margin against the onset of partial or total collapse.

Active Fault means a fault displaying evidence of displacement along one or more of its traces during the past 4,000 radiocarbon years before present or 4,500 calibrated calendar years before present (about three times the closed mean recurrence interval between surface faulting earthquakes along the Salt Lake City and Provo segments of the Wasatch fault zone).

For any other Draper City faults not associated with the WFZ, Active Fault means a fault displaying evidence of displacement along one or more of its traces during the Holocene epoch of geologic time (past 10,000 radiocarbon years before present or about 11,700 calibrated calendar years before present).

Bedrock means solid, consolidated, and indurated rock underlying soil and/or other unconsolidated and/or alluvial materials (modified after AGI, 2011).

Buildable area means:

1. The part of a site that may be developed after required setbacks have been deducted and open space requirements of Title 9 of the Draper City Municipal Code have been met, and;
2. If applicable, based on an accepted geologic hazards report, the part of a site not impacted by geologic hazards, or the part of a site where the identified geologic hazards can be mitigated to an acceptable risk.

City means the City Council, Mayor, City Manager, Public Works Director, City Engineer, Community Development Director, Planning Manager, Building Official, or other City employee.

City Council means the city council of Draper City.

Critical facilities mean essential, hazardous, special occupancy facilities, and Risk Categories III and IV as defined in the currently adopted International Building Code, and lifelines such as major utility, transportation, and communication facilities and their connections to critical facilities.

Critical Failure Surface means the surface in a slope stability analyses with a factor of safety greater than or equal to 1.5 under static conditions and greater than or equal to 1.0 under seismic conditions.

Development means all critical facilities, subdivisions, single- and multi-family dwellings, commercial and industrial buildings, retaining walls, and public right-of-way improvements, also additions to or intensification of existing buildings, storage facilities, pipelines, and utility conveyances, and other land uses.

Engineering geologist means a Utah-licensed geologist, who, through education, training, and experience, is competent in applying geologic data, techniques, and principles, such that geologic conditions and factors affecting engineered works are recognized, adequately interpreted, and clearly presented for use in engineering practice, land-use planning, and the protection of the public, safety, and welfare.

The individual must meet the following qualifications:

1. An undergraduate or graduate degree in geology, engineering geology, or geological engineering, or closely related field, from an accredited college or university;
2. Five full years of experience in a responsible position in the field of engineering geology in Utah, or in a state with similar geologic hazards and regulatory environments.

Engineering geology means geologic work relevant to engineering and environmental concerns, and public health, safety, welfare, and property. Engineering geology is the application of geological data, principles, and interpretation so geological factors affecting planning, design, construction, and maintenance of engineered works, land use planning, and groundwater resources are adequately recognized and properly interpreted for use in engineering, land-use planning, and related practice.

Essential facility means buildings and other structures intended to remain operational in the event of an adverse geologic event, including all structures defined in Section 10-7-160 of the City geologic hazards ordinance.

Fault means a fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other.

Fault plane means the plane that represents the rupture surface of a fault.

Fault setback means an area on either side of a fault within which structures for human occupancy or critical facilities or their structural supports are not permitted.

Fault scarp means a steep slope or cliff formed by movement along a fault.

Fault trace means the intersection of a fault plane with the ground surface, often present as a fault scarp, or detected as a lineament on aerial photographs or other imagery such as lidar.

Fault zone means a corridor of variable width along one or more fault traces, within which deformation has occurred.

Geologic hazard means a surface fault rupture, liquefaction, slope stability, landslide, debris flow, and rockfall that may present a risk to life or property.

Geologic hazards study report means a report containing the results of the geologic hazards study including maps, figures, data, and calculations that substantiate all conclusions and recommendations.

Geotechnical engineer means a Utah-licensed civil engineer who, through education, training, and experience, is competent in the field of geotechnical engineering for use in engineering practice, land use planning, and the protection of the public, safety, and welfare.

The individual must meet the following qualifications:

1. A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or an undergraduate degree in civil engineering with twelve (12) semester hours of graduate level education in geotechnical engineering, or course content related to evaluation of geologic hazards, from an accredited college or university.
2. Five (5) full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazards studies, including slope stability analyses.

Geotechnical engineering means the study and engineering evaluation of earth materials including soil, rock, and man-made materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.

Geotechnical engineering report means reports prepared to provide data on the physical properties of surface and subsurface soil conditions for the development of a property that contain the findings of field studies, including maps, plans, figures, data, calculations, etc. necessary to substantiate all geotechnical engineering conclusions and recommendations.

Governing body means the city council or a designee of the city council.

Holocene epoch means the period of time between about 10,000 radiocarbon years before present (or about 11,700 calibrated calendar years before the present).

Landslide means the downslope movement of a mass of soil, surficial deposits, or bedrock, including a continuum of processes between landslides, earth-flows, debris flows, debris avalanches, and rockfalls.

Liquefaction means a process by which certain water-saturated soils lose bearing strength because of earthquake-related ground shaking and subsequent increase of groundwater pore pressure.

Life safety means the damage state following a natural hazard (i.e., earthquake, flood, rockfall, debris flow, etc.), in which a structure has damaged components but retains a margin against the onset of partial or total collapse (to preserve the lives of the occupants). The goal of designing for life safety is to only protect public health and safety.

Public infrastructure means wastewater sewer collection systems, drinking water systems, storm-water drainage systems, utility extensions, telecommunications lines, streets, roads, and bridges, etc., owned and operated by municipalities and governments; includes any infrastructure within public rights-of-way.

Responsible charge, Geologist means the independent control and direction by use of initiative, skill, and independent judgment of geological work or the supervision of the work.

Responsible charge, geotechnical engineer means the independent control and direction by use of initiative, skill, and independent judgment of geotechnical engineering work or the supervision of the work.

Rockfall means a rock or mass of rock, newly detached from a cliff or other steep slope which moves downslope by falling, rolling, toppling, or bouncing; includes rockslides, rockfall avalanches, and talus.

Setback means an area subject to risk from a geologic hazard, within construction of critical facilities and structures designed for human occupancy are not permitted.

Slope stability means the resistance of a natural or artificial slope or other inclined surfaces to failure by landsliding, usually assessed under both static and dynamic (earthquake-induced) conditions.

Slope stability analysis means the analysis of the static and seismic stability of engineered and natural slopes of soil and rock.

Structure designed for human occupancy means any building or structure containing a habitable space, or classified as an assembly, business, educational, factory and industrial, institutional, mercantile, or residential occupancy classification under the adopted International Building Code and/or any residential dwelling or any other structure containing a habitable space used or intended for supporting or sheltering any use or occupancy, which is expected to have an occupancy rate of at least 2000 person-hours per year but does not include an accessory building.

Surface faulting means the fault-related displacement of the ground surface that occurs during an earthquake.

3.0 MINIMUM QUALIFICATIONS

Slope stability analyses must be performed by qualified engineering geologists and geotechnical engineers as defined in Section 2.0 of these Standards, and Sections 10-7-050, *Minimum Qualifications of the Geologist*, and 10-7-060, *Minimum Qualifications of the Geotechnical Engineer*, in the City geologic hazards ordinance.

4.0 GENERAL

All geotechnical engineering studies must consider the need for geological information. If geological data is required, the geotechnical engineering study work plan shall include a

geologic component to supplement the geotechnical engineering study. Geology shall be performed by a geologist who meets the minimum qualifications stipulated in Section 2.0 of these Standards, and Section 10-7-050 of the City geologic hazards ordinance.

For projects in the City Geologic Hazard Special Study Areas (see the City geologic hazards ordinance), the geotechnical engineering report shall comply with the City geologic-hazards ordinance. Geotechnical engineering reports must include supporting data for all recommendations and conclusions (i.e., laboratory test data, boring/test pit logs, engineering calculations, etc.).

5.0 SCOPING MEETING

Scoping meetings are only required for projects in the City Geologic Hazards Special Study Areas (see Section 10-7-070(A) of the City geologic hazards ordinance). For all other geotechnical engineering studies, a scoping meeting may be scheduled at the request of the applicant or, if deemed appropriate, by the City. The purpose of scoping meetings is to review the geotechnical engineer's investigative approach before the commencement of the geotechnical engineering study.

6.0 LAND DISTURBANCE PERMIT

Geotechnical engineering studies within geologic hazard special study areas require a land disturbance permit before the commencement of any subsurface exploration. As required by Title 18 of the current edition of the Draper City Municipal Code and except as otherwise noted therein, in City Geologic Hazards Special Study Areas, no person shall commence or perform any land disturbance, grading, relocation of earth, or any other land disturbance activity, without first obtaining a land disturbance permit.

7.0 SUBSURFACE EXPLORATION

All subsurface exploration programs must first consider the need for geological information. If geological subsurface data is required, the subsurface exploration program must be coordinated with a geologist who meets the minimum qualifications stipulated in Section 2.0 of these Standards, and Section 10-7-050 of the City geologic hazards ordinance. Both the geologist and geotechnical engineer must agree as to the extent of the program.

If geological information is not required, the geotechnical engineer must determine the exploration required to determine the site will be suitable for development from a geotechnical engineering perspective, consistent with concerns for public health, safety, and welfare; the requirements of the City Geotechnical Engineering Standards, and; the

provisions of the current edition of the Draper City Municipal Code and City geologic hazards ordinance.

The number of exploratory borings, test pits, trenches, Cone Penetration Tests, etc., shall be based on obtaining representative subsurface data consistent with the geotechnical engineering requirements of the project, the type of structures, the topography, and the geology. At a minimum:

1. One exploration per 3,000 square feet of building area for single-lot residential dwelling projects.
2. One exploration per acre of buildable area for single-family residential subdivision projects.
3. One exploration per 5,000 square feet of building area for multi-family residential projects.
4. Two explorations beneath small commercial structure projects (up to 6,000 square feet of building area).
5. One exploration per 6,000 square feet of building area for large commercial projects, greater than 6,000 square feet of building area.

The depth of the study shall extend at least to the depth of the zone of influence below footings from structural loads or refusal on bedrock.

Sampling intervals shall be at vertical intervals of no greater than 3 feet within 15 feet of the ground surface. Below a depth of 15 feet, sampling shall be performed at vertical intervals of no more than 5 feet or at significant stratigraphic changes, whichever results in more sampling.

Subsurface conditions observed in the subsurface explorations must be carefully documented ("logged") at the time of exploration by the geotechnical engineer or geologist or by field personnel under the direct supervision of the geotechnical engineer or geologist. A description of the field exploration program and the logs of the subsurface explorations must be included with the project geotechnical engineering study report.

Relatively undisturbed and bulk samples of representative subsurface materials shall be obtained from the subsurface explorations for laboratory testing and visual classification.

When encountered in subsurface explorations, depth to groundwater shall be measured on the day of the study and at least 5 days after completion of the subsurface study.

8.0 LABORATORY TESTING

Geotechnical engineering studies shall include sufficient in-situ and/or laboratory testing data to characterize the geotechnical engineering parameters of subsurface material(s) and to substantiate calculations from which conclusions and recommendations are derived. An adequate number of soil index tests (e.g., grain size, Atterberg Limits, dry density, and moisture content) shall be performed to characterize the physical parameters of the subsurface material.

Consolidation tests shall be completed to evaluate soil compressibility, expansion, and collapse potential in cohesive soils.

Evaluation of hydro-consolidation must extend to depths below the zone of influence from the stress of the footings or fill, and tests shall be performed at pressures typical of the magnitude to be encountered under design conditions. Sample disturbance will not be accepted as a reason to dismiss data showing significant hydro-consolidation potential without supporting data.

Unconfined compression, triaxial shear, direct shear, vane shear testing shall be completed for the analysis of allowable bearing capacity and lateral loading recommendations. Chemical tests to provide a preliminary evaluation of the chemical properties of soils having a deleterious effect on building materials will be contingent on the geotechnical engineer and the geotechnical engineering requirements of the project. These tests include, but are not limited to pH, chloride and sulfate content, and resistivity.

Tests to determine the California Bearing Ratio (CBR) value of subgrade materials:

1. Must be performed when providing pavements sections for public roads or roads to be dedicated to the City. A CBR test shall be completed on each soil type that will be used for roadway support.
2. Is not required for private streets or driveways.

Classification testing shall accompany consolidation tests, shear tests (direct/triaxial) and CBR tests.

9.0 GEOTECHNICAL ENGINEERING STUDY REPORTS REQUIRED

The applicant shall submit one electronic copy and two paper copies of the geotechnical engineering study report to the City. Only electronic copies of geotechnical engineering study reports are retained by the City. Hard copies of geotechnical engineering study reports are only provided for use by the City geotechnical engineering consultant to facilitate the review process.

All geotechnical engineering study reports shall include the original or electronic signature and professional seal of the Utah-licensed civil engineer meeting the qualifications of a geotechnical engineer as defined herein, and who is responsible for the preparation of the report. When applicable, the report shall also contain the original or electronic signature and professional seal of the Utah-licensed geologist meeting the qualifications of an engineering geologist as defined herein, and who is responsible for co-preparation of the geotechnical engineering study report.

10.0 GEOTECHNICAL ENGINEERING STUDY REPORTS

All geotechnical engineering study reports shall include, but not necessarily be limited to the following items (as applicable):

1. A title page indicating the name and location of the project and who the report was prepared for.
2. The purpose of the geotechnical engineering study.
3. A discussion of the proposed development, including the type and size of structures and proposed grading.
4. A vicinity map, with a north arrow and bar scale, depicting major streets, roadways, geographic features, and other pertinent data to locate and orient the site.
5. A description of the site, including at a minimum, location, size, topography, drainage, geologic hazards, adjacent properties, existing and adjacent structures, subterranean structures, and on-site and adjacent slopes that may affect the proposed development.
6. A site plan at a scale of at least 1 inch = 200 feet (or more detailed), with a north arrow and bar scale, depicting:

- a. Site boundaries.
 - b. Proposed buildable area(s).
 - c. Existing and adjacent structures.
 - d. On-site and adjacent slopes.
 - e. Topography/contours labeled at a minimum of 10-foot intervals.
 - f. Subsurface explorations.
 - g. Other data pertinent to depict site condition/development.
7. A regional geologic map at a scale of about 1 inch = 2,400 feet with a north arrow, bar scale, contours, and the site labeled.
8. A discussion of the field exploration program, which shall include, at a minimum:
 - a. Methods of subsurface exploration.
 - b. Methods and type of sampling.
 - c. Exploration logs.
 - d. Date(s) of exploration.
 - e. The materials documented during the subsurface exploration.
 - f. Depth below existing ground surface to groundwater.
9. A discussion of the geotechnical engineering study laboratory testing program, referencing applicable American Standard of Testing Materials (ASTM) or American Association of State Highway and Transportation Officials (AASHTO) procedures.
10. Numerical and graphical results of the following laboratory tests (as applicable):
 - a. In-situ dry density.
 - b. In-situ moisture content.
 - c. Atterberg Limits.
 - d. Grain size analysis (sieve and hydrometer).
 - e. Unconfined Compression Tests. Dry density, moisture content, percent saturation, and Atterberg limits shall be reported with the unconfined compression test result of each sample.
 - f. Consolidation tests with the following shown: Pre-consolidation Pressure (P_c), Initial Effective Overburden Pressure (P_o), Compression Index (C_c), and Swell or Rebound Index (C_r). Index testing shall be performed on consolidation test samples.
 - g. Direct shear tests with plots of normal stress versus shear resistance (failure envelope) and shear resistance versus displacement. If the shear test samples are soaked before testing and the rate of shear displacement exceeds 0.005

inches per minute, the Consultant shall provide data to demonstrate the rate of shear displacement was sufficient for drained conditions. Index testing shall be performed on shear test samples.

- h. Triaxial shear tests with plots of normal stress versus shear resistance (failure envelope) and shear resistance versus axial strain. Index testing shall be performed on shear test samples.
 - i. Proctor tests showing maximum dry density, optimum moisture content, gradation, Atterberg limits, and rock correction, as applicable.
 - j. California Bearing Ration (CBR) tests with gradation and Atterberg limits as applicable.
11. A discussion of the effect of groundwater on the project including:
- a. Depth to groundwater table from existing grade, if encountered, at the time of drilling and at least 5 days after drilling.
 - b. Historical high groundwater elevation.
12. Recommendations for footing design (allowable bearing capacity). Calculations used in the engineering analyses shall be provided in an appendix. Variables used in the calculations shall be substantiated.
13. Anticipated total and differential settlement beneath structures and public utilities. Analysis of secondary consolidation shall be provided for normally consolidated clays and when proposed loading exceeds existing overburden pressures.
14. Mitigation recommendations for settlement of buildings and public utilities constructed over fill areas.
15. Foundation setbacks from top and bottom of slopes if less than minimum building code requirements.
16. Depth of removal of soils not acceptable for support of proposed structure(s). The aerial limits of removal of soils not acceptable for support of proposed structure(s) shall be depicted on a site plan. Soils not acceptable for support of proposed structure(s) must be defined.
17. A recommendation whether perimeter foundation drains will be required, based on site-specific subsurface conditions.

18. Site class for seismic analysis, Site Modified Peak Ground Acceleration (PGA_M), spectral response acceleration parameter at a short period of 0.2 seconds, (S_{DS}), and spectral response acceleration parameter at 1.0 seconds, (S_{D1}), shall be clearly stated in the report. Values shall be based on the current American Society of Civil Engineers (ASCE)-7 (presently ASCE, 2016) for structural design. For commercial sites requiring a site-specific ground-motion-hazard analysis, the geotechnical engineer shall contact the structural engineer to verify whether a site-specific ground-motion-hazard analysis is required. If required, the site-specific ground-motion-hazard analysis shall be completed in accordance with the current ASCE 7 (ASCE, 2016).
19. Output files for seismic analyses shall be included in an appendix.
20. Site earthwork recommendations with testing frequencies.
21. Retaining wall design recommendations (if applicable), with shear strength and/or equivalent fluid weight recommendations based on a laboratory shear test with test.
22. Input and output files, calculations sheets, and associated laboratory test results for slope stability and/or liquefaction analyses (as applicable), provided in an appendix.
23. Pavement design and pavement construction recommendations for public streets. Pavement recommendations shall reference the City minimum pavement thickness standards based on street classification and the California Bearing Ration (CBR) test for the site.
24. Citations of literature and records used in the study, referenced aerial photographs, lidar images, and any other sources of data and information, including water-well logs, personal communications, etc.
25. A statement the site is suitable for the proposed development from a geotechnical engineering perspective, consistent with concerns for public health, safety, and welfare; the requirements of the City Geotechnical Engineering Standards, and; the provisions of the current edition of the Draper City Municipal Code.

11.0 AMENDED AND UPDATED GEOTECHNICAL ENGINEERING STUDY REPORTS

Update geotechnical engineering study reports may be required from applicants when:

1. The scope of the project changes after the initial geotechnical engineering study report was submitted to the City.

2. Geotechnical reports shall be valid and applicable in the City for two years. After two years, the applicant shall submit a letter from the geotechnical engineer stating:
 - a. the scope of the project as stated in the initial geotechnical engineering report has remained unchanged.
 - b. the professional registration of the consultant has not expired.
 - c. site conditions have not changed.
 - d. the report meets the requirements of the City Geotechnical Engineering Standards and the provisions of the current edition of the Draper City Municipal Code.
3. Site conditions change.

If an updated geotechnical engineering study report is required, the report must include at a minimum:

1. The purpose of the updated report.
2. A description of the proposed development.
3. A site reconnaissance by the geotechnical engineer of record for the project.
4. A statement addressing whether the recommendations of the prior report(s) remain valid and applicable.
5. Revised recommendations, as appropriate.

12.0 DRAPER CITY REVIEW

All geotechnical engineering study and geologic hazards study reports performed in the City will be reviewed by the City's retained consultants and permanently filed with the City. The City's retained geotechnical engineering and geologic consultants will evaluate geotechnical engineering reports for conformance with the City Geotechnical Engineering Standards and advise the City regarding the conformance of geotechnical engineering study or geologic hazards study reports with the City Geotechnical Engineering Standards. These minimum standards thus serve as the basis for the review of geotechnical engineering study and/or geologic hazards study reports.

When geotechnical engineering study and geologic hazards study reports comply with the City Geotechnical Engineering Standards, the City geotechnical engineering and geologic reviewers will prepare a report to the City recommending the City consider the geotechnical engineering study and geologic hazards report complete from a geotechnical engineering or geologic perspective.

When geotechnical engineering study and geologic hazards study reports do not comply with the City Geotechnical Engineering Standards, the City geotechnical engineer and geologic consultant will prepare a report to the City recommending the City consider the geotechnical engineering study and geologic hazards study report incomplete. The reviewer's report(s) shall list where the consultant's geotechnical engineering study and geologic hazards reports are not in compliance with the City's Geotechnical Engineering Standards.

13.0 CHANGE OF CONSULTANT LETTER

Written notification will be required if a change in geotechnical engineering or engineering geologist consultants occurs after the review process has been initiated or ownership of the property has changed. The letter must state that the new geotechnical engineering and/or engineering geologist consultant has reviewed the work performed by the previous geotechnical engineering and/or engineering geologist consultant, concurs with the recommendations and conclusions of the previous geotechnical engineering consultant, and agrees to assume responsibility as geotechnical engineering and/or engineering geologist consultant of record from "this point forward."

