NOTICE OF MEETING
PLANNING COMMISSION
CITY OF ST. GEORGE
WASHINGTON COUNTY, UTAH

Public Notice

Notice is hereby given that the Planning Commission of the City of St. George, Washington County, Utah, will hold a **Planning Commission** meeting in the City Council Chambers, 175 East 200 North, St George, Utah, on **Tuesday, November 18, 2025,** commencing at **5:00 p.m**.

The agenda for the meeting is as follows:
Call to Order
Flag Salute
Call for Disclosures

1. **ZONE CHANGE-1037 W 1050 N Rezone – PUBLIC HEARING**
   Consider a request for a zone change from RE-37.5 (Residential Estates, 37,500 ft² minimum lot size) and R-3 (Multi-Family) and C-3 (General Commercial) to PD-C (Planned Development Commercial) on approximately 1.0 acre. The property is generally located southeast of 1050 North and 1020 West. The applicant is Baseco of Nevada Southern Utah, and the representative is David Gomez. Case No. 2025-ZC-016 (Staff – Dan Boles)

2. **ZONE CHANGE- 311 West Mixed Use – PUBLIC HEARING**
   Consider a request to amend the City Zoning Map from C-4 (Central Business District) to PD-MU (Planned Development Mixed Use) on approximately 1.28 acres to allow for a new mixed-use project. The applicant is Rosenberg Associates, and the representative is Jared Bates. Case No. 2025-ZC-020 (Staff – Brenda Hatch)

3. **PLANNED DEVELOPMENT AMENDMENT-Utah First Credit Union Sun River– PUBLIC HEARING –**
   Consider a request for a Planned Development Amendment to the Atkinville Interchange Area Zone Plan, Planned Development Commercial (PD-C) zone. The applicant is seeking approval of the design and site plan for a new credit union of approximately 3,420 square feet and 22 feet in height. The request also includes an amendment to the Sun River Commons Master Sign Plan to include two monument signs to the site. The property is generally located at the corner of Pioneer Road and Bluegrass Way. The applicant is Civil Science, and the representative is Brandee Walker. Case No. 2025-PDA-031 (Staff – Brian Dean)

4. **HILLSIDE DEVELOPMENT PERMIT -Banded Hills Hillside Revision –**
   Consider a request for a Hillside Development Permit for modifications to the approved location of the rock fall hazard line approved with the original Hillside Permit. The applicant is RS Custom Homes, and the representative is Ryan Shaw. Case No. 2025-HS-011 (Staff – Dan Boles)

5. **GENERAL PLAN AMENDMENT Adoption of the Water Element of the General Plan- PUBLIC HEARING**
   Consider a request to adopt a comprehensive general plan update to add a Water Use and Preservation Element to the General Plan. The applicant is City of St George, and the representative is Carol Winner. Case No. 2025-GPA-016 (Staff – Carol Winner)

6. **ZONE REGULATION AMENDMENT City Standard Specifications Section 4– PUBLIC HEARING –**
   Consider a request to amend Standard Specification Section 4 Construction Standards to address an overall update to Section 4 including, revisions to Table 4.3 (Minimum Roadway Structural Requirements) for Major Collector roadways and larger, Road base gradation allowances for acceptance limits and suspension limits, revisions to Table 4.6 (Master Grading Bands) to meet target tolerances for aggregate gradation, removal of the Chip Seal and Slurry Seal sections and an update to the Standard Drawing 170 – Trench Backfill and Repair Detail in section 4 of City Standards and Specifications. The applicant is City of St George, and the representative is Wes Jenkins. Case No. 2025-ZRA-014 (Staff – Wes Jenkins)

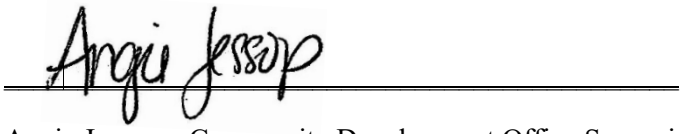
7. MINUTES

Consider a request to approve the meeting minutes from the October 28, 2025, meeting.

8. CITY COUNCIL ACTIONS

Report on items heard at the November 6, 2025, City Council meeting.

1. 2025-GPA-013 Desert Canyons Addition 2 – BD
2. 2025-GPA-014 Planetboys Commercial -DB
3. 2025-ZC-017 Desert Corner Zone Change – BH
4. 2025-PDA-028 White Cliffs -BD
5. 2025-PDA-029 White Dome Townhomes – BH
6. 2025-ZRA-013 Title 3-2W Temp Parking Lot Business Amendment -BD



Angie Jessop – Community Development Office Supervisor

Reasonable Accommodation: The City of St. George will make efforts to provide reasonable accommodations to disabled members of the public in accessing City programs. Please contact the City Human Resources Office at (435) 627-4674 at least 24 hours in advance if you have special needs.