If the new geotechnical engineering and/or engineering geologist consultant does not concur with the previous geotechnical engineering and/or engineering geologist consultant's conclusions and recommendations or does not agree to assume responsibility as geotechnical engineering and/or engineering geologist consultants of record from "this point forward," the new geotechnical engineering and/or engineering geologist consultant shall perform the necessary supplemental geotechnical engineering and/or geologic studies, in accordance with these Standards, necessary to assume responsibility as geotechnical engineering and/or engineering geologist consultants of record from "this point forward."

The applicant shall submit one electronic copy and one paper copy of the Change of Consultant letter, with the original or electronic signature and professional seal of the Utah-licensed civil engineer meeting the qualifications of a geotechnical engineer, as defined herein, and who will assume responsibility as geotechnical engineering consultants of record from "this point forward" and/or Utah-licensed geologist meeting the qualifications of an

engineering geologist as defined herein and who will assume responsibility as engineering geologist of record “from this point forward.

No new permits shall be issued for a project, and all previously permitted work shall stop until the City is officially notified of the name, address, and telephone number of the new project geotechnical engineer and/or engineering geologist (as applicable), or as otherwise approved by the City Building Official.

14.0 REFERENCES

- AGI, 2011, American Geological Institute, Glossary of Geology, Fifth Edition, revised, Neuendorf, K.K.E, Mehl, Jr., J.P., and, Jackson, J.A., editors: American Geological Institute, Alexandria, Virginia, 783 p.
- ASCE, 2016, ASCE 7-16, American Society of Civil Engineers Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 800 p, 2 vols.
<https://www.asce.org/publications-and-news/asce-7>
- Anderson, L.R., Keaton, J.R., Spitzley, and Allen, A.C., 1994, Liquefaction potential map for Salt Lake County, Utah, complete technical report, Utah Geological survey Contract Report 94-9, September 1994, 48 9., 9 plates.
- Bartlett, S.F., Hinckley, D.W., and Gerber, T.M., 2007, Probabilistic Liquefaction Potential and Liquefaction-Induced Ground Failure Maps for the Urban Wasatch Front: Phase IV, Fiscal Year 2007: Collaborative Research with University of Utah and Brigham Young University PHASE IV FY2007 <https://my.civil.utah.edu/~bartlett/ULAG>.
- Bartlett, S.F., Hinckley, D.W., and Gerber, T.M., 2016, Liquefaction-induced ground displacement hazard maps for a m7.0 scenario event on the Salt Lake City segment of the Wasatch fault zone, Salt Lake County, Utah, unpublished report
<https://my.civil.utah.edu/~bartlett/ULAG>.
- Biek, R.F., 2005, Geologic map of the Lehi quadrangle and part of the Timpanogos Cave quadrangle, Salt Lake and Utah counties, Utah: Utah Geological Survey Map 210, scale 1:24,000. http://files.geology.utah.gov/maps/geomap/7_5/pdf/m-210.pdf
- Boulanger, R.W., and Idriss I.M., 2004, “Evaluating the potential for liquefaction resistance or cyclic failures of silts and clays, Report UCD/CGM-04/01 University of California, Davis California.

Boulanger, R.W., and Idriss I.M., 2006, Liquefaction susceptibility criteria for silts and clays, Report UCD/CGM-04/01 University of California, Davis California; Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, No. 11, November 1, 2006, pp.1413-1426.

Bray, D. J., and Travasarou, T., 2009, Pseudostatic Coefficient for Use in Simplified Seismic Slope Stability Evaluation, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 135, No. 9, pp. 1336-1340. Cornforth, D.H., 2005, Landslides in practice, study, analysis, and remedial/preventive options in soils: John Wiley & Sons, Hoboken, New Jersey, p. 596.

Bray J. D. and Sancio R. B., 2006, Assessment of Liquefaction Susceptibility of Fine-Grained Soils, ASCE Journal of Geotechnical and Geoenvironmental Engineering, September 2006.

California Division of Mines and Geology (CDMG), 2008, Guidelines for evaluating and mitigating seismic hazards in California, CDMG Special Publication (SP) 117A.
<https://www.conservation.ca.gov/cgs/publications/sp117a>

Cannon, S.H., 2001, Debris-flow generation from recently burned watersheds: Environmental and Engineering Geoscience, v. 12, no. 4, p. 321–341.

Cannon, S.H., Gartner, J.E., Rupert, M.G., Michael, J.A., Rea, A.H., and Parrett, C., 2010, Predicting the probability and volume of post-wildfire debris flows in the intermountain western United States: Geological Society of America Bulletin, v. 122, p. 127–144.
https://www.researchgate.net/publication/249527492_Predicting_the_probability_and_volume_of_postwildfire_debris_flows_in_the_intermountain_western_United_States

CCRSP, 2000, Colorado Rockfall Simulation Program: Modeling Rockfall in 3D, Publication Number: FHWA-HRT-13-008, November 2012, CRSP-3D User's Manual (Pub. No. FHWA-CFL/TD-12-007), FHWA's Central Federal Lands Highway Division.
(roger.surdahl@dot.gov).

Cruden, D.M. and Varnes, D.J., 1996, Landslide types and processes, in Special Report 247, Landslides Study and Mitigation, (Turner, A.K. and Schuster, R.L., eds.): Transportation Research Board (TRB), National Research Council, National Academy Press, Washington, D.C., pp.36-75.

- DuRoss, C.B., 2008, Holocene vertical displacement on the central segments of the Wasatch fault zone, Utah: Bulletin of the Seismological Society of America, v. 98, no. 6, p. 2918–2933. <https://pubs.er.usgs.gov/publication/70034485> (abstract)
- DuRoss, C.B., and Hylland, M.D., 2015, Synchronous ruptures along a major graben-forming fault system: Wasatch and West Valley Fault Zones, Utah; Bulletin of the Seismological Society of America, Vol. 105, No. 1, pp. 14-37.
<http://bssa.geoscienceworld.org/content/105/1/14.full>
- DuRoss, C. B., S. E. K. Bennett, S. F. Personius, R. D. Gold, R. W. Briggs, A. I. Hiscock, N. G. Reitman, J. D. DeVore, and S. A. Mahan (2015), Multiple Holocene surface-faulting earthquakes at the Corner Canyon trench site on the Salt Lake City segment of the Wasatch fault zone, Utah. Seismol. Res. Lett., 86(2b), 671.
- DuRoss, C. B., S. F. Personius, A. J. Crone, S. S. Olig, M. D. Hylland, W. R. Lund, and D. P. Schwartz, 2016, Fault segmentation: New concepts from the Wasatch Fault Zone, Utah, USA, J. Geophys. Res. Solid Earth, 121, 1131–1157: [doi:10.1002/2015JB012519](https://doi.org/10.1002/2015JB012519).
- EERI, 2015, Earthquake Engineering Research Institute, Utah Chapter, Scenario for a Magnitude 7.0, Earthquake on the Wasatch Fault–Salt Lake City Segment, Hazards and Loss Estimates, June 4, 2015, 57 p. <https://ussc.utah.gov/pages/view.php?ref=1058>
- FGDC, 2020, Federal Geographic Data Committee, Digital Cartographic Standard for Geologic Map Symbolization, U. S. Geological Survey website (last updated May 9, 2017).
https://ngmdb.usgs.gov/fgdc_gds/geolsymstd/download.php
- Frankie, K.W., and Bartlett, S.L., 2019, Probabilistic Liquefaction Triggering and Lateral Spread Hazard Maps for Davis, Weber, and Salt Lake Counties, Utah: Collaborative Research with University of Utah and Brigham Young University, prepared for the United States Geological Survey and the Utah Department of Transportation, USGS Award Numbers: G17AP000053 & G17AP00054,
<https://my.civil.utah.edu/~bartlett/ULAG> (under USGA Technical Reports).
- Frankel, A.D., Petersen, M.D., Mueller, C.S., Haller, K.M., Wheeler, R.L., Leyendecker, E.V., Wesson, R.L., Harmsen, S.C., Cramer, C.H., Perkins, D.M., and Rukstales, K.S., 2002, Documentation for the 2002 Update of the National Seismic Hazard Maps, U.S.G.S. Open-File Report 02-420, 33p. <https://pubs.usgs.gov/of/2002/ofr-02-420>

- Giraud, R.E., and McDonald, G.N., 2007, The 2000–2004, fire-related debris flows in northern Utah, *in* Schaefer, V.R., Schuster, R.L., and Turner, A.K., editors, Conference presentations, 1st North American Landslide Conference, Vail, Colorado: Association of Environmental and Engineering Geologists Special Publication no. 23, p. 1522–1531.
- Giraud, R.E., 2020, Guidelines for the geologic study of debris-flow hazards on alluvial fans in Utah, *in* Bowman, S.D., and Lund, W.R., editors, Guidelines for investigating geologic hazards and preparing engineering-geology reports, with a suggested approach to geologic-hazard ordinances in Utah, second edition: Utah Geological Survey Circular 128, p. 75–91, <https://doi.org/10.34191/C-128>.
- Higgins, J.D., and Andrews, R.D., 2012, Rockfall types and causes, Chapter 2, pp. 21-55, in Turner, A.K. and Schuster, R.L., eds., 2012, Rockfall Characterization and Control, Transportation Research Board (TRB) of the National Academies, Transportation Research Board Miscellaneous Publication, National Transportation Board Business Office, 500 Fifth Street, NW, Washington, D.C., 20001, p. 658.
- Hinckley, D.W., 2010, Liquefaction-induced ground displacement mapping for the Salt Lake Valley, Utah, unpublished Masters of Science thesis, Department of Civil and Environmental Engineering, University of Utah, May 2010, <https://my.civil.utah.edu/~bartlett/ULAG>.
- Hiscock, A.I., and DuRoss, C.B., 2016, Late Holocene chronology of surface-faulting earthquakes at the Corner Canyon site on the Salt Lake City segment of the Wasatch fault zone, Utah: U.S. Geological Survey External Grant Award Number G14AP00057, December 1, 2016, 24 p., 2 plates: http://ugspub.nr.utah.gov/publications/non_lib_pubs/contract/G14AP00057.pdf
- ICC, 2017, 2018 International Building Code (IBC), International Code Council, Inc., Washington, D.C.
- Jones, CL, Higgins, J.D., and Andrew, R.D., 2000, Colorado rockfall simulation program, Version 4.0: Colorado Geological Survey Miscellaneous Investigation MI-66. https://geodata.geology.utah.gov/pages/view.php?ref=2514&k=&search=&offset=1283&order_by=relevance&sort=DESC&archive=0
- Lund, W.R., and Knudsen, T.R., 2020, Guidelines for evaluating rockfall hazards in Utah, in Bowman, S.D., and Lund, W.R., editors, Guidelines for investigating geologic hazards and preparing engineering-geology reports, with a suggested approach to geologic-hazard

ordinances in Utah, 2nd edition: Utah Geological Survey Circular 122, p. 111–123.
<http://ugspub.nr.utah.gov/publications/circular/c-122.pdf>

Lund, W.R., Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2020, Guidelines for evaluating surface-fault-rupture hazards, in Utah, *in* Bowman, S.D., and Lund, W.R., editors, Guidelines for investigating geologic hazards and preparing engineering-geology reports, with a suggested approach to geologic-hazard ordinances in Utah, second edition: Utah Geological Survey Circular 128, p. 31–58: <https://doi.org/10.34191/C-128>.

Martin, G.R. and Lew, M., eds., 1999, Recommended procedures for implementation of DMG special publication 117, guidelines for analyzing and mitigating liquefaction potential in California, Southern California Earthquake Center (SCEC), University of Southern California, 63 p.

McDonald, G.N., Hiscock, A.I., Kleber, E.J., and Bowman, S.D., 2018, Detailed mapping of the Wasatch fault zone, Utah and Idaho – Using new high-resolution lidar data to reduce earthquake risk: Final technical report to the U.S. Geological Survey, National Earthquake Hazards Reduction Program, award no. G17AP00001, 39 plates, scale 1:24,000.
https://ugspub.nr.utah.gov/publications/non_lib_pubs/contract/FTR_G17AP00001.pdf

McDonald, G.N., Kleber, E.J., Hiscock, A.I., Bennett, S.E.K., and Bowman, S.D., 2020, Fault trace mapping and surface-fault-rupture special study zone delineation of the Wasatch fault zone, Utah and Idaho: Utah Geological Survey Report of Study 280, 23 p.:
<https://doi.org/10.34191/RI-280>.

McKean, A.P., and Solomon, B.J., 2018, Interim geologic map of the Draper quadrangle, Salt Lake and Utah Counties, Utah: Utah Geological Survey Open-File Report OFR 683DM, 33 p., 1 pl., GIS data, scale 1:24,000.
https://ugspub.nr.utah.gov/publications/gis_maps/draper_ofr_683.zip

Olig, S.S., 2011, Extending the paleoseismic record of the Provo segment of the Wasatch Fault Zone, Utah, Final Technical Report Submitted to: U.S. Geological Survey National Earthquake Hazards Reduction Program, Award No. 02HQGR0109, variously paginated, in Paleoseismology of Utah, Volume 23, Compilation of U.S. Geological Survey National Earthquake Hazards Reduction Program Final Technical Reports for Utah, compiled by Bowman, S.D. and Lund, W.R., DVD (9 p. + 56 reports), 2013 Utah Geological Survey Miscellaneous Publication 13-3.
<https://geology.utah.gov/hazards/technical-information/paleoseismology-of-utah-series/#tab-id-5>

OpenTopography, 2025, OpenTopography provides online access to high-resolution (meter to sub-meter scale), Earth science-oriented, lidar imagery and topography data acquired with lidar and other technologies: <http://opentopography.org>

Quaternary Fault Parameters Working Group, Utah Geological Survey Bulletin 134, CD.

Rocscience, 2015, Rocscience Inc., RocFall simulation program, version 5.014; University of Toronto, Toronto, Ontario, Canada.

Seed, H.B., and Idriss, I.M., 1982, Ground motion and soil liquefaction during earthquakes: Earthquake Engineering Research Institute, Oakland, California, p. 135.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F., 2001, Recent Advances in Soil Liquefaction Engineering and Seismic Site Response Evaluation, Proceedings, Fourth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics and Symposium in Honor of Professor W.D. Liam Finn, San Diego, California, Paper No. SPL-2, March 26-31, 2001, 45 pp.

Seed, R.B., Cetin, K.O., Moss, R.E.S., Kammerer, A.M., Wu, J., Pestana, J.M., and Riemer, M.F., Sancio, R.B., Bray, J.D., Kayen, R.E., and Faris, A., 2003, Recent Advances in Soil Liquefaction Engineering: A Unified and Consistent Framework, 26th Annual ASCE Los Angeles Geotechnical Spring Seminar, Keynote Presentation, H.M.S. Queen Mary, Long Beach, California, April 30, 2003, 71 pp.

Stark, T.D., Choi, H., and McCone, S. (2005), "Drained shear strength parameters for analysis of landslides," ASCE Journal of Geotechnical and Geoenvironmental Engineering, v. 131, no. 5, pp. 575-588. <http://tstark.net/wp-content/uploads/2012/10/JP57.pdf>

Turner, A. K., and Duffy, J., D., 2012, Evaluation of rockfall mechanics, Chapter 8, pp. 85-406, in Turner, A.K. and Schuster, R.L., eds., 2012, Rockfall Characterization and Control, Transportation Research Board (TRB) of the National Academies, Transportation Research Board Miscellaneous Publication, National Transportation Board Business Office, 500 Fifth Street, NW, Washington, D.C., 20001, p. 658.

Turner, A.K., and Jayaprakash, 2012, Introduction, Chapter 1, pp. 3-20, in Turner, A.K. and Schuster, R.L., eds., 2012, Rockfall characterization and control, Transportation Research Board (TRB) of the National Academies, Transportation Research Board Miscellaneous

Publication, National Transportation Board Business Office, 500 Fifth Street, NW, Washington, D.C., 20001, p. 658.

UGS, 2025a, Utah Geological Survey GeoData Archive website.
<https://geodata.geology.utah.gov/pages/home.php?login=true6.0>

UGS, 2025b, Utah Geological Survey online interactive aerial imagery collection.
<https://geodata.geology.utah.gov/imagery>

USGS, 2025, National Seismic Hazard Maps, Data and Documentation web page:
<http://eqhazmap.usgs.gov>. For obtaining a pga for a specific probability or return period see <http://earthquake.usgs.gov/research/hazmaps/design/>.

Watry, S.M. and Lade, P.V., 2000, "Residual shear strengths of bentonites on Palos Verdes Peninsula, California," Proceedings of the session of Geo-Denver 2000, American Society of Civil Engineers, pp. 323-342.

WGUEP, 2016, Working Group on Utah Earthquake Probabilities, Earthquake probabilities for the Wasatch Front region in Utah, Idaho, and Wyoming: Utah Geological Survey Miscellaneous Publication 16-3, 164 p., 5 appendices.
https://ugspub.nr.utah.gov/publications/misc_pubs/mp-16-3/mp-16-3.pdf

Youd, T.L., and Idriss, I.M., eds., 1997, Proceedings of the NCEER workshop on evaluation of liquefaction resistance of soils: National Center for Earthquake Engineering Research Technical Report NCEER 97-0022.

Youd, T.L., and Gilstrap, S.D., 1999, Liquefaction and deformation of silty and fine-grained soils: Proceedings of the Second International Conference on Earthquake Geotechnical Engineering, Lisboa, Portugal, 21-25 June 1999, Seco e Pinto (ed.), pp. 1013-1020.

Youd, T.C., Hansen, C.M., and Bartlett, S.F., 2002, Revised MLR equations for predicting lateral spread displacement, ASCE Journal of Geotechnical and Geoenvironmental Engineering, December 2002.

APPENDIX A - MINIMUM STANDARDS FOR FAULT ACTIVITY INVESTIGATIONS

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 ACTIVE FAULT 1

3.0 WASATCH FAULT ZONE..... 2

4.0 MINIMUM QUALIFICATIONS OF INVESTIGATORS 2

5.0 PARCELS REQUIRING A FAULT-ACTIVITY INVESTIGATION 2

6.0 SCOPING MEETING..... 3

7.0 FAULT-ACTIVITY INVESTIGATIONS..... 3

8.0 SURFACE-FAULTING MITIGATION..... 9

9.0 GEOLOGIC HAZARD REPORTS FOR FAULT ACTIVITY INVESTIGATIONS..... 15

10.0 DISCLOSURE OF GEOLOGIC HAZARDS STUDY REPORT 21

1.0 INTRODUCTION

This Appendix presents the minimum standards and methods for performing fault activity investigations in Draper City (the City) and preparing geologic hazards study reports for fault activity investigations. These standards constitute the minimum level of effort required in conducting fault activity investigations in the City.

Considering the complexity of evaluating the timing of the last surface rupture earthquake along a fault (fault activity), additional effort beyond the minimum standards presented herein may be required at some sites to adequately address fault activity.

The information presented herein does not relieve consultants of their responsibility to perform additional geologic or engineering studies they believe are necessary to assess fault activity at a site. The purpose of establishing minimum standards for fault activity investigations is to:

1. Protect the health, safety, welfare, and property of the public by minimizing the potential adverse effects of active faulting and related hazards.
2. Assist property owners and Applicants with property in Fault Activity Study Areas in conducting reasonable and adequate fault activity investigations.
3. Provide consultants with a common basis for preparing proposals, conducting Fault Activity Study Areas investigations, and recommending mitigation.
4. Provide an objective framework for the City review of geologic hazards study reports for Fault-Activity-Study-Area investigations.

2.0 ACTIVE FAULT

The City defines an active fault as a fault displaying evidence of displacement along one or more of its traces during the past 4,000 radiocarbon years before present [14C yr. B.P.] or about 4,500 calibrated years before present [cal yr. B.P.] (about three times the closed mean recurrence interval between surface faulting earthquakes along the Salt Lake City and Provo segments of the Wasatch Fault Zone (WFZ)) (WGUEP, 2016).

For any other City fault not directly associated with the WFZ, active fault means a fault displaying evidence of displacement along one or more of its traces during the past 10,000 14C yr. B.P. or about 11,700 cal yr. B.P.

3.0 WASATCH FAULT ZONE

The WFZ is a major tectonic feature in the western United States, extending for about 230 miles from near Fayette, Utah in the south to near Malad, Idaho in the north. Surface faulting has occurred along the WFZ in northern Utah throughout late Pleistocene and Holocene time (WGUEP, 2016).

The WFZ consists of a series of normal-slip faults with relative movement down to the west and up to the east (WGUEP, 2016; DuRoss and Hylland, 2015). In Salt Lake Valley, the WFZ is represented by the Salt Lake City segment which extends for 23± miles along the eastern edge of the valley (WGUEP, 2016). In Utah Valley, the WFZ is represented by the Provo segment which extends for 59± miles along the eastern edge of Utah Valley (WGUEP, 2016). Repeated Holocene normal-slip movement has been well documented along the Salt Lake City and Provo segments of the WFZ (WGUEP, 2016; DuRoss and Hylland, 2015; Olig, 2011).

4.0 MINIMUM QUALIFICATIONS OF INVESTIGATORS

Site-specific fault activity investigation in the City must be performed by qualified engineering geologists as defined in Section 2.0 of these Standards, and in Section 10-7-050 of the City geologic hazards ordinance.

5.0 PARCELS REQUIRING A FAULT-ACTIVITY INVESTIGATION

The City has delineated Fault Activity Study Areas bracketing faults considered active until proven otherwise. Geologic hazards special study area maps reflecting geological concerns pertaining to development within the City may be viewed at the City online map portal via the geologic information application. A site-specific fault activity investigation for the part of the property in the Fault Activity Study Area is required before receiving a land use approval or building permit from the City.

The City Fault Activity Study Areas generally extend horizontally 300 feet on the downthrown side and 150 feet on the upthrown side of mapped fault traces. For fault zones; Fault Activity Study Areas extend from the outermost faults in the fault zone.

A site-specific fault activity investigation may also be required if onsite or nearby fault-related features, not shown on the City Fault Activity Study Areas Map, are identified during other geologic or geotechnical engineering studies performed on or near the site or during construction.

Development of any parcel of land in a fault activity study area requires submittal and the City review of a geologic hazards study report for a site-specific fault activity investigation before receiving a land-use or building permit from the City. It is the responsibility of the applicant to retain a qualified geologist to perform the fault activity investigation (see Section 2.0 of these Standards, and Section 10-7-050 of the City geologic hazards ordinance). The purpose of fault-activity investigations is to accurately locate active faults. When faults are identified, fault-activity investigations shall:

1. Evaluate the age of the last surface-faulting earthquake along the fault trace(s).
2. Document the physical characteristics of the fault, e.g., amount of past fault displacement, bearing (strike) of fault, and inclination (dip) of fault.

A site-specific surface fault rupture hazard study includes a field investigation (usually involving the excavation and geologic documentation of a trench) and a geologic hazards study report. This Appendix describes the minimum standards required by the City for surface-fault-rupture-hazard studies.

6.0 SCOPING MEETING

The applicant or consultant shall schedule a scoping meeting with the City to evaluate the engineering geologist's/geotechnical engineer's investigative approach (see Section 10-7-070 of the City geologic hazards ordinance).

7.0 FAULT-ACTIVITY INVESTIGATIONS

The part of the property in a Fault Activity Study Area must be evaluated for the presence of active faults. At a minimum, the fault-activity investigation shall consist of the following tasks:

7.1 Review of Available Literature, Evaluation of Aerial Photographs and Lidar Imagery

The initial task in a fault-activity investigation shall consist of:

1. Review of available published geologic/geotechnical engineering reports pertinent to the site and vicinity, including previous unpublished fault-activity investigations.
2. Interpretation of available stereo-paired aerial photographs, and evaluation of lidar imagery for geomorphic features (such as scarps, springs, and seeps; faceted spurs, offset ridges or drainages; geologic structures, etc.), and lineaments indicative of surface fault rupture. Aerial photographs reviewed shall include more than one set

and shall include pre-urbanization aerial photographs. The locations of geomorphic features and lineaments identified from aerial photographs and lidar imagery shall be presented in the geologic hazards study report for the fault-activity investigation as a lineament map.

7.2 Geologic Reconnaissance and Fault Mapping

The second task of the fault-activity investigation shall consist of performing a geologic reconnaissance and site-specific fault mapping (Lund and others, 2020).

1. Geologic reconnaissance of the property shall be performed to assess the origin of the geomorphic features and lineaments identified from the evaluation of stereo-paired aerial photographs, and lidar imagery and whether the features are associated with surface-fault-rupture.
2. Detailed fault and surficial geologic mapping of the property shall be performed to:
 - a. Document on a site map the site-specific geologic deposits. The site map shall be at a scale of at least 1 inch = 200 feet (or more detailed), with a north arrow and bar scale, and clearly depicted site boundaries.
 - b. Identify fault scarps and other fault-related features such as sag ponds, springs, aligned or disrupted drainages, faceted spurs, grabens, and displaced landforms (e.g., terraces, shorelines).
 - c. Ascertain the location and age of faults.
 - d. Identify trench locations.

The area mapped must extend beyond parcel boundaries as necessary to locate and evaluate evidence of other faults projecting towards or into the site (Lund and others, 2020).

7.3 Subsurface Exploration

The third task is subsurface exploration consisting of exploratory trenching to directly identify faults:

1. If buildable areas are known, subsurface exploration must provide the minimum footage of trenching necessary to explore proposed buildable areas plus a distance beyond proposed buildable areas equal to at least the minimum fault setback distance for proposed structure types (see Fault Setback Table for IBC Risk Categories, Section 8.1) (e.g., generally about 50 ft.).

2. If buildable areas are not known, the entire part of the property in the fault-activity-study area must be investigated by trenching.

Trench backfilling methods and procedures must be documented in the geologic hazards study report for the fault-activity investigations in order to determine whether additional corrective excavation, backfilling, and compaction shall be required at the time of construction and/or site grading.

7.3.1 Trench Siting

Exploratory trenches must be oriented as perpendicular to the anticipated trend of identified active fault traces as possible and provide continuous coverage across the part of the site investigated (one trench or overlapping trenches). When a fault is identified, additional trenches will be required to:

1. Accurately determine the trend and location of the fault as it crosses the property.
2. Provide a comprehensive characterization of faulting at a site, and/or;
3. Characterize variability along the trend of the fault.

Ground deformation resulting from past surface faulting on normal faults in Utah is highly variable and may change significantly over short distances along the trend of the fault (Lund and others, 2020). Consequently, the City requires subsurface data not to be extrapolated more than 300 feet without additional subsurface information (i.e., trenches).

Complex fault zones may require closer trench spacing. When it is necessary to offset trenches to accommodate site conditions, at least 25 feet of overlap must be provided to avoid gaps in trench coverage. Care must be taken not to offset trenches at a common surficial feature potentially associated with past surface faulting (e.g., a change in surface slope across the site). Test pits or potholes alone are not an acceptable alternative to trenches for evaluating surface rupture.

7.3.2 Trench Safety

Appropriate trench safety measures regarding ingress, egress, and working in or in the vicinity of the trench must be implemented and maintained at all times. It is the responsibility of the consultant to ensure fault trenches are excavated in compliance with all applicable federal and state safety regulations.

7.3.3 Depth of Trench Excavation

The depth of a trench will ultimately depend on the presence of groundwater, stability of subsurface deposits, and the geologic age of the subsurface geologic units. At a minimum, trenches shall be deep enough to:

1. Extend into sediments at least 4,000 14C yr B.P. or to the base of Holocene deposits and into the underlying older materials.
2. Evidence of the most recent surface faulting.
3. Record all relevant aspects of fault geometry when a fault is identified (strike, dip, displacement of the fault(s); width of fault and deformation zones, including grabens and subsidiary hanging-wall and footwall faults, etc.).

When site conditions preclude exploratory trenching (i.e. the presence of shallow groundwater; excessive thickness of fill; inability to extending into sediments at least 4,000 14C yr B.P. or to the base of Holocene deposits and into the underlying older materials), alternative subsurface exploration programs must be implemented. Benching, shoring, and any other means to safely increase trench depth must be utilized before abandoning exploratory trenching.

Alternative subsurface exploration programs:

1. May consist of closely spaced Cone Penetration Test (CPT) soundings, borings, geophysical exploration techniques, or a combination of techniques. The actual subsurface exploration program to be used on any specific parcel will be determined on an individual basis, considering the current state of technical knowledge about the fault zone and information gained from the previous exploration on adjacent or nearby parcels.
2. Must be discussed with the City, at a project scoping meeting before implementation, and shall be clearly described in a consultant work plan. At the project scoping meeting, the consultant's work plan shall include a written description of the proposed exploration program along with an exploration site plan. The site plan shall be at a scale of at least 1 inch = 200 feet (or more detailed), with a north arrow and bar scale, clearly depicting site boundaries, anticipated or published surface geologic conditions within several thousand feet of the site, the location and type of the proposed alternative subsurface exploration, and the anticipated earth materials present at depth on the site.

Should all applicable subsurface explorations techniques prove insufficient to adequately characterize past fault activity, and a potentially active fault may be concealed by unfaulted younger deposits:

1. The practical limitations of trenching must be acknowledged and explained in the geologic hazards study report.
2. The resulting uncertainties of the trench depth and unfaulted deposits must be acknowledged in the geologic hazards study report, and recommendations must reflect the resulting uncertainties of the trench depth and unfaulted deposits.
3. The uncertainty in fault location shall be discussed with the City and addressed by increasing fault setback distances along the projected fault trace (see Section 8.1, Requirements for Fault Setbacks).

7.3.4 Documenting Trench Exposures

Trench walls shall be cleaned of debris and backhoe smear before documentation. Trench logs shall be carefully drawn in the field at a minimum scale of 1 inch = 5 feet, with no vertical exaggeration. Vertical control must be used and shown on each end of trench logs. Horizontal control must be used and shown on the base of trench logs.

Trench logs shall not be generalized or diagrammatic and must graphically represent the geologic units and geologic structures observed and all other significant geologic information from the trench (see Section 9.0(9)(g)). Interpretations of the age and origin of the deposits, faulting, and/or deformation must also be included. The strike, dip, and net vertical displacement of faults must be noted. Clearly annotated field logs are acceptable for the geologic hazards study report for the fault activity investigation.

7.3.5 Fault Displacement

In general, one surface-faulting earthquake is not sufficient to characterize surface-faulting displacements associated with an active fault. Consequently, whenever possible, ground displacements assigned to an active fault should be based on a minimum of two surface-faulting earthquakes at the site of interest.

If an active fault is identified and surface-faulting displacements cannot be measured at the site, the maximum surface-faulting displacements based on paleoseismic data from nearby paleoseismic investigations on the Salt Lake City and Provo segments shall be used (Lund

and others, 2020). In the absence of nearby data, consult WGUEP (2016), or the most current paleoseismic literature, for the range of surface-faulting displacements measured on the Salt Lake City and Provo segments of the WFZ.

7.3.6 Geochronology

The engineering geologist shall interpret the ages of geologic units exposed in the trench. When faulting is identified, efforts must be made to determine the time of the latest surface-faulting displacement along the fault using appropriate geologic and/or relative soil stratigraphic age-dating techniques, such as radiocarbon dating, optically stimulated luminescence (OSL) signals from quartz sand grains, relative, etc. If relative soil profile development is used to estimate the age of sediments, the experience of the geologist in soil profile development dating must be provided at the scoping meeting.

Many of the surficial deposits in the Salt Lake and Provo valleys were deposited during the Pleistocene epoch and are referred to as Bonneville lake-cycle sediments. Although late-stage Bonneville lake-cycle sediments do not correspond to the Pleistocene-Holocene boundary (i.e., Bonneville lake-cycle deposits are older than 10,000 14C yr B.P.), for purposes of evaluating fault activity, these deposits provide a useful regional datum.

For practical purposes, and due to documented Holocene displacement along the Salt Lake and Provo segments of the WFZ, any fault which displaces late-stage Bonneville lake-cycle deposits shall be considered active unless the Bonneville deposits are overlain by clearly unfaulted Holocene-age deposits greater than 4,000 years old. Conversely, the presence of demonstrably unbroken, undeformed, and stratigraphically continuous Bonneville sediments constitutes reasonable geologic evidence for the absence of younger age faulting.

7.3.7 Documenting Trenches and Faults

All trenches and faults in trenches must be surveyed by a Utah licensed professional land surveyor. Faults in trenches must be surveyed with an accuracy of about 0.1 feet. Survey data shall be included in the geologic hazards study report for the fault-activity investigation as an appendix. Trenches and faults surveyed by hand-held GPS devices will not be accepted.

7.4 Field Review

A field review by the City is required during exploratory trenching. The applicant must provide a minimum of 48 hours' notice to schedule the field review with the City. The trenches shall be open, safe, cleaned, and a preliminary log completed at the time of the review. Field reviews allow the City to evaluate the subsurface data (i.e., age and type of

sediments; presence/absence of faulting, etc.) with the consultant. Discussions about questionable features or mitigation measures are encouraged, but the City will not help log the trench, explain the stratigraphy, or give verbal approval of the proposed development during the field review.

7.5 Geologic-Restricted Areas

When the entire part of a property situated in the fault activity study area is not assessed for surface-fault rupture, the areas not assessed shall be designated as a geologic-restricted area. A fault activity investigation must be performed before the development and/or issuance of building permits for habitable structures in Geologic-Restricted Areas. Geologic-Restricted Areas must be shown on all site maps and final recorded plat maps.

8.0 SURFACE-FAULTING MITIGATION

In the City, two methods are available to mitigate an active fault.

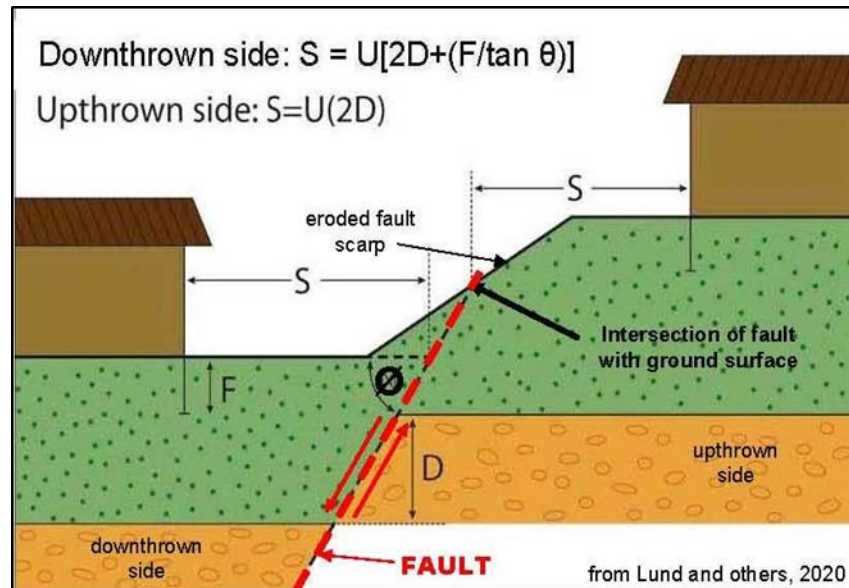
1. Active fault mitigation by fault avoidance, and/or;
2. Active fault mitigation by engineering design.

8.1 Active Fault Mitigation by Fault Avoidance and Fault Setback

To address wide discrepancies in fault setback recommendations, the City has adopted the fault setback calculation methodology for normal faults of Lund and others (2020). The consultant shall use this method to establish the minimum fault setbacks for critical facilities and structures designed for human occupancy. Should a consultant want to use a different fault setback method, the consultant must obtain prior approval from the City and justify the method used in the geologic hazards study report. Faults and fault setbacks must be clearly identified on all pertinent site maps.

Minimum fault setbacks are based on the type and criticality of the proposed structures as defined by the International Building Code (IBC) (see Fault Setback Table for IBC Risk Categories). A fault setback shall be calculated using the formulas presented herein and then compared to the minimum fault setback established in the Fault Setback Table for IBC Risk Categories. *The greater of the two shall be used as the fault setback.* Minimum fault setback distances apply to both the downthrown and upthrown sides of the fault (hanging wall and footwall blocks, respectively).

Top-of-slope and/or toe-of-slope setbacks required by the City Municipal Code must also be considered; the greater setback must be used.



8.1.1 Downthrown Side of Fault (hanging wall block)

The fault setback for the downthrown side of the fault shall be calculated using the following formula:

$$S = U (2D + F/\tan \theta),$$

where:

- S = Setback in which critical and essential facilities and structures for human occupancy are not permitted.
- U = Criticality Factor, based on the proposed occupancy of the structure (see Fault Setback Table for IBC Risk Categories).
- D = Expected fault displacement per surface faulting earthquake (assumed to be equal to the net vertical displacement measured for each past surface faulting earthquake); If earthquake displacements cannot be measured, the maximum displacement based on paleoseismic data from nearby paleoseismic investigations on the Salt Lake City and Provo segments (as applicable), of the WFZ may be used

(Lund and others, 2020). In the absence of nearby data, consult WGUEP (2016), or the most current paleoseismic literature, for the range of displacements measured on the Salt Lake City and Provo segments of the WFZ.

F = Maximum depth of footing or subgrade part of the building.

θ = Dip of the fault (degrees).

8.1.2 Uprthrown Side of Fault (footwall block)

The dip of the fault and depth of the subgrade part of the structure is not relevant in calculating the fault setback on the upthrown side of the fault. Consequently, the fault setback for the upthrown side of the fault shall be calculated as:

$$S = U \times 2D$$

The fault setback is measured from the part of the structure closest to the fault, whether subgrade or above grade. Minimum fault setbacks apply as defined above.

8.1.3 Fault Setback Table for IBC Risk Categories

Fault setback recommendations and criticality factors (U) for modified IBC risk category of buildings and other structures (modified from 2024 Table 1604.5 (ICC, 2024)).¹

IBC Risk Category ²	Criticality ³	U ⁴	Minimum Setback (feet) ⁴
I - Buildings and other structures that represent a low hazard to human life in the event of failure	4	--	--
II(a) - Single-family dwellings.	3	1.5	15
II(b) - Buildings and other structures except those listed in Risk Categories I, II(a), III, and IV	2	2	20
III Buildings and other structures that represent a substantial hazard to human lives in the event of failure	1	3	50
IV - Buildings and other structures designated as essential facilities	1	3	50

¹ See ICC (2024) chapter 3, Use and Occupancy Classification (p. 45) and chapter 16, Structural Design, table 1604.5 (p. 364) for a complete list of structures/facilities included in each IBC Risk Category. Check table 1604.5 if a question exists regarding which Risk Category a structure falls under.

² Risk Category I - includes but is not limited to agricultural facilities, certain temporary facilities, and minor storage facilities.

Risk Category II - includes subcategories II(a) and II(b) to reflect the lower hazard associated with single-family dwellings and apartment complexes and condominiums with <10 dwelling units.

1. Risk Category II(a) - single-family dwellings.
2. Risk Category II(b) - buildings and other structures except those listed in Risk Categories I, II(a), III, and IV; includes but not limited to:
 - a. many businesses, factory/industrial, and mercantile facilities.
 - b. public assembly facilities with an occupant load ≤ 300 (e.g., theaters, concert halls, banquet halls, restaurants, community halls).
 - c. adult education facilities such as colleges and universities with an occupant load ≤ 500 .
 - d. other residential facilities (e.g., boarding houses, hotels, motels, care facilities, dormitories with >10 dwelling units).
3. Risk Category III—includes but not limited to:
 - a. public assembly facilities with an occupant load > 300 , schools (elementary, secondary, daycare).
 - b. adult education facilities such as colleges and universities with an occupant load > 500 .
 - c. Group I-2 occupancies (medical facilities without surgery or emergency treatment facilities) with an occupant load > 50 .
 - d. Group I-3 occupancies (detention facilities for example jails, prisons, reformatories, detention facilities) with an occupant load > 5 .
 - e. any other occupancy with an occupant load > 5000 .
 - f. power-generating stations, water-treatment plants, wastewater treatment facilities, and other public utility functions not included in risk category IV.

- g. buildings and other structures not included in risk category IV that contain quantities of toxic or explosive materials.

4. *Risk Category IV*—includes but is not limited to:

- a. Group I-2 occupancies having surgery or emergency treatment facilities.
- b. fire, rescue, ambulance, and police stations, and emergency vehicle garages.
- c. designated emergency shelters: emergency preparedness, communication, and operations centers and other facilities required for emergency response.
- d. power-generating stations and other public utility facilities are required as emergency backup facilities for Risk Category IV structures.
- e. buildings and other structures containing quantities of highly toxic materials.
- f. aviation control towers, air traffic control centers, and emergency aircraft hangars.
- g. buildings and other structures having critical national defense functions.
- h. water-storage facilities and pump structures required to maintain water pressure for fire suppression.

³ *Criticality*: a factor based on relative importance and risk posed by a building; lower numbers indicate more critical facilities. Criticality is included in fault-setback equations by the factor U, which is inversely proportional to criticality to increase fault setbacks for more critical facilities.

⁴ *Minimum setback*: Use minimum fault setback or the calculated fault setback, whichever is greater

8.2 Active Fault Mitigation by Engineering Design

Performance-based engineering building design as used herein means an approach to the design of a structure to meet certain measurable or predictable performance seismic load and vertical and horizontal displacement requirements, for structures built astride active faults without a specifically prescribed method by which to attain those requirements. This contrasts with traditional prescribed building codes, which mandate specific construction practices, such as stud size and distance between studs in wooden frame construction, etc.

Performance-based engineering building design:

1. Does not apply to critical and essential facilities, defined as IBC Category III and IV structures (see Fault Setback Table for IBC Risk Categories, Section 8.1.3).

2. Is intended to provide life safety protection to the inhabitants of the structure in the event of a surface-faulting earthquake beneath the structure.

Performance-based engineering building design will be permitted in the City on sites where the Applicant has submitted:

1. The required geologic hazards study report, prepared by a qualified geologist, containing all items in Section 9.0, including:
 - a. age and origin of geologic units.
 - b. fault type and location(s).
 - c. all relevant aspects of fault geometry (the strike, dip, and the width of the fault and deformation zones, including grabens and subsidiary hanging-wall and footwall faults, etc.).
 - d. evidence of the most recent surface faulting.
 - e. fault recurrence interval (if known).
 - f. ground displacement per surface-faulting earthquake.
2. A geotechnical engineering report from a Utah licensed geotechnical engineer performed in accordance with these Standards, including the potential maximum cantilever, free span, and tilt of the foundation at the location of the active fault(s).
3. A structural engineering report from a Utah licensed structural engineer presenting the structural design for the residential dwelling meeting all required building code and seismic requirements. The structural engineering report shall confirm:
 - a. The geologic hazards study and geotechnical engineering reports have been received and reviewed.
 - b. Structures have been designed in accordance with the recommendations in the geologic hazards study and geotechnical engineering reports.
 - c. Structures have been designed to account for the identified hazards in accordance with the City municipal code and the International Building Code standards.

The structural design shall be reviewed by:

1. An internal City Staff review committee consisting of the City Engineer and Chief Building Official; the committee shall utilize the City geologic hazard ordinance, the International Building Code, and other applicable City regulations to evaluate the structural design.

2. The City consulting structural engineer, in accordance with the standards established by the City Building Official, the International Building Code, the City Municipal Code, and the City geologic hazard ordinance.

8.3 Small-Displacement Faults

Small-displacement faults are defined herein as faults having less than 4 inches of displacement. Small-displacement faults are not categorically exempt from mitigation requirements. Fault activity investigations must consider whether possible future displacements may exceed past amounts.

Specific structural risk-reduction options such as foundation reinforcement shall be acceptable for small-displacement faults if structural risk-reduction mitigation protects life safety and minimizes structural damage. If structural risk-reduction measures are proposed for small-displacement faults, the criteria in Section 8.2 (Engineering Design for Surface-Fault Mitigation) must be fulfilled.

9.0 GEOLOGIC HAZARD REPORTS FOR FAULT ACTIVITY INVESTIGATIONS

Geologic hazards study reports for fault activity investigations shall be prepared in accordance with the City geologic hazards ordinance. If the geologic hazards study report contains geotechnical engineering recommendations, the geotechnical engineering part of the geologic hazards study report must be prepared in accordance with the City Geotechnical Engineering Standards.

Geologic hazards study reports for fault activity investigations submitted to the City are expected to follow the outline and address the subjects presented herein. Variations in site conditions may require additional items to be addressed or permit some items to be omitted (except as noted).

Geologic hazards study reports for fault activity investigations shall include, at a minimum:

1. *Purpose and scope of work.* The geologic hazards study report shall contain a clear and concise statement of the purpose of, and the scope of work performed for the investigation.
2. *Geologic and tectonic setting.* The geologic hazards study report shall contain a clear and concise statement of the general geologic and tectonic setting of the site vicinity. The section shall include a discussion of active faults in the area, paleoseismicity of the relevant fault system(s), and shall reference relevant published and unpublished

geologic literature.

3. *Site description and conditions.* The geologic hazards study report shall include information on geologic units, graded and filled areas, vegetation, existing structures, and other factors affecting site development, choice of investigative methods, and the interpretation of data.
4. *Methods of investigation.* The geologic hazards study report shall include the following information:
 - a. Review of published and unpublished maps, literature, and records concerning geologic units, faults, surface and groundwater, and other factors.
 - b. Stereoscopic interpretation of aerial photographs and examination of lidar imagery, both on-site and off-site, to detect fault-related topography, vegetation or soil contrasts, and other lineaments of possible fault origin. The photograph's source, date, flightline numbers, and scale must be referenced.
 - c. Observations of surface features, both on-site and offsite, including mapping of geologic and soil units; geomorphic features such as scarps, springs, and seeps (aligned or not); faceted spurs, offset ridges or drainages; and geologic structures.
 - d. Locations and relative ages of other possible earthquake-induced features, both on-site and off-site, such as sand blows, lateral spreads, liquefaction, and ground settlement shall be mapped and described. Slope failures, although they may not be conclusively tied to earthquake causes, shall also be noted.
5. *Subsurface investigations.* The geologic hazards study report shall include:
 - a. A description of the program of subsurface exploration,
 - b. The purpose of each trench and trench location,
 - c. A summary of trenching.
 - d. All trench logs (see Section 9.0[9]g).
 - e. The criteria used to evaluate the ages of the deposits documented in subsurface explorations and shall demonstrate the presence or absence of faulting.
 - f. Exploratory borehole and cone penetration testlogs (see Item 9h).
 - g. The purpose of each trench and trench location.
6. *Conclusions.* Conclusions must be supported by adequate data and shall contain, at a minimum:
 - a. The data upon which conclusions are based, which shall include, at a minimum, a

discussion of the consultant's findings regarding:

- i. Interpretation of stereoscopic aerial photographs, evaluation of lidar imagery, and other remote sensing tools.
 - ii. Review of published and unpublished maps, literature, and records concerning geologic units, faults, surface, and groundwater.
 - iii. Observations of surface features, both on-site and offsite, including mapping of geologic and soil units; geomorphic features such as lineaments; scarps, springs, and seeps (aligned or not); faceted spurs, offset ridges or drainages, etc.
- b. The location of active faults, including orientation and geometry of faults, amount of net slip along faults, anticipated future offset.
 - c. The method to mitigate active faulting.
 - d. The delineation of fault setback areas if mitigation method is fault avoidance by fault setback.
 - e. All factors stipulated in Section 8.2, Surface-Fault Mitigation by Engineering Design if engineering design mitigation is chosen.
 - f. The degree of confidence in, and limitations of, the data and conclusions.
 - g. A conclusion regarding the potential risk of active faulting at the subject property.
 - h. A statement of whether the proposed development and buildable area depicted on the site plan meet the requirements of the City geologic hazards ordinance.
7. *Recommendations*. Recommendations must be supported by adequate geologic data and appropriate reasoning behind each statement. Minimum recommendations shall include:
- a. Recommended fault setback distances per Section 8.1, if the proposed fault activity mitigation method is fault avoidance by fault setback. Supporting calculations must be included. Faults and fault setbacks must be shown on all site maps and final recorded plat maps.
 - b. The required geologic information stipulated in Section 8.2 if performance-based engineering building design of structures is the proposed fault activity mitigation method.
 - c. Geologic-Restricted Areas as stipulated in Section 7.5, Geologic-Restricted Areas. Geologic-Restricted Areas must be shown on all site maps and final recorded plat maps.
 - d. Other recommended building restrictions or use limitations (i.e., placement of detached garages, swimming pools, or other non-habitable structures).

- e. Need for additional or future investigations to confirm buildings are not sited across active faults, such as inspection of building footing or foundation excavations by the consultant.
8. *References*: Geologic hazards study reports for fault activity investigations must include citations of literature and records used in the investigation, referenced aerial photographs or images interpreted (air-photo source, date and flight number, scale), and any other sources of data and information, including lidar images, well logs, personal communications, etc.
9. *Illustrations*: At a minimum, the geologic hazards study report must include the following:
- a. *Vicinity map*, with north arrow and bar scale, depicting major streets, roadways, geographic features, and other pertinent data to locate and orient the site.
 - b. *Site plan*, with north arrow and bar scale, at a scale of at least 1 inch = 200 feet (or more detailed), clearly depicting site boundaries, proposed buildable area, existing structures, streets, slopes, drainages, subsurface explorations, geophysical traverses, etc., and all other pertinent data.
 - c. *Regional geologic map*, with a north arrow, bar scale, contours, and citation, depicting the general surface geology (landslides, alluvial fans, etc.), bedrock geology where exposed, bedding attitudes, faults, and other geologic structural features near the site (generally a published 1:24,000 scale geologic map is adequate); geologic cross-sections may be included as deemed appropriate to illustrate three-dimensional relationships.
 - d. *Site-specific geologic map* of the subject area, with north arrow and bar scale, at a scale equal to or more detailed than 1 inch = 200 feet, depicting at a minimum:
 - i. location and boundaries of the property.
 - ii. proposed buildable areas, if known.
 - iii. topographic contours labeled at a minimum of 10-foot intervals labeled at a minimum of 10-foot intervals.
 - iv. the locations of subsurface investigation explorations.
 - v. topography, and drainage.
 - vi. site-specific geologic mapping performed by the consultant as part of the geologic hazard investigation.
 - vii. boundaries and features related to all geologic hazards.
 - viii. delineation of any recommended building setback distances from hazards.
 - ix. Geologic restricted areas.
 - x. recommended locations for structures.

- xii. Buildable and non-buildable areas, clearly identified with distance from property corners.
 - xiii. all bedding, jointing, and other geologic structures following Federal Geographic Data Committee (FGDC) Standard Geologic Map Symbolization (FGDC, 2020).
 - xiii. a legend defining all items noted on the map.
- e. *Site-specific fault map*, with north arrow and bar scale, when faulting is identified at the site. The fault map shall be at a scale of at least 1 inch = 200 feet and must depict, at a minimum:
 - i. location and boundaries of the property.
 - ii. proposed buildable areas, if known.
 - iii. topographic contours labeled at a minimum of 10-foot intervals.
 - iv. surveyed locations of trenches (and any other exploratory techniques).
 - v. surveyed location(s) of faults identified in the trenches.
 - vi. inferred location of the faults between trenches.
 - vii. recommended fault setback distance on each side of the faults.
 - viii. geologic-restricted areas.
 - ix. a legend defining all items noted on the map.
- f. *Lineament map* of the subject area, with north arrow and bar scale, at a scale equal to or more detailed than 1 inch = 500 feet, depicting lineaments and other geomorphic features identified from the interpretation of stereoscopic aerial photographs, evaluation of lidar imagery, and other remote sensing tools.
- g. *Trench logs* for each trench excavated as part of the investigation. Graphical trench logs shall be carefully drawn in the field at a minimum scale of 1 inch = 5 feet, with no vertical exaggeration. Vertical control must be used and shown on each end of trench logs. Horizontal control must be used and shown along the base of trench logs. At a minimum, trench logs shall include (as applicable):
 - i. trench orientation and an indication of the trench wall logged.
 - ii. trench top and bottom.
 - iii. sample locations.
 - iv. geologic units and geologic structures observed and all other significant geologic information from the trench.
 - v. interpretations of the age and origin of the deposits, faulting, and/or deformation.
 - vi. stratigraphic contacts.
 - vii. detailed stratigraphic unit lithology descriptions.

- viii. USCS soil classification of unconsolidated/non-lithified trench units.
 - ix. geologic origin and age of geologic units.
 - x. contact descriptions.
 - xi. pedogenic horizons.
 - xii. marker beds.
 - xiii. fault orientation and geometry (strike and dip), and amount of net displacement.
 - xiv. deformation or offset of sediments, faults, and fissures, buried scarp-free faces, and colluvial wedges.
 - xv. in-filled fractures.
 - xvi. drag folds.
 - xvii. rotated clasts.
 - xviii. lineations.
 - xix. liquefaction features including dikes, sand blows, etc.
- h. *Exploratory boreholes and cone penetration testlogs* when utilized as a part of the investigation shall be included in the geologic hazards study report and must include (as applicable):
- i. lithologic descriptions.
 - ii. geologic origin and age of geologic units.
 - iii. USCS soil classification or other standardized engineering soil classification (an explanation of the classification scheme must be included).
 - iv. sample intervals.
 - v. penetrative resistance values.
 - vi. static ground-water depths and dates measured.
 - vii. total depth of the borehole.
 - viii. identity of the person logging the borehole.
 - ix. electronic copies of CPT data files (in an appendix).
- i. *Geophysical data* must be included in geologic hazards study reports for fault activity investigations and shall depict stratigraphic interpretations and fault locations, along with correlations to trench or borehole logs to confirm interpretations.
- j. *Photographs* of scarps, trench walls, or other features to enhance the understanding of site conditions and fault-related conditions are not required but shall be included when deemed appropriate. Composited, rectified digital photographs of trench walls may be used as background for trench logs, but all geologic features and conditions observed in the trench must still be depicted.

10.0 DISCLOSURE OF GEOLOGIC HAZARDS STUDY REPORT

The owner of the parcel must record a notice running with the land disclosing the geologic hazards study report for the property; see Section 10-7-120 of the City geologic hazards ordinance. The disclosure of the geologic hazards report must be completed before the approval of any development or subdivision of such parcel.

APPENDIX B - MINIMUM STANDARDS FOR SLOPE STABILITY ANALYSES

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
2.0 SCOPING MEETING.....	3
3.0 SLOPE STABILITY INVESTIGATIONS.....	4
4.0 FACTORS OF SAFETY.....	5
5.0 SUBSURFACE EXPLORATION.....	6
6.0 FIELD REVIEW	10
7.0 SOIL PARAMETERS.....	10
8.0 STATIC SLOPE STABILITY ANALYSIS.....	13
9.0 SURFICIAL STABILITY OF SLOPES	15
10.0 SEISMIC SLOPE STABILITY ANALYSIS.....	17
11.0 WATER RETENTION BASINS AND FLOOD CONTROL CHANNELS	19
12.0 MITIGATION	19
13.0 REPORT SUBMITTALS.....	20
14.0 DRAPER CITY REVIEW	22
15.0 DISCLOSURE OF GEOLOGIC HAZARDS STUDY REPORTS	23
16.0 NOTICE OF GEOLOGIC HAZARDS AND WAIVER OF LIABILITY.....	23

1.0 INTRODUCTION

The purpose of this Appendix to the Draper City Geotechnical Engineering Manual is to protect the health, safety, welfare, and property of the citizens of Draper City (the City), protect the City's infrastructure and financial health, and minimize adverse effects of geologic hazards to public health, safety, welfare, and property by encouraging wise land use.

This Appendix presents the minimum standards and methods for performing quantitative slope-stability investigations in the City and preparing geologic-hazards study reports for quantitative slope-stability investigations. The standards presented herein are directly applicable to landslide investigations and constitute the minimum standards and methods when evaluating the stability of landslides.

Considering the complexity inherent in performing quantitative slope stability investigations, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address the stability of a property. The minimum standards presented herein do not relieve consultants of their professional responsibility to perform additional geologic and/or geotechnical engineering analyses they believe are necessary to assess the stability of a site.

The purposes for establishing minimum quantitative standards for slope stability analyses are to:

1. Protect the health, safety, welfare, and property of the public by minimizing the potential adverse effects of unstable slopes and related hazards.
2. Assist property owners and Applicants in conducting reasonable and adequate studies.
3. Provide consultants with a common basis for preparing proposals, conducting investigations, and formulating mitigation measures.
4. Provide an objective framework for municipal review of geologic-hazards study reports for slope stability investigations.

1.1 Areas Requiring Slope Stability Investigations

Slope stability investigations shall be performed for all sites located within slope stability study areas as designated on the City online map portal via the geologic information application, that are affected by proposed developments meeting the following criteria:

1. Cut and/or fill slopes steeper than are at gradient of about 2 horizontal (h) to 1 vertical (v).
2. Natural slopes with gradients steeper than or equal to 3h:1v.
3. Natural and cut slopes with potentially adverse geologic conditions (e.g., bedding, foliation, or other structural features that are potentially adverse to the stability of a slope).
4. Natural and cut slopes which include a geologic hazard such as a landslide, irrespective of the slope height or slope gradient.
5. Buttresses and stability fills.
6. Cut, fill, or natural slopes of water-retention basins or flood-control channels.

When evaluating site conditions to determine the need for slope stability analyses, off-property conditions shall be included. The consultant shall demonstrate that the proposed hillside development will not affect or limit the development of adjacent sites.

1.2 Roles of Engineering Geologist and Geotechnical Engineer

The investigation of the static and seismic stability of slopes is an interdisciplinary practice. The involvement of both an engineering geologist and geotechnical engineer is required. Analyses shall be performed only by or under the direct supervision of licensed professionals, competent in their respective areas of practice, and meeting the qualifications stipulated in the City geologic hazards ordinance.

An engineering geologist shall provide appropriate input to the geotechnical engineer concerning the potential impact of the geology, stratigraphy, and hydrologic conditions on the stability of slopes. The shear strength and other geotechnical engineering earth material properties shall be evaluated by the geotechnical engineer. Qualified engineering geologists and geotechnical engineers may assess and quantitatively evaluate slope

stability. However, the geotechnical engineer shall perform all design stability calculations. Ground motion parameters for use in seismic stability analysis may be provided by either the engineering geologist or geotechnical engineer.

1.3 Minimum Qualifications of the Licensed Professionals

Slope stability analyses must be performed by qualified engineering geologists and geotechnical engineers as defined in Section 2.0 of these Standards, and Sections 10-7-050, Minimum Qualifications of the Geologist, and 10-7-060, Minimum Qualifications of the Geotechnical Engineer, in the City geologic hazards ordinance.

2.0 SCOPING MEETING

The Applicant must schedule a scoping meeting with the City. A work plan prepared by the Applicant's geologic and geotechnical engineering consultants, outlining the consultant's investigative approach, shall be provided to the City before the scheduled scoping meeting. At scoping meetings, the City reviews the consultant's work plan with the Applicant and the Applicant's consultants. The work plan should allow for flexibility due to unexpected site conditions. The City understands field findings may require modifications to the work plan. Upon completion of a successful scoping meeting, and acceptance of the consultant work plan, a work plan approval letter will be issued by the City (see Section 10-7-070, Preliminary Activities, of the City geologic hazards ordinance).

Where landslides are present:

1. The proposed subsurface exploration program shall include borings (see Section 5.0).
2. For the scoping meeting, the consultant shall perform a preliminary slope stability analysis to assist in the planning of the depth of the borings and intervals for obtaining samples, particularly for obtaining samples at potential landslide slip surfaces¹ with the lowest factors of safety.
3. The following soil properties shall be used for preliminary slope stability analyses:

¹ Landslide slip surface(s): the surface along which the displaced material within a landslide moves.

a. For material above and below the potential landslide slip surface:

- i. Friction Angle = 30 degrees
- ii. Cohesion = 100 pounds per square foot
- iii. Soil Unit Weight = 135 pounds per cubic foot
- iv. No water table.

b. For the landslide slip surface material:

- i. Friction Angle = 11 degrees
- ii. Cohesion = 0 pounds per square foot
- iii. Soil Unit Weight = 135 pounds per cubic foot
- iv. No water table.

3.0 SLOPE STABILITY INVESTIGATIONS

The analysis of the stability of slopes and landslides requires a comprehensive understanding of the geologic and geotechnical engineering parameters of the particular property. Consequently, geologic, and geotechnical engineering parameters are crucial components in slope stability investigations.

Slope stability investigations shall consist, at a minimum, of the following fundamental phases:

1. Review of available published geologic/soils reports pertinent to the site and vicinity, including previous unpublished surface-fault-rupture investigations available from the City upon request².
2. Review and interpretation of available stereoscopic and oblique aerial photographs, DEMs, and lidar imagery.³

² The Utah Geological Survey Geodata Archive website contains a collection of consultant geologic and geotechnical engineering reports (UGS, 2025a).

³ The Utah Geological Survey Geodata Archive website contains a collection of stereoscopic aerial photographs dating back to 1937 (UGS, 2025b). OpenTopography provides online access earth science-oriented, lidar imagery, and topography data acquired with lidar and other technologies (OpenTopography, 2025).

3. Geologic field mapping, including, but not necessarily limited to, identification and documentation of geologic units and measurement of the bearing (strike) and inclination (dip) of bedding, foliation, fractures, jointing, faults, particularly geologic structures oriented such that the geologic structures adversely impact the stability of slopes (i.e., adverse geologic conditions).
4. Documentation and evaluation of subsurface groundwater conditions (including effects of seasonal and longer-term natural fluctuations as well as landscape irrigation), surface water, on-site sewage disposal, and/or stormwater disposal.
5. Subsurface exploration and sampling of earth materials for geotechnical engineering testing in the laboratory; testing to include determination of shear strength parameters and other pertinent geotechnical engineering properties.
6. Construction of geologic cross-sections for all slope stability analyses.
7. Where landslides are present, analysis of the geologic mode of failure, depicted on a geologic cross-section.
8. Evaluation of data obtained from the investigation and presentation of findings and recommendations in a geologic-hazards study report.

Geologic-hazards study reports for slope-stability investigations shall demonstrate each of these phases has been adequately performed and the information obtained has been considered and logically evaluated (see Section 13.0).

4.0 FACTORS OF SAFETY

The factor of safety for slope stability means the ratio of resisting forces or moments (i.e., shear strength of the soils and rock along a failure plane), to the driving forces such as gravity loads of the hillside mass, plus any loading from structures, plus live loads (e.g., traffic), and/or earthquake/seismic loads.

The City minimum required factors of safety follow:

1. Static and surficial slope stability analyses: 1.5 (see Sections 8.0 Static Slope Stability Analysis and 9.0 Surficial Stability of Slopes). If the factor of safety is less than 1.5:
 - a. mitigation is required to achieve a minimum factor of safety to 1.5.

- b. the project must be designed to achieve a minimum factor of safety of 1.5.
- 2. Calibrated pseudostatic slope stability analyses: 1.0 (see Section 10.0, Seismic Stability of Slopes). If the factor of safety is less than 1.0, the slope is susceptible to movement from ground shaking associated with an earthquake, and a deformation analysis must be performed to estimate the amount of slope movement during an earthquake).
- 3. Temporary excavations and slopes: 1.3. Mitigation measures must be recommended as necessary to maintain a minimum factor of safety of 1.3 during construction.

5.0 SUBSURFACE EXPLORATION

The purpose of subsurface exploration is to identify and document the geologic materials and structures at a site, to provide data to evaluate geotechnical engineering parameters, and, to provide samples for detailed laboratory characterization of materials from potentially critical zones. Subsurface exploration is almost always required and may be performed by several techniques, the applicability of which is discussed herein.

Where landslides are not present or suspected, subsurface exploration must be performed to provide data to evaluate geotechnical engineering parameters and to assess the potential impact of the geology, stratigraphy, and hydrologic conditions on the stability of the slope. The program of subsurface exploration must include obtaining samples of representative subsurface materials for appropriate laboratory testing.

Where landslides are present or suspected, subsurface exploration must be performed to determine the type, controlling geologic conditions, geometry, and depth of the landslide; the stability of the landslide, and the necessary mitigation to achieve the required factors of safety for landslide stability. The depth of geologic exploration must consider the regional geologic structure and the likely failure mode of the landslide (Cornforth, 2005).

5.1 Trenching

Subsurface exploration consisting of trenching has proven, in some cases, to be useful:

- 1. To evaluate subsurface conditions and potential adverse geologic conditions to depths of about 15 feet.

2. When uncertainty exists regarding whether a particular landform is a landslide, although a landslide can generally be identified from evaluation of stereoscopic aerial photographs and lidar imagery.
3. For verifying margins of landslides, although the geometry of a landslide can typically be determined from evaluation of stereoscopic aerial photographs and lidar imagery.

Care must be exercised when trenching within a landslide. Landslides characteristically contain relatively large blocks of intact geologic units, which, in trench exposures, can give the false impression the geologic unit has not been displaced by landslide movement. *Slope stability analyses for landslides, based solely on data obtained from trenches, will not be accepted unless the trenches extend to depths representative of probable landslide slip surfaces determined by the preliminary slope analyses.*

Exposures in trenches shall be documented on a trench log. Trench logs shall be carefully drawn in the field at a minimum scale of 1 inch = 5 feet. Vertical control must be used and shown on each end of trench logs. Horizontal control must be used and shown along the base of trench logs. Trench logs must document all geologic information from the trench and must graphically represent the geologic units and geologic structures observed.

Trench logs shall include, at a minimum:

1. Date of excavation.
2. Type and size of equipment used for excavation of the trench.
3. Name of person(s) responsible for logging the trench.
4. Relative location of the trench to nearest landmark or common property corner and associated accuracy in location.
5. Trench orientation.
6. An indication of the trench wall was logged.
7. Trench top and bottom.
8. Stratigraphic contacts.

9. Stratigraphic unit descriptions including lithology, prepared with standard geologic nomenclature (FGDC, 2020).
10. Geologic origin and age of the deposits.
11. USCS soil classification.
12. Contact descriptions.
13. Pedogenic horizons.
14. Marker beds.
13. Deformation or offset of sediments, faults, and fissures.
14. Location and type of soil/bedrock samples.
15. Groundwater when documented in the trench.

5.2 Drilling

When the trench technique will not extend to depths representative of probable landslide slip surfaces determined by the preliminary slope analyses, drilling must be used for:

1. Locating basal and internal landslide slip surfaces.
2. Documenting the subsurface soil and geologic conditions, particularly for geologic units with inclined bedding that includes weak layers (i.e., claystone, shale, siltstone, etc.).
3. Obtaining soil samples within the range of probable landslide slip surfaces.

Conventional subsurface exploration techniques involving continuous core drilling with an oriented core barrel, angle drilling, and auger borings are useful techniques to assess and document subsurface soil and geologic conditions.

Although not commonly used in Utah, a 24-inch-diameter bucket-auger-boring with down-hole logging can provide valuable data (provided the consultant has determined the drill hole is safe to enter). The evaluation of the safety of the proposed subsurface exploration program is the responsibility of the consultant.

The depth of the subsurface exploration must be sufficient to assess the conditions at or below the level of the deepest potential failure surface possessing a safety factor of 1.5 or less under static conditions and 1.0 or less under seismic conditions.

Boring logs must be included with all geologic-hazards study reports and shall include, at a minimum:

1. Date of drilling.
2. Type and size of drill rig used.
3. Name of person that logged the boring.
4. Relative location of boring to nearest landmark or common property corner and associated accuracy in location.
5. Stratigraphic contacts.
6. Stratigraphic unit descriptions including lithology, prepared with standard geologic nomenclature (FGDC, 2020).
7. Geologic origin and age of the deposits.
8. USCS soil classification.
9. Contact descriptions.
10. Marker beds.
11. Location and type of soil/bedrock samples.
12. Groundwater elevation, if encountered, on the day of drilling and at least 5 days after drilling is complete.

5.3 Geologic Units

Particular attention must be given to the presence or absence of weak layers during subsurface exploration (i.e., claystone, shale, siltstone, etc.). Unless demonstrably proven (through comprehensive and detailed subsurface exploration), subsurface geological weak layers, even as thin as 1/16-inch or less, are not present, a weak layer shall be assumed to occur anywhere in the stratigraphic profile (i.e., ubiquitous weak clay beds) when performing slope stability analyses.

For unconsolidated alluvium, fill materials, or other soil units not containing weak interbeds, other exploration methods such as small-diameter borings (i.e., rotary wash or hollow-stem-auger) or Cone Penetration Testing (CPT) are acceptable. When CPT soundings are used, at a minimum, one boring used for sampling and laboratory testing shall be performed next to one of the CPT soundings to verify CPT-soil behavior type interpretations.

6.0 FIELD REVIEW

A field review by the City is required during exploratory trenching. The applicant must provide a minimum of 48-hours' notice to schedule the field review with the City. The trenches shall be open, safe, cleaned, and a preliminary log completed at the time of the review. Field reviews allow the City to evaluate the subsurface data (i.e., age and type of sediments; presence/absence of faulting, etc.) with the consultant. Discussions about questionable features or an appropriate setback distance are encouraged, but the City will not help log the trench, explain the stratigraphy, or give verbal approval of the proposed development during the field review.

7.0 SOIL PARAMETERS

Soil properties, including unit weight and shear strength parameters (i.e., cohesion and friction angle), can be based on conventional field and laboratory tests as well as in-field performance tests. Laboratory tests for saturated, residual shear strengths of the weakest material along bedding or the landslide slip surface material must be performed. Strength parameters derived solely from CPT data are not appropriate for slope-stability analysis, particularly for strengths along existing landslide slip surfaces where residual strengths have developed.

Should all applicable subsurface exploration techniques prove unsuccessful in adequately documenting and sampling the weakest material along bedding and/or the landslide slip surface:

1. The weakest material present, consistent with site geologic conditions may be used if substantiated.
2. The practical limitations of subsurface exploration techniques must be acknowledged and explained in the geologic-hazards study report.

The resulting uncertainties of the subsurface exploration techniques must be acknowledged in the geologic-hazards study report, and recommendations must reflect the resulting uncertainties of the depth of subsurface exploration and deposits not documented and sampled.

7.1 Residual Shear Strength Parameters

Residual strength parameters shall be determined using either the direct shear or ring shear testing apparatus; however, ring shear tests are preferred. Soil specimens must be subjected to the necessary number of shearing cycles in the direct shear test or the necessary amount of rotation in the ring shear test to assure residual strength has developed.

In the direct-shear and ring-shear tests, the stress-deformation curves should be used to determine when the necessary number of shear cycles has been achieved. When the stress-deformation curves indicate no further decreases in shear strength with additional shearing cycles or shearing rotations, the necessary number of shear cycles has been achieved.

7.2 Interpretation of Shear Strength Parameters

The geotechnical engineer should use judgment in the selection of appropriate shear test methods and in the interpretation of the results to develop shear strength parameters commensurate with slope stability conditions to be evaluated.

The stress-deformation curves obtained during shear tests must be submitted with the other laboratory test results. It shall be recognized for most clayey soils, the residual shear strength envelope is curved and passes through the origin (i.e., at zero normal stress there is zero shear strength). Any “apparent shear strength” increases resulting from a non-

horizontal shear surface (i.e., ramping) or “bulldozing” in residual direct shear tests must be discounted in the interpretation of the strength parameters. Scatter plots of shear strength data should be presented to show idealized parameters. The geologic-hazards study report shall summarize shear strength parameters used for slope stability analyses and describe the methodology used to interpret test results and estimate shear strength parameters.

The degree of saturation for all test specimens shall be reported. Direct shear tests on partially saturated samples can grossly overestimate the cohesion that can be mobilized when the material becomes saturated in the field. This potential must be accounted for when selecting shear strength parameters. If the rate of shear displacement exceeds 0.005 inches per minute, the consultant shall provide data to demonstrate the rate is sufficiently slow for drained conditions.

Shear strengths used in slope stability analyses shall be evaluated considering the natural variability of engineering characteristics inherent in earth materials. Shear tests on each earth material identified at a site may be required.

Direct shear tests do not always provide realistic strength values (Watry and Lade, 2000). Correlations between liquid limit, percent clay fraction, and strength (fully softened and residual) with published data shall be performed to verify tested shear strength parameters (e.g., Stark and others, 2005). Strength values used in analyses that exceed those obtained by the correlation must be justified.

Shear strengths of fill materials for proposed fill slopes shall be evaluated using samples mixed and remolded to represent anticipated field conditions. Confirming shear strength testing of fill materials shall be completed during grading. In situations where strength degradations are not expected to occur, peak shear strengths may be used to represent across-bedding failure surfaces or compacted fill. Fully softened (or lower) strengths shall be used for saturated colluvial materials having the potential for soil creep.

When there has not been past landslide deformation, ultimate shear strength parameters shall be used in static slope stability analyses. When there has been past landslide deformation, residual shear strength parameters shall be used in static slope stability analyses.

Averaged strength parameters may be appropriate for some across-bedding conditions if sufficient representative samples have been carefully tested. Analyses for along-bedding or along-existing-landslide slip surfaces shall be based on lower-bound interpretations of

residual shear strength parameters and comparison of those results to correlations, such as those of Stark and others (2005).

7.3 Default Soil Parameters

In the Traverse Mountain area, landslide slip surfaces for known landslides commonly occur in the Tertiary-age volcanic deposits. The landslide slip surfaces typically are along clay layers formed by the in-situ alterations of tuff layers. In cases when landslide slip surfaces have been sampled and tested, relatively low residual-shear-strength values of cohesion equal 0 psf and friction angles equal 11 to 12 degrees have been reported. Similar values have been reported from the Springhill landslide in North Salt Lake, occurring in a similar Tertiary-age tuffaceous volcanic formation .

Based on existing shear strength parameters of the Tertiary-age volcanics at Traverse Mountain, the following shear strength parameters for landslide slip surfaces and weak layers in the Tertiary volcanics shall be used (unless demonstrated otherwise):

1. Cohesion = 0 psf.
2. Friction angle = 11 degrees.

If site-specific testing produces lower residual shear strength parameters than the default values, the site-specific test results should be used. If site-specific testing produces higher values, documentation must be provided to demonstrate:

1. The weakest materials were retrieved and tested.
2. The materials retrieved represent the basal landslide slip surface.

8.0 STATIC SLOPE STABILITY ANALYSIS

The following guidelines must be followed when evaluating static slope stability for slopes, landslides, and temporary stability of excavations:

1. Static slope stability shall be analyzed along cross-sections depicting the most adverse conditions (e.g., highest slope, steepest slope, most adverse bedding planes, shallowest likely groundwater table, etc.). Often several analyses are required to characterize different site conditions and several cross-sections to demonstrate the most adverse site condition.

2. When evaluating the static stability of an existing landslide, slope stability analyses must also address the potential for partial reactivation. Inclinometers can be used to determine critical landslide slip surfaces and, along with high-resolution GPS, the rate of movement of existing landslides. Critical slip surfaces shall be depicted on the slope stability cross-sections.
3. Long-term stability shall be analyzed using the highest known or anticipated groundwater level based upon a groundwater assessment performed under the requirements of Section 5.0, Subsurface Exploration.
4. Where back-calculation is appropriate for landslide analyses, shear strengths used for design shall be no higher than the lowest strength computed using back-calculation (see Cornforth, 2005). Justification shall be required to use shear strength values higher than back-calculated shear strength values. Assumptions used in back-calculations regarding pre-sliding topography and groundwater conditions at failure must be substantiated in the geologic-hazards study report.
5. Shear strength values higher than those obtained through site-specific laboratory tests shall not be accepted.
6. If direct shear or triaxial shear testing is not appropriate to model the strength of highly jointed and fractured rock masses, the design strengths shall be evaluated in a manner that considers overall rock mass quality and is consistent with the practice of rock mechanics.
7. Where bedding planes are laterally unsupported on slopes, potential failures along the unsupported bedding planes shall be analyzed. Similarly, stability analyses shall be performed where bedding planes form a dip-slope or near-dip-slope using composite potential failure surfaces that consist of potential slip surfaces along bedding planes in the upper portions of the slope in combination with slip surfaces across bedding planes in the lower portions of the slope.
8. Stability analyses shall include the effect of expected maximum moisture conditions on soil unit weight.
9. For effective stress analyses, measured groundwater conditions adjusted to potentially unfavorable conditions with respect to anticipated future groundwater levels, seepage, or pore pressure shall be included in the slope stability analyses.

10. Tension crack development shall be considered in the analyses of potential failure surfaces. The height and location of the tension crack shall be determined by searching.
11. Anticipated surcharge loads, as well as external boundary pressures from water, shall be included in slope stability analyses, as deemed appropriate.
12. Analytical chart solutions may be used provided the analytical charts were developed for similar site conditions. Otherwise, computer-aided search techniques shall be used to locate the potential failure surface with the lowest factor of safety. Substantiation of the analytical results must be provided in the geologic-hazards study report.

Both the lowest factor of safety and the critical failure surface shall be documented. The critical potential failure surface determined from slope stability analyses may be composed of circles, wedges, planes, or other shapes that could potentially yield the minimum factor of safety most appropriate for the geologic site conditions. The critical potential failure surface having the lowest factor of safety with respect to shearing resistance must be sought.

9.0 SURFICIAL STABILITY OF SLOPES

Slopes must be analyzed for surficial stability to a depth of 4 ft. The slumping and sliding of near-surface sediments are most critical during the seasonal snowmelt, periods of heavy prolonged precipitation, or when excessive landscape water is applied.

The assessment of surficial slope stability shall be based on analysis procedures for the stability of an infinite slope with seepage parallel to the slope surface or an alternate failure mode that would produce the minimum factor of safety. The minimum acceptable depth of saturation for surficial stability evaluation shall be 4 feet.

Soil creep as used herein means the steady downhill movement of material at an imperceptible rate (e.g., deformation continuing under constant stress) (Cruden and Varnes, 1996). All geologic-hazards study reports in hillside areas shall address the potential for soil creep. If identified, the potential effects of soil creep shall be addressed where any proposed structure is planned within 10 feet to an existing natural slope, by either infinite or translational stability analyses. The potential effects on the proposed

development shall be evaluated and mitigation measures proposed as deemed appropriate, including setback recommendations.

9.1 Applicability and Procedures

Conclusions must be substantiated with appropriate data and analyses in the geologic-hazards study report. Shear strengths comparable to actual field conditions shall be used in completing surficial stability analyses. Surficial stability analyses shall be performed under rapid draw-down conditions where appropriate (e.g., for debris and detention basins).

Where 2:1 (horizontal: vertical) or steeper slopes have soil conditions that can result in the development of an infinite slope with parallel seepage, calculations shall be performed to demonstrate that the slope has a minimum static factor of safety of 1.5, assuming a fully saturated 4-foot thickness. If conditions will not allow the development of a slope with parallel seepage, surficial slope stability analyses may not be required (provided the City geologic/geotechnical engineer consultants concur).

Surficial slope stability analyses shall be performed for fill, cut, and natural slopes assuming an infinite slope with seepage parallel to the slope surface or other failure mode that would yield the minimum factor of safety against failure.

9.2 Soil Properties

Soil properties used in surficial stability analyses shall be determined as noted in Section 7.0, Soil Parameters. Residual shear strength parameters for surficial slope stability analyses shall be used for soil creep analysis. Softened soil strengths shall be used for all other surficial stability analyses developed for a stress range consistent with the near-surface conditions being modeled.

9.3 Seepage Pressure

The minimum acceptable vertical depth for which saturation parallel to the slope shall be applied is 4 feet for natural and man-made slopes. The vertical depth of saturation should be increased to the depth of loose fill placed on the surface of the slope or loose surficial material if greater than 4 feet. The seepage pressure to be added in the global stability analyses of a detention or retention pond shall be determined through a flow net analysis, finite element numerical analysis, or the seepage pressure can be modeled using pore water pressure as a piezometric line.

10.0 SEISMIC SLOPE STABILITY ANALYSIS

When the factor of safety for calibrated pseudostatic stability analyses is less than 1.0, a deformation analysis must be performed to estimate the amount of slope movement from ground shaking during an earthquake. The method used for performing the deformation analysis must be described in the geologic-hazards study report. All variables used in the deformation analysis must be substantiated.

10.1 Ground Motion for Pseudostatic and Seismic Deformation Analyses

The controlling faults for the City are the Salt Lake City, Fort Canyon, and Provo segments of the Wasatch fault zone (WFZ). Repeated Holocene normal-slip movement has been well documented along the segments (WGUEP, 2016; DuRoss and Hylland, 2015).

For determining the minimum design loads and associated criteria for buildings and other structures, the City uses the most current version of the American Society of Civil Engineers (ASCE)-7 (presently ASCE, 2016). In regard to design ground accelerations for seismic slope-stability analyses, ASCE-7 allows either a probabilistic or deterministic approach to determining the likelihood of different levels of ground motion that will be exceeded at a particular site within a given time period. To remain consistent with the current International Building Code (ICC, 2017) and ASCE-7 documents, slope stability analyses shall be based on the modified peak acceleration (PGA_M) with a 2 percent probability of exceedance in 50 years (2,500-year return period).

Modified peak bedrock ground motions can be obtained via the internet from the ASCE⁴ or from the California's Office of Statewide Health Planning and Development (OSHPD) website⁵. Site-specific response analysis may also be used to develop PGA values as long as the procedures are in accordance with the current ASCE-7, input data are provided, and results are documented in the geologic-hazards study report.

10.2 Seismic (Pseudostatic) Slope Stability Evaluations

Pseudostatic analysis for evaluating seismic slope stability is acceptable as long as the minimum factor of safety is met. Pseudostatic seismic slope stability analyses should be performed using a seismic coefficient (k_h) equal to $\frac{1}{2}$ the $PGAM$ (see Section 10.1). If the

⁴ <http://asce.org>

⁵ <http://seismicmap.org>

City mandated factor of safety of 1.0 or greater is not met, a deformation analysis must be performed to estimate the amount of slope movement from ground shaking during an earthquake (see Section 10.3).

10.3 Permanent Seismic Slope Deformation Analyses

The method used for performing deformation analyses to estimate the amount of slope movement from ground shaking during an earthquake must be described in the geologic-hazards study report. Bray and Travarasrou (2009), or the most current version thereof, is currently the City's preferred method. For deformation analyses, calculated seismic displacements shall be 5 cm or less, or mitigation measures must be recommended to constrain calculated displacements to 5 cm or less. Should the City's preferred method for performing deformation analyses change, the Applicant and the Applicant's consultants will be notified at the project scoping meeting.

If using Bray and Travarasrou (2009):

1. The input for the Moment Magnitude for sites within the City shall be 7.1.
2. The probable deformation shall not be less than the displacement calculated for a probability of exceedance of 50%.
3. The spectral acceleration at 1.5 times the fundamental period of the slope shall be taken from the spectral acceleration curve based on the 2% probability of exceedance in 50 years adjusted for the appropriate site class.
4. The printout of the pseudostatic analysis used to determine the yield coefficient (k_y) as well as the displacement calculations must be submitted with the geologic-hazards study report.

For specific projects, different levels of tolerable displacement may be possible, however the following site-specific conditions must be considered:

1. The extent to which the displacements are localized or broadly distributed: broadly distributed shear deformations would generally be less damaging, potentially allowing larger displacements
2. The displacement tolerance of the foundation system: stiff, well-reinforced foundations with lateral continuity of vertical support elements are generally more

resistant to damage than typical slabs-on-grade type with individual spread footings, consequently, possibly allowing greater displacements.

3. Foundations placed on slopes composed of soils are likely to experience strain-softening which could involve very large displacements following strain-softening if peak strengths are used in the evaluation of k_y .

Foundations placed on slopes composed of soils to experience strain-softening: slopes composed of soils likely to experience strain-softening should be designed for relatively low displacements if peak strengths are used in the evaluation of k_y due to the potential for progressive failure, which could involve very large displacements following strain softening.

To consider a threshold larger than 5 cm, the project consultant must provide prior, acceptable justification to the City and obtain the City's approval. Such justification must demonstrate, to the satisfaction of the City, the proposed project can be developed to an acceptable and reasonable risk as defined in the City geologic hazards ordinance.

11.0 WATER RETENTION BASINS AND FLOOD CONTROL CHANNELS

Static and seismic slope stability analyses shall be performed for cut, fill, and/or natural slopes associated with water-retention basins and flood-control channels. The slope stability analyses shall include the effects of rapid drawdown (if applicable).

12.0 MITIGATION

When unstable slopes and/or landslides are determined to exist on a property, mitigation measures resulting in factors of safety in excess of 1.5 for the static slope stability analyses and acceptable seismic displacement estimates shall be implemented such that the property can be developed to an acceptable and reasonable risk as defined in the City geologic hazards ordinance.

Mitigation measures intended to add stabilizing forces to slopes should include strain compatibility as follows:

1. The amount of deformation needed to mobilize the recommended shear strength in buttresses proposed to stabilize laterally unsupported bedding or a landslide. The amount of deformation must be included in the analyses to confirm buttresses will not allow adverse movements of the upslope bedding or landslide deposits.

2. Soldier pile deformations resulting from movements needed to mobilize the soil's shear strength when drilled soldier piles are proposed to support a potentially unstable slope. If residential structures are to be directly or indirectly supported by the soldier piles, pile deformations must be compared to tolerable deflections in the supported structures.

13.0 REPORT SUBMITTALS

Geologic-hazards study reports for slope stability investigations shall be prepared in accordance with the City geologic hazards ordinance. If the geologic-hazards study report contains geotechnical engineering recommendations, the geotechnical engineering part of the geologic-hazards study report must be prepared in accordance with these Standards.

Geologic-hazards study reports for slope stability investigations submitted to the City are expected to follow the outline and address the subjects presented herein. Variations in site conditions may require additional items to be addressed or permit some items to be omitted (except as noted).

Geologic-hazards study reports for slope stability investigations shall include, at a minimum:

1. All items required in Section 10-7-100(I), Geologic Hazards Study Reports, of the City geologic hazards ordinance.
2. Boring, trench, and test pit logs.
3. Analytical results, including computer output files.
4. Summaries of the slope stability analyses and conclusions regarding slope stability.
5. A discussion of:
 - a. The development of idealized subsurface conditions and the shear strength parameters used in the slope stability analyses.
 - b. The engineering analysis.
 - c. The slope stability analyses.

6. Laboratory data (particularly shear strength test results, including individual stress-deformation plots from direct shear tests).
7. A description of the appropriateness of the shear strength testing methods used in modeling field conditions and the long-term performance of the subject slope. Design shear strength values used shall be justified with laboratory test data and geologic descriptions and history, along with past performance history, if known, of similar materials.
8. Shear strength test plots consisting of normal stress versus shear resistance (failure envelope). Plots of shear resistance versus displacement shall be provided for all residual and fully softened (ultimate) shear tests.
9. An evaluation of whether mitigation measures are required, including an evaluation of multiple mitigation options. (See Section 10-7-100(I)(14) of the City geologic hazards ordinance.)
10. Specific recommendations for mitigation of the effects of identified hazards, consistent with the purposes set forth in Section 10-7-010, of the City geologic hazards ordinance, including design or performance criteria for engineered mitigation measures, including all supporting calculations, analyses, modeling, or other methods, and assumptions. Final design plans and specifications for engineered mitigation must be signed and sealed in blue ink by a qualified geotechnical and civil and/or structural engineer, as appropriate. (See Section 10-7-100(I)(15) of the City geologic hazards ordinance.) Mitigation measures must be reasonable and practical to implement especially if the mitigation measures require ongoing maintenance by property owners. (See Section 10-7-110(F)(9) of the City geologic hazards ordinance.)
11. Subsurface geologic and groundwater conditions illustrated on geologic cross-section(s) prepared by the qualified engineering geologist. The geologic cross-section must be used by the geotechnical engineer for slope stability analyses. When on-site sewage or stormwater disposal exists or is proposed, the slope stability analyses shall include the effects of the effluent plume on the stability of the slope.
12. The results of all slope stability analyses submitted with pertinent backup documentation (i.e., calculations, computer output, etc.). Printouts of input data, output data, and graphical plots must be submitted for each computer-aided slope

stability analysis. In addition, input data files, recorded on diskettes, CDs, or other electronic media may be requested by the City to facilitate the City's review.

13. A statement addressing potential impacts of the geology, stratigraphy, and hydrologic conditions on the stability of slopes.
14. A conclusion regarding the stability of slopes and impacts of geologic hazards on the development of the site.
15. A statement the proposed development and buildable area depicted on the site plan meet the requirements of the City geologic hazards ordinance.
16. Recommendations for development and mitigation of the property.

14.0 DRAPER CITY REVIEW

All geologic-hazards study reports for slope stability investigations performed in the City will be reviewed by the City's retained reviewers and permanently filed with the City. The City's reviewers will evaluate geologic-hazards study investigations and geologic-hazards study reports for conformance with the City geologic hazards ordinance and applicable City codes and advise the City regarding the conformance of the consultant geologic-hazards study investigation and geologic-hazards study reports with the City geologic hazards ordinance and applicable City codes (see Section 10-7-110, Review of Geologic Hazards Study Reports, of the City geologic hazards ordinance).

When a geologic-hazards investigation and geologic-hazards study report comply with the City geologic hazards ordinance and applicable City codes, the City reviewers will prepare a report to the City recommending the City consider the geologic-hazards investigation and geologic-hazards study report *complete*.

When the geologic-hazards study investigation and geologic-hazards study report is not performed in compliance with the City geologic hazards ordinance and applicable City codes, the City reviewers will prepare a report to the City recommending the City consider the geologic-hazards study investigation and geologic-hazards study submittal report incomplete. The reviewer's report(s) shall list/explain the parts of the consultant's geologic-hazards study investigation and geologic-hazards study report not in compliance with the City geologic hazards ordinance and/or applicable City codes.

The City reviewers do not approve consultant documents or the supporting data in consultant documents. The City reviewers recommend the City either consider a consultant submittal complete or incomplete in accordance with applicable City codes and ordinances.

15.0 DISCLOSURE OF GEOLOGIC HAZARDS STUDY REPORTS

Whenever a geologic-hazards study report is required, the owner of the parcel must record a notice running with the land in a form satisfactory to the City before the approval of any development or subdivision of such parcel (see Section 10-7-120 of the City geologic hazards ordinance). Disclosure shall include signing a Disclosure and Acknowledgment Form provided by the City, which includes:

1. Notice the parcel is located within a City geologic-hazard-study area as shown on the Draper City webpage geologic information application or as otherwise defined herein.
2. Notice a geologic-hazards study report was prepared and is available for public inspection in the City's files.

Where geologic hazards and related setbacks are delineated in a subdivision, the Applicant shall also place an additional notification on the City plat map stating the above information.

16.0 NOTICE OF GEOLOGIC HAZARDS AND WAIVER OF LIABILITY

For developments where full mitigation of seismic slope displacements is not implemented, a Notice of Geologic Hazard shall be recorded with the proposed development describing the displacement hazard at issue and the partial mitigation employed. The Notice shall clearly state that the seismic displacement hazard at the site has been reduced by partial mitigation, but not totally eliminated.

In addition, the owner shall assume all risks, waive all claims against the City and its consultants, and indemnify and hold the City and its consultants harmless from any and all claims arising from the partial mitigation of the seismic displacement hazard.

APPENDIX C - MINIMUM STANDARDS FOR LIQUEFACTION INVESTIGATIONS

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	GENERAL REQUIREMENTS	6
3.0	SCOPING MEETING.....	6
4.0	PRELIMINARY SCREENING FOR LIQUEFACTION	6
5.0	FIELD INVESTIGATIONS	8
6.0	GROUND MOTION FOR LIQUEFACTION ANALYSES.....	10
7.0.	EVALUATION OF LATERAL SPREAD IN LIQUEFACTION-PRONE SOILS.....	10
8.0	SUBMITTALS	11

1.0 INTRODUCTION

This Appendix presents the minimum standards and methods for performing liquefaction investigations in the City and preparing geologic-hazards study reports for liquefaction hazard investigations. These standards constitute the minimum standards and methods required when conducting liquefaction investigations in the City.

Considering the complexity inherent in performing liquefaction investigations, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address the liquefaction potential of a property. The minimum standards presented herein do not relieve consultants of their professional responsibility to perform additional geologic or geotechnical engineering analyses they believe are necessary to adequately assess the liquefaction potential at a site.

The purpose of establishing minimum standards for liquefaction investigations is to:

1. Protect the health, safety, welfare, and property of the public by minimizing the potential adverse effects of liquefaction and related hazards.
2. Assist property owners and land developers in conducting reasonable and adequate studies.
3. Provide consultants with a common basis for preparing proposals, conducting investigations, and formulating mitigation measures.
4. Provide an objective framework for municipal review of geologic-hazards study reports liquefaction investigations.

1.2 Liquefaction Factor of Safety

The factor of safety for liquefaction resistance is defined as the cyclic stress ratio required (CRR) to generate liquefaction divided by the cyclic stress ratio (CSR) generated by the anticipated earthquake ground motions at the site:

$$\text{Factor of Safety} = \text{CRR/CSR}$$

Acceptable factors of safety for liquefaction studies in the City are shown in the table in Section 1.3.

1.3 Properties Requiring Liquefaction Analyses

The Liquefaction Potential Geologic Overlay Map, may be viewed at the City online map portal via the geologic information application, depicts generalized liquefaction susceptibility areas for the City and shall be used to determine whether or not a site-specific liquefaction assessment is required for a particular property.

Site-specific liquefaction investigations required in the City geologic hazards ordinance are based on modified IBC risk category of buildings and other structures (modified from 2018 Table 1604.5 (ICC, 2017)¹:

IBC Risk Category ²	Liquefaction Study Required	Required Safety Factor
I - Buildings and other structures that represent a low hazard to human life in the event of failure	No	not applicable
II(a) - Single-family dwellings.	See Section 1.4	1.25
II(b) - Buildings and other structures except those listed in Risk Categories I, II(a), III, and IV	Yes	1.25
III Buildings and other structures that represent a substantial hazard to human lives in the event of failure	Yes	1.3
IV - Buildings and other structures designated as essential facilities	Yes	1.3

¹ See ICC (2024) chapter 3, Use and Occupancy Classification (p. 45) and chapter 16, Structural Design, table 1604.5 (p. 364) for a complete list of structures/facilities included in each IBC Risk Category. Check table 1604.5 if a question exists regarding which Risk Category a structure falls under.

² Risk Category I - includes but is not limited to agricultural facilities, certain temporary facilities, and minor storage facilities.
Risk Category II - includes subcategories II(a) and II(b) to reflect the lower hazard associated with single-family dwellings and apartment complexes and condominiums with <10 dwelling units.

1. Risk Category II(a) - single-family dwellings.
2. Risk Category II(b) - buildings and other structures except those listed in Risk Categories I, II(a), III, and IV; includes but not limited to:
 - a. many businesses, factory/industrial, and mercantile facilities.
 - b. public assembly facilities with an occupant load ≤ 300 (e.g., theaters, concert halls, banquet halls, restaurants, community halls).
 - c. adult education facilities such as colleges and universities with an occupant load ≤ 500 .
 - d. other residential facilities (e.g., boarding houses, hotels, motels, care facilities, dormitories with >10 dwelling units).
3. *Risk Category III*—includes but not limited to:
 - a. public assembly facilities with an occupant load > 300 , schools (elementary, secondary, daycare).
 - b. adult education facilities such as colleges and universities with an occupant load > 500 .
 - c. Group I-2 occupancies (medical facilities without surgery or emergency treatment facilities) with an occupant load >50 .
 - d. Group I-3 occupancies (detention facilities for example jails, prisons, reformatories, detention facilities) with an occupant load >5 .
 - e. any other occupancy with an occupant load >5000 .
 - f. power-generating stations, water-treatment plants, wastewater treatment facilities, and other public utility functions not included in risk category IV.
 - g. buildings and other structures not included in risk category IV that contain quantities of toxic or explosive materials.
4. *Risk Category IV*—includes but is not limited to:
 - a. Group I-2 occupancies having surgery or emergency treatment facilities.
 - b. fire, rescue, ambulance, police stations, and emergency vehicle garages.
 - c. designated emergency shelters: emergency preparedness, communication, and operations centers and other facilities required for emergency response.

- d. power-generating stations and other public utility facilities are required as emergency backup facilities for Risk Category IV structures.
- e. buildings and other structures containing quantities of highly toxic materials.
- f. aviation control towers, air traffic control centers, and emergency aircraft hangars.
- g. buildings and other structures that have critical national defense functions.
- h. water-storage facilities and pump structures that are required to maintain water pressure for fire suppression.

1.4 Liquefaction Hazard Assessment Waiver – Residential Dwellings

A liquefaction investigation will be waived for wood framed residential structures if:

1. Liquefaction hazard reduction measures are to be included in the design and construction of the structures.
2. A Utah licensed structural engineer prepares a signed and sealed letter demonstrating the proposed design measures and the expected behavior of the structure should liquefaction occur, do not need to be implemented because the residential structure(s) has been designed to withstand at least 4 to 12 inches of vertical and horizontal liquefaction induced ground displacements¹ with respect to life safety.

Risk to the occupants and potential damage to the structure must be addressed, and the structural engineer must demonstrate the life safety of occupants will be preserved should liquefaction occur. The letter must explain what hazard reduction measures are included in the design of the structure, or explain why none should be required.

If such a letter cannot be obtained from a Utah licensed structural engineer, a liquefaction hazard investigation must be performed per this appendix. If a structural engineer has not been retained by the applicant, as may be case for residential subdivision sites, then the liquefaction hazard investigation may be waived for Plat approval at the discretion of the City building official if the geotechnical engineer indicates the liquefaction hazard will not prevent

¹ see Figure 8-1, p. 20, Figure 8-2, p. 21, and Figure 8-7, p. 27, in Bartlett and others, 2007.

development of the property. The letter from the structural engineer or a site specific liquefaction analysis will be required for the building permit application.

A disclosure notice referencing the letter from the Utah licensed structural engineer will be required to be completed by the applicant and filed with the City prior to issuing a building permit.

1.5 Roles of Engineering Geology and Geotechnical Engineering

The investigation of liquefaction hazards is an interdisciplinary practice. The site investigation report must be prepared by a qualified engineering geologist or geotechnical engineer, who must have competence in the field of seismic hazard evaluation and mitigation, and be reviewed by a qualified engineering geologist or geotechnical engineer, also competent in the field of seismic hazard evaluation and mitigation.

Because of the different expertise and abilities of qualified engineering geologists and geotechnical engineers, the scope of the site investigation report for the project may require that both professionals prepare and review the report, each practicing in the area of their expertise. The involvement of both a qualified engineering geologist and geotechnical engineer is not required but will generally provide greater assurance that the hazard is properly identified, assessed, and mitigated.

Liquefaction analyses are the responsibility of the geotechnical engineer, although the engineering geologist should be involved in the application of screening criteria (see Section 3.0, steps 1 and 2) and general geologic site evaluation (see Section 4.1) to map the likely extent of liquefiable deposits and shallow groundwater. Geotechnical engineers shall:

1. Evaluate the engineering properties of subsurface earth material.
2. Perform the quantitative liquefaction analysis resulting in a numerical factor of safety and quantitative assessment of settlement and liquefaction-induced permanent ground displacement.

The geotechnical and civil engineers shall develop all mitigation and design recommendations. Ground motion parameters for use in quantitative liquefaction analyses may be provided by either the engineering geologist or geotechnical engineer.

1.6 Minimum Qualifications of the Licensed Professional

Liquefaction analyses in the City must be performed by qualified engineering geologists and qualified geotechnical engineers as defined in Section 2.0 of these Standards, and Sections 10-7-050 and 10-7-060 of the City geologic hazards ordinance.

2.0 GENERAL REQUIREMENTS

Except for the derivation of ground motion parameters for use in quantitative liquefaction analyses (see Section 6.0), liquefaction investigations should be performed in general accordance with the latest version of Recommended Procedures for Implementation of California Division of Mines and Geology Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California (Martin and Lew, 1999). Additional protocol for liquefaction investigations is provided in Youd and Idriss (1997). See the City geologic hazard ordinance for supplemental requirements.

3.0 SCOPING MEETING

The applicant must schedule a scoping meeting with the City. A work plan prepared by the applicant's geologic and geotechnical engineering consultants, outlining the consultant's investigative approach, shall be provided to the City before the scheduled scoping meeting. All work plans shall include the original or electronic signature and professional seal, in blue ink, of the qualified professional(s) responsible for the work. At scoping meetings, the City reviews the consultant's work plan with the Applicant and the Applicant's consultants.

The work plan should allow for flexibility due to unexpected site conditions. The City understands field findings may require modifications to the work plan. Upon completion of a successful scoping meeting, and acceptance of the consultant work plan, a work plan approval letter will be issued by the City (see Section 10-7-070, Preliminary Activities, of the City geologic hazard ordinance).

4.0 PRELIMINARY SCREENING FOR LIQUEFACTION

The Liquefaction Special Study Area map is based on broad regional studies and does not replace site-specific studies. The presence of a site in a designated potential liquefaction area does not automatically indicate a liquefaction hazard

exists; it only indicates that a liquefaction hazard investigation must be performed to determine whether a liquefaction hazard may be present.

Soil liquefaction is caused by strong seismic ground shaking where saturated, cohesionless, granular soil undergoes a loss in shear strength that can result in settlement and permanent ground displacement. Surface effects of liquefaction include settlement, bearing capacity failure, ground oscillations, lateral spread, and flow failure. It has been well documented that soil liquefaction may occur in clean sands, silty sands, and sandy silt, non-plastic silts, and gravelly soils (Youd and Gilstrap, 1996; Boulanger and Idriss, 2004; Bray and Sancio, 2006). All of the following conditions must be present for liquefaction to occur:

1. Soils *must be* submerged below the water table.
2. Soils *must be* loose to moderately dense.
3. The intensity and duration of ground shaking *must be* sufficient for the soils to generate seismically-induced excess pore water pressure and lose shearing resistance.

The following criteria may be used to assess when a quantitative evaluation of potential liquefaction hazard may not be necessary:

1. When the estimated maximum historical, present, and/or future groundwater levels are determined to be deeper than 50 feet below the existing ground surface or proposed finished grade (whichever is greater).
2. When “bedrock” or similar solid, lithified, very dense, and very hard formational material underlies the site.
3. If the corrected standard penetration blow count, $(N1)_{60}$, is greater than or equal to 33 in all samples.

During a quantitative evaluation of a potential liquefaction hazard the following subsurface soils may be considered non-liquefiable:

1. When samples with corrected standard penetration blow count, $(N1)_{60} \geq 33$.

2. The corrected cone penetration test tip resistance, qc_{1N} , in cone penetration test hat are ≥ 180 .
3. The plastic soils (i.e., Plastic Limits ≥ 20).

5.0 FIELD INVESTIGATIONS

5.1 Geologic Reconnaissance

Geologic research and reconnaissance are important to provide information to define the extent of unconsolidated deposits that may be prone to liquefaction. Such information should be presented on geologic maps and cross-sections and describe the formations present at the site that includes the nature, thickness, and origin and age of deposits with liquefaction potential.

There also should be an analysis of current groundwater conditions at the site, the highest historical water levels, and the estimated highest water level likely to occur under the most adverse foreseeable conditions in the future.

During the field investigation, the engineering geologist should map the limits of unconsolidated deposits with liquefaction potential. Liquefaction typically occurs in cohesionless silt, sand, and fine-grained gravel deposits of Holocene to late Pleistocene age in areas where the groundwater is shallower than about 50 feet.

Shallow groundwater conditions may exist for a variety of reasons, some of which are of natural and or manmade origin. Landscape irrigation, on-site sewage disposal, and unlined manmade drainage canals, lakes, reservoirs, and detention basins may create a shallow groundwater table in previously unsaturated sediments.

5.2 Subsurface Explorations

Subsurface explorations may consist of drilled-borings and/or cone penetration tests.

The exploration program shall be planned to determine the soil stratigraphy, groundwater level, and subsurface soil indices required to evaluate the liquefaction potential by either geotechnical engineering in situ and/or laboratory testing of soil samples. Borings and CPT soundings must penetrate a minimum of:

1. Fifty (50) feet below final ground surface for native and proposed fill sites.

For saturated cohesionless soils where the SPT $(N1)_{60}$ values are less than 15, or where cone penetration test tip resistances are below 60 tons per square foot (tsf), grain-size analyses, hydrometers tests, and Atterberg Limits tests shall be performed on these soils to further evaluate their potential for permanent ground displacement (Youd et al., 2002) and other forms of liquefaction-induced ground failure and settlement. These same tests shall be performed on saturated cohesionless soils with SPT $(N1)_{60}$ values between 15 and 30 to further evaluate the potential for liquefaction-induced settlement.

Where a structure may have subterranean construction or deep foundations (e.g., caissons or piles), the depth of investigation should extend to a depth that is a minimum of 20 feet below the lowest expected foundation level (e.g., caisson bottom or pile tip) or 50 feet below the existing ground surface or lowest proposed finished grade, whichever is deeper.

During a liquefaction investigation, if the liquefaction indices indicate that the liquefaction potential may extend below those depths, the exploration should be continued until a thickness of at least 10 feet of non-liquefiable soils are documented.

5.3 Spatial Frequency of Tests

At a minimum, standard penetration tests for liquefaction analyses shall be performed at intervals no more than 2.5 feet. Cone penetration tests for liquefaction should be continuous.

For parcels ≤ 1 -acre, one liquefaction boring will be sufficient. For larger parcels, the horizontal spacing between borings for liquefaction analyses:

1. Shall depend on the specific project, but must not exceed 500 feet.
2. Will be reviewed and modified, if deemed appropriate, during the project scoping meeting.

6.0 GROUND MOTION FOR LIQUEFACTION ANALYSES

The two controlling faults most impacting the City are the Salt Lake City and Provo segments of the Wasatch fault zone (WFZ). Repeated Holocene movement has been well documented along both segments (DuRoss and Hyland, 2015).

For determining the minimum design loads and associated criteria for building and other structures, the City uses the most current version of the American Society of Civil Engineers (ASCE)-7 (presently 2016). In regard to design ground accelerations for liquefaction analyses, ASCE-7 allows either a probabilistic or deterministic approach to determining the likelihood of different levels of ground motion that will be exceeded at a particular site within a given time period. To be consistent with current IBC and ASCE-7 documents, liquefaction analyses shall be based on the modified peak acceleration (PGA_M) with a 2 percent probability of exceedance in 50 years (2,500-year return period).

Modified peak bedrock ground motions can be obtained via the internet from the ASCE or from California's Office of Statewide Health Planning and Development (OSHPD) website, seismicmaps.org which is based on Petersen and others (2014)². Site-specific response analysis may also be used to develop PGA values as long as the procedures, input data, and results are thoroughly documented, and in accordance with the current ASCE-7.

7.0. EVALUATION OF LATERAL SPREAD IN LIQUEFACTION-PRONE SOILS

Estimates of the amount of lateral spread, and measures to mitigate the hazard must be provided if liquefaction-prone soils are identified. The methodology used to evaluate the lateral spread hazard at the property must be from a published document and cited for review. The method should be discussed at the City scoping meeting.

Generally lateral spread occurs in cohesionless sands and gravels. A site must meet the following criteria for lateral spread to occur:

1. The lateral spread susceptible layers should be relatively continuous.

² <http://Seismicmap.org>

2. The free face ratio³ should be between 1 and 20 percent.
3. The ground slope should be between 0.1 and 6 percent.
4. The lateral spread susceptible layers should be at least about 3 feet (1 m) thick but no greater than about 50 feet (15 m) thick.
5. The depth to the top of lateral spread zone or layers should be less than about 35 feet (10 m).

8.0 SUBMITTALS

Submittals for review shall include:

1. Boring/CPT logs.
2. The methodology used, with complete citation.
3. Laboratory data.
4. Subsurface conditions and parameters used for analyses.
5. Liquefaction calculations, submitted with pertinent backup documentation (i.e., calculations, computer output, etc.).
6. Estimates of ground settlement, lateral spread, and measures to mitigate the hazard if liquefaction-prone soils are identified.
7. A signed and sealed letter from a Utah licensed structural engineer acknowledging receipt of the liquefaction investigation report, stating the proposed liquefaction-hazard reduction design measures, and the expected behavior of the structure during an earthquake with respect to life safety.

If on-site sewage or storm-water disposal exists or is proposed, the liquefaction analyses shall include the effects of the effluent plume on liquefaction potential.

³ Free face ratio means the height of the free face divided by the distance of the site behind the free face times 100.

9.0 DISCLOSURE OF GEOLOGIC HAZARD REPORT

The owner of the parcel must record a notice running with the land disclosing the geologic hazards study report for the property; see Section 10-7-120 of the City geologic hazards ordinance. The disclosure of the geologic hazards report must be completed before the approval of any development or subdivision of such parcel.

APPENDIX D - MINIMUM STANDARDS FOR DEBRIS FLOW INVESTIGATIONS

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	MINIMUM QUALIFICATIONS OF INVESTIGATORS	1
3.0	INVESTIGATIVE METHODS.....	2
4.0	SCOPING MEETINGS.....	2
5.0	SUBSURFACE EXPLORATIONS.....	2
6.0	CHANNEL SEDIMENT BULKING AND FLOW-VOLUME ESTIMATION	3
7.0	DEBRIS-FLOW HAZARDS REPORT	4
8.0	RISK REDUCTION MEASURES.....	5

1.0 INTRODUCTION

The procedures outlined herein are intended to provide consultants with a general outline for performing uniform debris flow hazard investigations on alluvial fans and engineering measures to mitigate the debris flow hazards in Draper City, Utah. These standards constitute the minimum level of effort required in conducting debris flow hazard investigations in Draper City.

Debris flows are fast moving, flow-type landslides composed of a slurry of rock, mud, organic matter, and water that move down drainage basin channels onto alluvial fans. In addition to threatening lives, debris flows can damage structures and infrastructure by sediment burial, erosion, direct impact, and associated water flooding.

Debris flow investigations are required for:

1. Areas depicted in the City Debris Flow Special Study Area Map; the City Debris Flow Special Study Area Map may be viewed at the City online map portal via the geologic information application.
2. Other environmentally sensitive areas that the City Planning Commission and the City Council finds to be of significance to the health, safety, welfare, and property of the citizens of the Draper City; and
3. All properties on or adjacent to alluvial fans and drainage channels subject to flash flooding and debris-flow deposition.

Section 10-7-100 of the City geologic hazards ordinance requires a geologic hazards study report for sites depicted in the City Debris Flow Special Study Area Map.

2.0 MINIMUM QUALIFICATIONS OF INVESTIGATORS

Debris flow related geologic hazard investigations/assessments in the City must be performed by qualified engineering geologists as defined in Section 2.0 of these Standards, and Section 10-7-050 of the City geologic hazards ordinance, with at least five years of previous experience performing debris-flow hazard investigations in Utah or another state with similar geologic conditions.

Often debris-flow geologic hazard investigations are interdisciplinary, requiring assistance from a professional engineer, the engineering must be performed by a Utah licensed civil with at least five years of previous experience performing debris-flow hazard investigations in Utah or another state with similar geologic conditions.

3.0 INVESTIGATIVE METHODS

Considering the complexity of evaluating debris-flow hazards, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address the hazard. The information presented herein does not relieve the geologist/engineer of their responsibility to perform additional geologic and/or engineering analyses they believe are necessary to assess debris flow hazards at a site.

Debris flow hazard investigations shall include, when appropriate, evaluation of the drainage basin and channel independently of the alluvial fan evaluation, particularly for estimating erodible sediment volume available for debris flow bulking (see Section 6.0) and the probability of post-wildfire debris flows (i.e., see Cannon, 2001; Giraud and McDonald, 2007; Cannon and others, 2010).

Debris-flow hazard investigations and reports shall conform with:

1. The most current Utah Geological Survey Guidelines for the Geologic Investigation of Debris-Flow Hazards on Alluvial Fans in Utah (presently, Giraud, 2020). The methodology presented in Giraud (2020), is not summarize herein.
2. Section 10-7-100 of the City geologic hazards ordinance.

4.0 SCOPING MEETINGS

The applicant or consultant shall schedule a scoping meeting with the City to evaluate the engineering geologist's/geotechnical engineer's investigative approach (see Section 10-7-070 of the City geologic hazards ordinance). For debris flow hazard investigations the investigative approach shall include proposed cross-channel profiles to estimate the erodible sediment volume available for debris flow bulking.

5.0 SUBSURFACE EXPLORATIONS

Exposures in trenches/test pits shall be documented on a trench/test pit log. Trench/test pit logs shall be carefully drawn in the field at a minimum scale of 1-inch equals 5-feet (1:60).

Vertical control must be used and shown on each end of the trench/test pit log. Horizontal control must be used and shown along the base of the trench/test pit log.

Trench/test pit logs must document all significant geologic information from the trench/test pit and shall graphically represent the geologic units and geologic structures observed.

Trench/test pit logs shall include, at a minimum, trench orientation and an indication of which trench/test pit wall was logged; trench/test pit top and bottom; stratigraphic contacts; stratigraphic unit descriptions including lithology, Unified Soil Classification System soil classification, geologic origin and age of the deposits, and contact descriptions; soil (pedogenic) horizons; marker beds, and; deformation or offset of sediments, faults, and fissures.

A field review by the City is required at the completion of consultant's exploratory excavations. The applicant must provide a minimum of 48-hours' notice to schedule the field review with the City. The excavations must be open, safe, cleaned, and a preliminary log completed at the time of the review. The field review allows the City to evaluate the subsurface data with the consultant. Discussions about questionable features are encouraged, but the City will not help log the trench/test pit, explain the stratigraphy, or give verbal approval of the proposed development during the field review.

6.0 CHANNEL SEDIMENT BULKING AND FLOW-VOLUME ESTIMATION

Channel sediment-bulking and flow-volume estimates must not rely solely on empirical methods alone. Empirical methods are only approximate and have low reliability (see Giraud, 2020). Cross-channel profiles to estimate the erodible depth of channel sediment is necessary to estimate the sediment volume available for bulking. This may be accomplished by either:

1. Cross-channel profiles generated from high-resolution lidar (i.e., ≤ 1 meter), or;
2. Estimating potential sediment-bulking rates of the material likely to be mobilized via field inspection of the drainage channels and field generated cross-channel profiles (Giraud, 2020).

The number of cross-channel profiles to estimate the erodible sediment volume available for debris flow bulking shall be based on the dimensional uniformity of the channel, supported by adequate data, and consisting of at least one profile at each end of the channel and one in the center of the drainage. A variant of more than 10 percent in either the channel width or depth would be considered dimensional non-uniformity.

7.0 DEBRIS-FLOW HAZARDS REPORT

In addition to items listed in Section 10-7-100 of the City geologic hazards ordinance, debris flow geologic hazards study reports shall contain at a minimum:

1. Recommendations and conclusions supported by satisfactory data, presented clearly and concisely.
2. The probability of debris-flow occurrence (if possible), estimates of debris-flow volume, a map showing hazard areas, and a discussion on the likely effects of debris flows on the proposed development.
3. The degree of confidence in, and limitations of, the data and conclusions.
4. Recommendations to define buildable and non-buildable areas (if appropriate) and design risk-reduction measures.
5. Geologic and/or engineering analyses necessary to assess the debris-flow hazards at a site.
6. The area of the drainage basin, shown on a site plan.
7. Calculations to support the 100-year storm event with estimated flow rates.
8. The erodible sediment volume available for debris flow bulking.
9. Probability of non-fire-related debris flows.
10. Probability of post-wildfire debris flows.
11. The volume of debris flows based on non-fire related flows and post wildfire flows.
12. Alluvial fan evaluation (Giraud, 2020, p. 89).
13. Drainage basin and channel evaluation (Giraud, 2020, p. 89).
14. The across-fan and down fan extent of individual debris flows.
15. Cross-sections of the debris flow channel used to estimate debris-flow volumes.

16. Calculations to substantiate debris-flow-volume estimates, stream gradients, sediment bulking, etc.

8.0 RISK REDUCTION MEASURES

Holocene-age sediments were generally deposited under climatic conditions similar to the present. Consequently, the Utah Geological Survey considers Holocene-age debris-flow deposits on an alluvial fan as sufficient evidence of a potential hazard to warrant site-specific debris-flow-hazard studies and implementation of risk-reduction measures as appropriate (unless geologic and topographic conditions on the alluvial fan have changed) (Giraud, 2020).

Risk-reduction measures shall reduce the level of risk such that there are no impacts to properties from potential debris flow events. If risk-reduction measures are included in the report, the following shall be addressed in the report (Giraud, 2020):

1. A discussion of the implications of risk-reduction measures on adjacent properties, and the need for long-term maintenance.
2. Calculation of debris flow impact forces if recommendations are provided for debris flow-deflection structures or debris-flow-resistant construction (reinforcement of foundations, flood-proofing), hydraulic modeling of debris flow discharge, run-up, and runout. Specific information on flow type(s), deposit distribution and thickness, flow velocity, peak flow, and runout is necessary to calibrate models.
3. A discussion of the residual risk to development (if appropriate) after risk-reduction measures are in place.

9.0 DISCLOSURE OF GEOLOGIC HAZARD REPORT

The owner of the parcel must record a notice running with the land disclosing the geologic hazards study report for the property; see Section 10-7-120 of the City geologic hazards ordinance. The disclosure of the geologic hazards report must be completed before the approval of any development or subdivision of such parcel.

APPENDIX E - MINIMUM STANDARDS FOR ROCKFALL HAZARD INVESTIGATIONS

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	SCOPING MEETINGS.....	1
3.0	ROCKFALL-HAZARD SPECIAL STUDY AREAS	1
5.0	MINIMUM QUALIFICATIONS OF INVESTIGATORS	3
6.0	ROCKFALL HAZARD STUDY ASSESSMENT.....	3
7.0	ROCKFALL HAZARD INVESTIGATION REPORTS	5
8.0	ROCKFALL HAZARD MITIGATION REQUIREMENTS	6
9.0	LETTER FROM STRUCTURAL ENGINEER.....	6
10.0	DISCLOSURE OF GEOLOGIC-HAZARD REPORT.....	7

1.0 INTRODUCTION

The procedures outlined herein are intended to provide consultants with a general outline for performing uniform rockfall-hazard investigations and engineering measures to mitigate the rockfall hazards in Draper City, Utah (the City). These Standards constitute the minimum level of effort required in conducting rockfall hazard investigations in the City.

Considering the complexity inherent in performing rockfall-hazard investigations, additional effort beyond the minimum standards presented herein may be required at some sites to adequately address rockfall hazards. The information presented herein does not relieve consultants of their duty to perform additional geologic or geotechnical engineering analyses that they believe are necessary to assess the rockfall hazard at a site.

2.0 SCOPING MEETINGS

The applicant or consultant shall schedule a scoping meeting with the City to evaluate the engineering geologist's/geotechnical engineer's investigative approach (see Section 10-7-070 of the City geologic hazards ordinance).

3.0 ROCKFALL-HAZARD SPECIAL STUDY AREAS

Rockfall hazard is based on several factors including geology, topography, and climate. Rockfall sources include bedrock outcrops or boulders on steep mountainsides or near the edges of escarpments such as cliffs, bluffs, and terraces. Talus cones and scree-covered slopes are indicators of a rockfall hazard, but other less obvious areas may also be vulnerable to rockfall.

Rockfalls are initiated by freeze/thaw action, rainfall, weathering, and erosion of the rock and/or surrounding material, and root growth. Rockfall is also the most common type of slope failure caused by earthquakes (Lund and Knudsen, 2020).

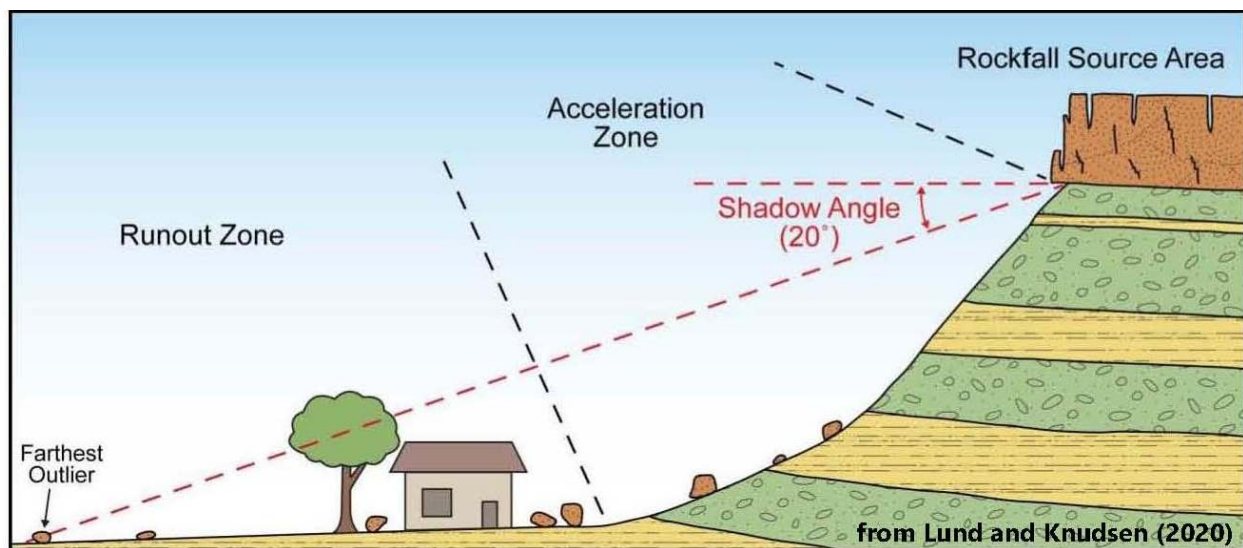
The following three components must be considered when evaluating the rockfall-hazard susceptibility of a property:

1. A rock source, in general, defined by bedrock geologic units that exhibit relatively consistent patterns of rockfall susceptibility throughout the study area;
2. An acceleration zone, where rockfall debris detached from the source gain momentum as the rock debris travels downslope. The acceleration zone often

includes a talus slope, which becomes less apparent with decreasing relative hazard and is typically absent where the hazard is low, and;

3. A runout zone (rockfall shadow zone), which includes gentler slopes where rock debris (i.e., cobbles and boulders), have rolled or bounced beyond the base of the acceleration zone (see Rockfall Component Figure, from Lund and Knudsen, 2020). The boundary of the rockfall shadow zone is established using the shadow angle (Lund and Knudsen, 2020), which is the angle formed by a horizontal line and a line extending from the base of the rock source and the outer limit of the runout zone (see the following figure). Shadow angles vary based on rock type, boulder shape, slope steepness, slope composition, and rock source height.

Rockfall Component Schematic



Rock fall investigations are required for:

1. Areas depicted in the City Rockfall Special Study Area Map; the City Rockfall Special Study Area Map may be viewed at the City online map portal via the geologic information application.
2. Environmentally sensitive areas that the City Council finds to be of significance to the health, safety, and welfare of the citizens of the City
3. Locations at the base of rock and talus slopes that are susceptible to rockfall; evidence of past rockfalls being the primary indicator. For the City, a rockfall hazard area is

defined by the following:

- a. The presence of a rock source area;
- b. The presence of rock debris in the acceleration and runout zones, and;
- c. Whether the size of rock debris in the acceleration and runout zones and associated rock debris velocities pose a life safety issue to existing and/or proposed structures.

5.0 MINIMUM QUALIFICATIONS OF INVESTIGATORS

Rockfall related geologic hazard investigations/assessments in the City must be performed by qualified engineering geologists as defined in Section 2.0 of these Standards, and in Section 10-7-050 of the City geologic hazards ordinance, with at least five years of previous experience performing rockfall hazard investigations in Utah or another state with similar geologic conditions.

Often rockfall hazard investigations are interdisciplinary, requiring assistance from a professional engineer. When interdisciplinary, must be performed by qualified geotechnical as defined in Section 2.0 of these Standards, and in Section 10-7-060 of the City geologic hazards ordinance, with at least five years of previous experience performing rockfall hazard investigations in Utah or another state with similar geologic conditions.

6.0 ROCKFALL HAZARD STUDY ASSESSMENT

The rockfall-hazard assessment should commence with an assessment of whether the conditions for rockfall are present at or near the site of interest by documentation of the following:

1. A rock source;
2. An acceleration zone;
3. A runout zone (rockfall shadow zone).

If either a rock source or a slope steep enough to permit rockfall debris to move rapidly downslope is absent, or there is no rock debris on the site, there is no rockfall hazard. The determination of whether a rockfall hazard is present or not can often be made quickly from analysis of aerial photographs or other remote sensing data, or from a brief site reconnaissance (Lund and Knudsen, 2020). Rockfall-hazard investigations should include (see Lund and Knudsen, 2020):

1. Interpretation of stereoscopic aerial photographs (from multiple years if available), evidence of rockfalls subsequently obscured by development or other ground disturbance.
2. Analysis of available lidar imagery and other remotely sensed data for evidence of rockfall sources and past rockfall activity.
3. Review of topographic maps (from multiple years if available), for indications of talus and near-vertical slopes.
4. Mapping susceptible geologic units, talus slopes, and topographic features that may affect rockfall hazards.
 - a. In acceleration zones, the following must be recorded:
 - i. slope angle.
 - ii. aspect (compass direction of the slope face).
 - iii. substrate (defined in rockfall simulation program).
 - iv. surface roughness (defined in rockfall simulation program).
 - v. vegetation.
 - vi. geomorphic or topographic features that could deflect the path of a rockfall.
 - vii. abrupt changes in slope potentially causing rockfall debris to become airborne ("launch points").
 - b. In runout zones, the following must be recorded:
 - i. distribution of rockfall debris.
 - ii. rockfall debris rock sizes.
 - iii. amount/extent of rockfall debris embedment.
 - iv. weathering of rockfall debris as an indicator of rockfall age.
5. Rockfall sources must be evaluated for:
 - a. rock type/lithology.
 - b. weathering.
 - c. discontinuities (bedding, joints, faults, shear zones, foliation, schistosity, veins, etc.).
 - d. potential rockfall rock sizes.

6. The presence of discontinuities in the bedrock source, which could potentially provide additional detachment surfaces for blocks and/or wedge failures, and control the size and shape of rockfall debris; important properties of discontinuities include:
 - a. Orientation.
 - b. Spacing.
 - c. Persistence.
 - d. Roughness.
 - e. Weathering.
 - f. aperture width and filling.
 - g. seepage.

Discontinuity spacing and other rock mass data can be obtained from a rock outcrop scanline survey or rock cores.

7. Investigation of groundwater conditions, both current and historical.
8. The use of a 2-D or 3-D rockfall simulation programs (i.e., Higgins and others, 2000; CRSP, 2000; Rocscience, 2015) to:
 - a. predict rockfall trajectories, characteristics, and runout limits.
 - b. provide a basis for the analyses and specifications for rockfall-hazard mitigation measures (see Turner and Duffy, 2012, for a discussion of 2-D rockfall simulation programs).

Many of the parameters listed in Items 4a and 4b are required input for rockfall simulation programs.

7.0 ROCKFALL HAZARD INVESTIGATION REPORTS

Rockfall hazard investigation geologic hazard reports shall conform with Section 10-7-100 of the City geologic hazards ordinance. The rockfall hazard investigation geologic hazard reports shall also include, but are not limited to:

1. Calculations to substantiate rockfall impact energies.
2. Input/output files for computer rockfall simulation programs.

3. Sufficient data to support all conclusions and recommendations.
4. Recommendations for rockfall-hazard mitigation, when required.

8.0 ROCKFALL HAZARD MITIGATION REQUIREMENTS

When a rockfall hazard is present, avoidance is the most effective and pragmatic means of mitigating the hazard. When avoidance is not a viable or cost-effective hazard-reduction option i.e., (existing developments), the engineering geologic/geotechnical engineering consultants should:

1. Propose design measures and/or define the boundary beyond which siting of a structure will minimize the risk from future rockfall, with respect to life safety and rockfall debris penetrating exterior walls of proposed structures.
2. Provide the parameters required for a qualified Utah licensed structural engineer to determine and design an engineering technique to mitigate the hazard (i.e., rock stabilization, engineered structures, or modification of at-risk structures or facilities, etc.).
3. Provide, at a minimum, the following parameters: rock size(s), rock trajectories, rock velocities, rock impact energies, rock bounce heights, rock runout distances, which in turn form a basis for the selection of designs for rockfall hazard mitigation.
4. Employ a 2-D or 3-D rockfall simulation program to predict rockfall trajectories, characteristics, rock velocities, energy, bounce heights, runout limits, etc., and to provide a basis for the analyses and design of rockfall hazard mitigation measures (Higgins and others, 2000; CRSP, 2000; Rocscience, 2015).

9.0 LETTER FROM STRUCTURAL ENGINEER

A stamped letter is required from a Utah licensed structural engineer acknowledging receipt of the rockfall hazard report and addressing the proposed design measures and the expected behavior of the structure during the design rockfall event. The letter must demonstrate:

1. The life safety of occupants will be preserved should a rockfall event occur.
2. Potential damage to the structure should a rockfall event occur.

3. Rockfall debris will not penetrate the exterior walls of the structure.

10.0 DISCLOSURE OF GEOLOGIC-HAZARD REPORT

The owner of the parcel must record a notice running with the land disclosing the geologic hazards study report for the property; see Section 10-7-120 of the City geologic hazards ordinance. The disclosure of the geologic hazards report must be completed before the approval of any development or subdivision of such parcel.

MEMO



To: City Council
From: Mike Barker, City Manager
Date: 2025-12-16
Re:

Approve Resolution #25-75

Comments:

This proposed boundary adjustment with Highland City affects two slivers of property -- Utah County parcels 11:017:0157 and 35:544:0050. Highland City owns parcel 11:017:0157, which is located in Draper City. Alpine Joint Venture LTD owns parcel 35:544:0050, which is located in Highland City. Alpine Joint Ventures, LTD also own property adjacent to parcel 35:544:0050. The proposed boundary adjustment would place the Highland-owned parcel in Highland City and the Alpine Joint Ventures, LTD parcel in Draper City boundaries adjacent to other property Alpine Joint Ventures, LTD owns in Draper City.

ATTACHMENTS:

[R_25-75_Intent_for_Boundary_Adjustment_with_Highland.pdf](#)

RESOLUTION NO. 25-75

A RESOLUTION EXPRESSING DRAPER CITY'S INTENT TO ADJUST ITS COMMON MUNICIPAL BOUNDARIES WITH HIGHLAND CITY AFFECTING PARCELS 11:017:0157 AND 35:544:0050, AUTHORIZING AND SCHEDULING A PUBLIC HEARING, AND PROVIDING FOR NOTICE THEREOF

WHEREAS, Utah Code Ann. § 10-2-903 establishes a procedure by which two adjacent municipalities may mutually adjust their common boundaries; and

WHEREAS, Draper City and Highland City are adjacent municipalities that share common boundaries; and

WHEREAS, the Draper City Council has determined that it is in the public interest to consider a mutual adjustment of a portion of the common boundary affecting Utah County parcels 11:017:0157 and 35:544:0050; and

WHEREAS, the proposed boundary adjustment is depicted and described in Exhibit A, attached hereto and incorporated herein by this reference; and

WHEREAS, Draper City intends to hold a public hearing to review the proposed boundary adjustment no less than 60 days after adopting this Resolution; and

WHEREAS, this Resolution complies with the procedural requirements of Utah Code Ann. § 10-2-903.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, as follows:

Section 1. Intent to Adjust a Common Boundary. Draper City declares its intent to adjust its common municipal boundary with Highland City as provided in Exhibit A pursuant to Utah Code Ann. § 10-2-903.

Section 2. Public Hearing Scheduled. A public hearing to consider the proposed boundary adjustment shall be held on February 17, 2026, at 7:00 p.m. or as soon as possible thereafter, in the Council Chambers at Draper City Hall, 1020 E Pioneer Rd, Draper, Utah.

Section 3. Notice of Public Hearing. The Draper City Recorder is hereby authorized and directed to publish notice of the proposed public hearing as a Class B notice for three successive weeks prior to the public hearing. The content of all notices shall comply with Utah Code Ann. § 10-2-903(4).

Section 4. Severability Clause. If any part or provision of this Resolution is held invalid or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Resolution and all provisions, clauses and words of this Resolution shall be severable.

Section 5. Clerical Corrections. The City Recorder, under the supervision of the City Manager and City Attorney, is authorized to make non-substantive corrections to any portion of this Resolution and to the City codes referenced herein, if any, for grammatical, typographical, or numbering errors, or for consistency purposes that do not alter the substantive intent and that are otherwise in accordance with the expressed intent of the City Council.

Section 6. Effective Date. This Resolution shall become effective immediately upon passage.

(Signature page to follow)

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, ON THE 16th DAY OF DECEMBER, 2025.

DRAPER CITY

Mayor Troy K. Walker

ATTEST:

Nicole Smedley, City Recorder

VOTE TAKEN:

Councilmember Green
Councilmember Johnson
Councilmember T. Lowery
Councilmember F. Lowry
Councilmember Vawdrey
Mayor Walker

YES	NO	ABSENT
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

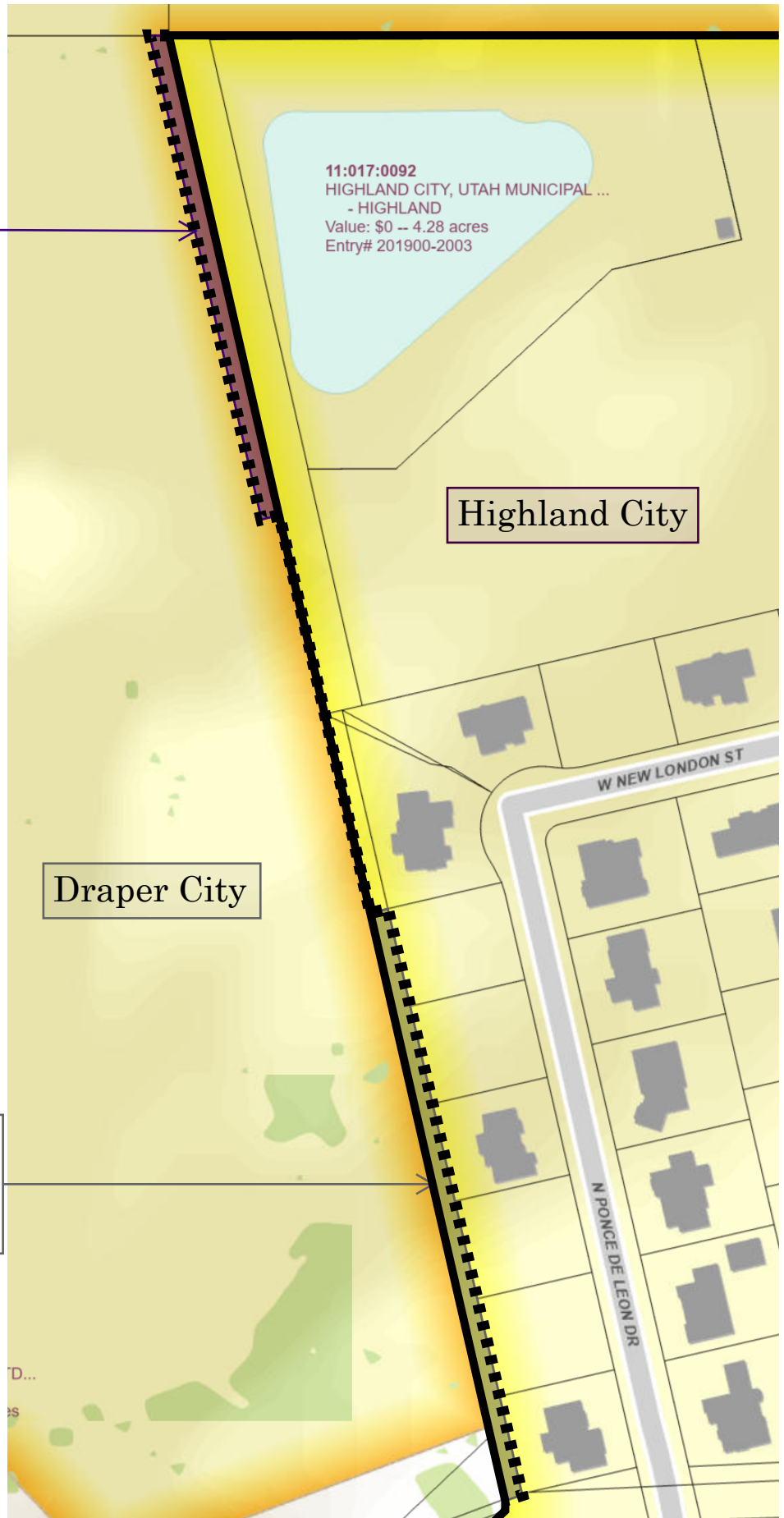
EXHIBIT A
(Boundary Adjustment Area)

MAP OF HIGHLAND-DRAPER BOUNDARY ADJUSTMENT

Parcel: 11:017:0157
Owner: Highland City
To be annexed from Draper City into Highland City

Key
— Current municipal boundary line
- - - Proposed municipal boundary line

Parcel: 35:544:0050
Owner: Alpine Joint Venture LTD
To be annexed from Highland City into Draper City



MEMO



To: City Council
From: Clint Smith, Fire Chief
Date: 2025-12-16
Re: Approve Ordinance #1695

Comments:

In compliance with Utah 2026 HB48, our responsibility as a local entity is to support the development and implementation of the statewide Wildland-Urban Interface (WUI) map by ensuring accurate identification of local risk areas where development and wildland fuels intersect. This includes providing relevant local data, reviewing mapped boundaries, and coordinating with state agencies to verify that the WUI designations reflect on-the-ground conditions. By fulfilling these responsibilities, we help ensure the WUI map is a reliable tool for applying required fire-resilience standards, guiding mitigation planning, informing residents of their wildfire risk, and strengthening overall community protection as mandated by the legislation.

ATTACHMENTS:

[O-1695 Wildland Urban Interface Amendments.pdf](#)

ORDINANCE NO. 1695

AN ORDINANCE OF THE DRAPER CITY COUNCIL AMENDING TITLE 7 OF THE DRAPER CITY MUNICIPAL CODE ESTABLISHING THE WILDLAND URBAN INTERFACE AREA.

WHEREAS, Title 7 of the Draper City Municipal Code establishes standards for fire prevention; and

WHEREAS, Utah Code 65A-8-203 establishes a process for cooperative agreements and funding with the Utah Division of Forestry Fire and State Lands; and

WHEREAS, Draper City has previously adopted the Utah Wildland Urban Interface Code as part of the Draper City Fire Code; and

WHEREAS, The Draper City Fire Code as currently adopted allows the legislative body to establish wildland-urban interface areas; and

WHEREAS, Draper City Municipal Code 2-4-010 requires exercise of legislative powers through ordinance unless otherwise specifically provided; and

WHEREAS, the City Council has reviewed the proposed text amendment and finds good cause to revise the terms and provisions of Title 7.

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH, AS FOLLOWS:

Section 1. Findings. The City Council of Draper City has made the following findings to amend Title 7 of the Draper City Municipal Code: 1) The proposed amendments comply with the Utah Code Annotated. 2) The proposed amendments serve the best interest of the health, safety, and welfare of the citizens of Draper.

Section 2. Adoption of Map. The map found in the attached Exhibit B is hereby declared as the wildland-urban interface area of Draper City

Section 3. Revision. Title 7 of the Draper City Municipal Code are hereby amended to read as shown in Exhibit "A" attached hereto and incorporated herein by reference.

Section 4. Correction of Editing Errors. The City Attorney is authorized to correct any punctuation, spelling, formatting, clerical, or *de minimis* errors prior to submitting the Ordinance to Sterling Codifiers.

Section 5. Severability. If any section, part, or provision of this Ordinance is held invalid, or unenforceable, such invalidity or unenforceability shall not affect any other portion of this Ordinance, and all sections, parts, and provisions of this Ordinance shall be severable.

Section 6. Effective Date. This Ordinance shall become effective immediately upon publication or posting, or 30 days after final passage, whichever is closer to the date of final passage.

PASSED AND ADOPTED BY THE CITY COUNCIL OF DRAPER CITY, STATE OF UTAH,
ON THIS 16th DAY OF DECEMBER, 2025.

ATTEST:

DRAPER CITY

Nicole Smedley, City Recorder

Mayor Troy K. Walker

VOTE TAKEN:	YES	NO
Councilmember Vawdrey	_____	_____
Councilmember Johnson	_____	_____
Councilmember Lowrey	_____	_____
Councilmember Lowry	_____	_____
Councilmember Green	_____	_____
Mayor Walker	_____	_____

EXHIBIT A

7-10-020: FIRE CODE:

- A. The most recent version of the International Fire Code published by the International Code Council as adopted by the State of Utah is hereby adopted as the Fire Code of Draper City. All appendices contained within the International Fire Code, excluding Appendix A, are also hereby adopted as the Fire Code of Draper City.
- B. ~~The most recent version of the Utah Wildland Urban Interface Code, issued by the International Code Council and adopted by the State of Utah, with the alternatives or amendment approved by the Utah Division of Forestry, is hereby adopted as the Wildland Urban Interface Code of Draper City.~~

Wildland Urban Interface Area Code

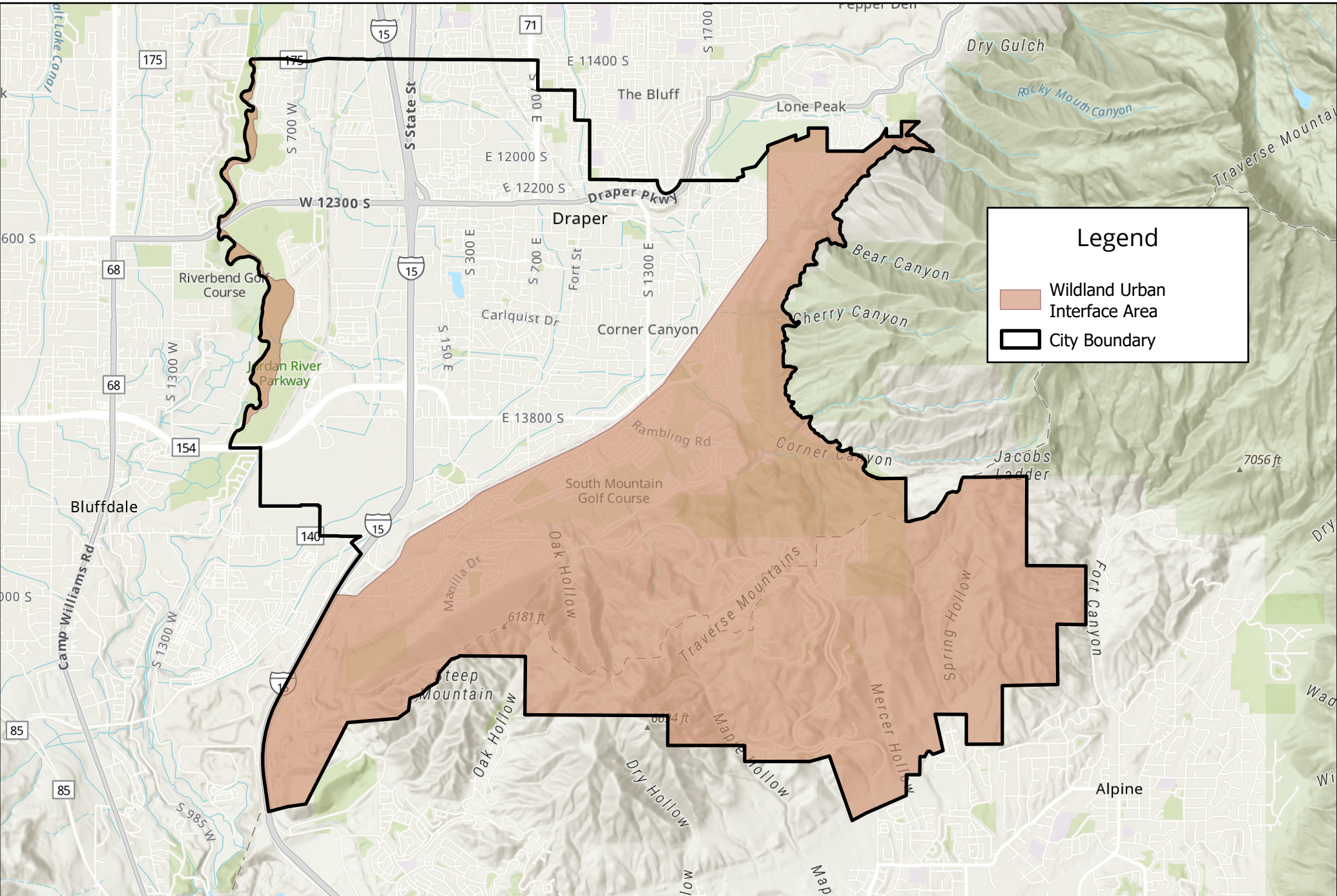
- 1. The most recent version of the Utah Wildland Urban Interface Code, issued by the International Code Council and adopted by the State of Utah, with the alternatives or amendment approved by the Utah Division of Forestry, is hereby adopted as the Wildland Urban Interface Code of Draper City.
 - 2. Maps for wildland-urban interface areas can be found on the Draper City Map Portal.
 - 3. The city council may amend maps for wildland-urban interface areas by resolution as frequently as once each calendar year with a recommendation from the Draper Fire Department.
 - 4. Structures built in wildland-urban interface areas must comply with the Wildland Urban Interface Code.
- C. Subject to the provisions of subsection D of this section, automatic fire sprinkler systems are required for structures built under the provisions of the International Residential Code (IRC) under any of the following conditions:
 - 1. The structure:
 - a. is located in an ~~urban-wildland~~ wildland-urban interface area as provided in the Utah Wildland Urban Interface Code adopted as a construction code under the State Construction Code; and
 - b. does not meet the requirements described in Utah Code,

Subsection 65A-8-208(4)(f) and Utah Administrative Code R652-122-1300, Minimum Standards for County Wildland Fire Ordinance;

2. The structure is in an area where a public water distribution system with fire hydrants does not exist as required in Utah Administrative Code, R309-550-5, Water Main Design;
 3. The only fire apparatus access road has a grade of greater than 10% for more than 500 continual feet;
 4. The total floor area of all floor levels within the exterior walls of the dwelling unit exceeds 10,000 square feet; or
 5. The total floor area of all floor levels within the exterior walls of the dwelling unit is double the average of the total floor area of all floor levels of unsprinkled homes in the subdivision that are no larger than 10,000 square feet.
- D. A single-family dwelling described in subsection C of this section does not require a fire sprinkler system if the dwelling:
1. is located outside of the wildland-urban interface;
 2. is built in a one-lot subdivision; and
- has 50 feet of defensible space on all sides that limits the propensity of fire spreading from the dwelling to another property.

Exhibit B

(Remainder of page intentionally left blank)



Wildland Urban Interface Area



Exhibit C

Memorandum of Findings to Support the Wildland-Urban Interface Areas Map

MEMORANDUM

TO: Draper City Council
FROM: Don Buckley, Fire Marshal
DATE: 12/4/2025
RE: Designation of Wildland-Urban Interface (WUI) Zone in Accordance with the 2024 IWUIC

Purpose

This memorandum documents the methodology used by the Draper City Fire Department to identify and map the Wildland-Urban Interface (WUI) areas.

Code Basis

Under the International Wildland-Urban Interface Code (IWUIC), local jurisdictions may designate WUI areas where structures and other human development are located adjacent to or intermixed with wildland fuels. WUI designations must account for vegetation hazards, topography, and fire-protection capabilities.

Method of Identification

On August 4, 2025 the I met with Utah Forestry, Fire and State Lands (FFSL) to discuss a hazard identification process using the following criteria:

1. Vegetation and Fuel Loading

Areas with moderate to high wildland fuel continuity were identified using:

- o GIS vegetation data from Utah DNR's Utah Wildfire Risk Assessment Portal (UWRAP) which gives a good overview of Wildfire Hazards.
- o Fuel models based on data from Utah DNR's Utah Wildfire Risk Assessment Portal (UWRAP) which gives a good overview of Flame Front Characteristics, and Ember Characteristics.

2. Topographic Influence

Slopes exceeding **30%** were incorporated due to increased fire spread potential.

3. Proximity of Structures to Fuels

Areas where buildings are located:

-
- o Within approximately 0–1.5 miles of wildland fuels
 - o Intermixed within continuous fuels
 - o In isolated pockets within urban settings adjacent to fuels
4. **Historical and Operational Fire Risk**
Local wildfire history (2008, 800 Acre Wildfire in Corner Canyon, 2025, 1.5 Acre Wildfire behind Draper Heights) and response limitations such as access, water supply, and evacuation routes were evaluated.
5. **GIS Mapping and Boundary Determination**
Layers from FFSL and UWRAP were merged with parcel information in our GIS system to generate the final WUI boundary.
Mapping performed by: Karen Burnett GIS Manager
Software: ArcGIS

Date completed: November 5, 2025

Resulting WUI Designation

The analysis resulted in a designated WUI zone that starts at Highland Drive as the base line. On the West end of Highland then South to the city boundary. Then from Highland Drive South and East over the mountain to the city boundary. On the North end of Highland Drive East up the mountain to the city boundary. The zone is classified as the Draper Wildland Urban Interface (WUI)

This is mapped and shown in **Exhibit B** (attached map).

Implementation

All new construction, significant remodels, and applicable fuel-modification requirements will apply to properties within the designated WUI zone.

Please let me know if any additional information is needed.

Thank you,

Don Buckley

Draper Fire Marshal,

Draper City Fire Department,

1020 East Pioneer Rd

Draper, UT 84020

Phone: (801) 824-3714

don.buckley@draperutah.gov