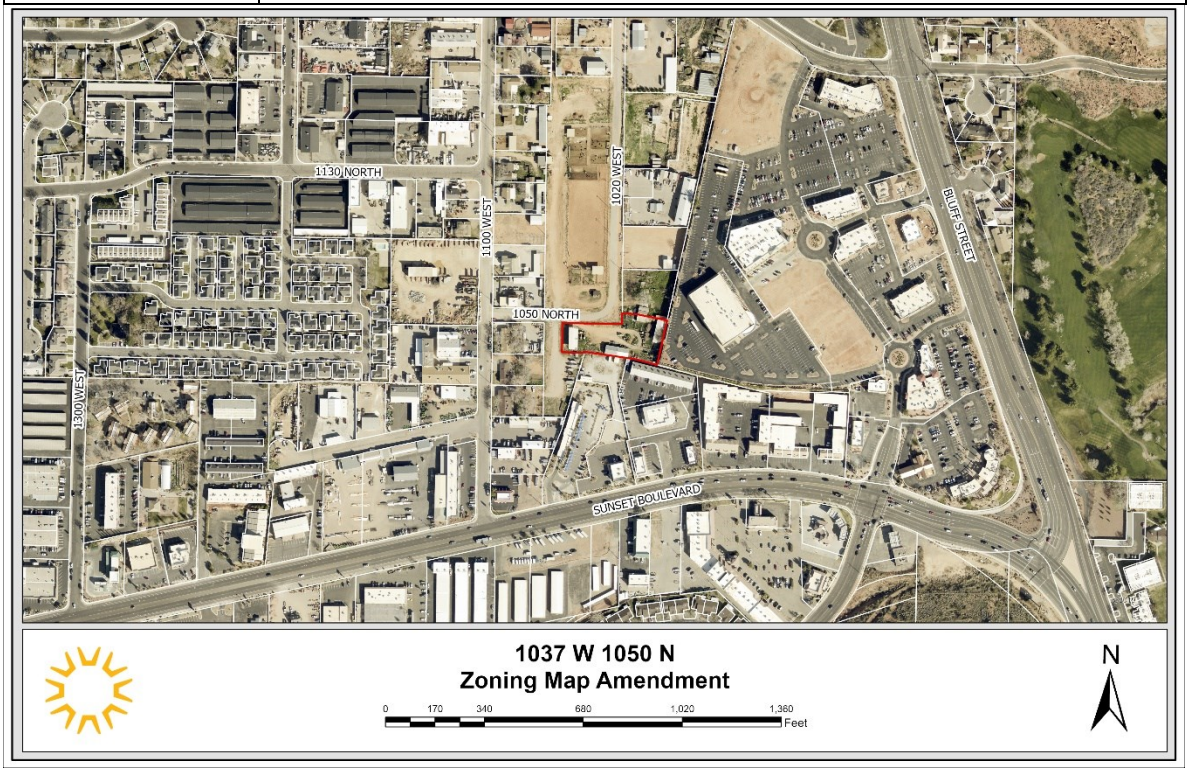
St.George
Community Development

ITEM 1

Zone Change

PLANNING COMMISSION AGENDA REPORT: **11/18/2025**

1037 W 1050 N Zone Change Zone Change (Case No. 2025-ZC-016)		
Request:	Consider a request to amend the City Zoning Map in order to change the zoning on approximately 1.0 acre located southeast of 1050 North and 1020 West to PD-C.	
Applicant:	David Gomez – Baseco of Nevada Southern Utah	
Location:	Located southeast of 1050 North and 1020 West.	
General Plan:	COM (Commercial)	
Existing Zoning:	C-3 (General Commercial), RE-37.5 (Residential Estates, 37,500 ft² minimum lot size), R-3 (Residential, multi-family)	
Surrounding Zoning:	North	RE-37.5 (Residential Estates, 37,500 ft² minimum lot size), R-3 (Residential, multi-family)
	South	C-3 (General Commercial)
	East	C-3 (General Commercial)
	West	RE-37.5 (Residential Estates, 37,500 ft² minimum lot size)
Land Area:	Approximately 1.0 acre	



BACKGROUND:
Approximately one month ago, the Planning Commission heard a request from the applicant to change the property to C-3 zoning. The Planning Commission at that time recommended approval with a 7-0 vote to make that change. Before it went before the City Council, the applicant changed the request to an initial PD-C zone request with the following uses:

1. Construction trad services, plumbing shop, electrical shop, etc.
2. Personal instruction service

Because of the change in request, the application was re-noticed and is back to the Planning Commission for a new recommendation. This request is only to establish the uses on the property. If the applicant should desire any changes on the property, a PD amendment application would need to be submitted and approved.

Currently, the subject property, located at 1037 West 1050 North, has three zoning designations on the zoning map. The first is C-3 (General Commercial), which makes up the largest zoning category on the property (approximately 65%). The second category on the property is RE-37.5 (Residential Estates, 37,500 ft² minimum lot size). Finally, the R-3 (Residential, multi-family) zone is a small portion of the lot. The reason behind the request at hand is to simply consolidate the entire lot into one category, which is the PD-C zone. The General Plan calls for commercial. A PD-C zoning designation would comply with the Commercial General Plan designation.

As was discussed in the previous hearing, the history of the zoning on this property is challenging to determine. Going back to maps as far back as 1979, it appears that the same zoning designation boundaries haven't moved. The maps that far back are far less detailed and even appear to be hand colored (if colored at all). That said, it appears that the location of that property still has the three zoning designations as it does today. Approval of this application would fix that issue. It would give a clear, single zoning designation that would clearly lay out what is allowed under the city code.

RECOMMENDATION:
Staff recommends that the Planning Commission study the zone change request for 1037 W 1050 N Zone Change from R-3 (Residential, multi-family) and RE-37.5 (Residential Estates, 37,500 ft² minimum lot size) and C-3 (General Commercial) to PD-C (Planned Commercial) as proposed by the applicant.

ALTERNATIVES:
1. Recommend approval as presented.
2. Recommend denial.
3. Continue the proposed zone change amendment to a future date.

POSSIBLE MOTION:
"I move that we forward a positive (negative) recommendation to the City Council for the zone change to PD-C (Planned Development Commercial) for 1037 W 1050 N zone change, case number 2025-ZC-016, based on the findings listed in the staff report and subject to the following condition…"

1. That the uses are limited to the two described previously in this staff report.

FINDINGS FOR APPROVAL:
1. The proposed zone change is consistent with the general plan.
2. There is Commercial zoning in the surrounding area to the proposed zone change.

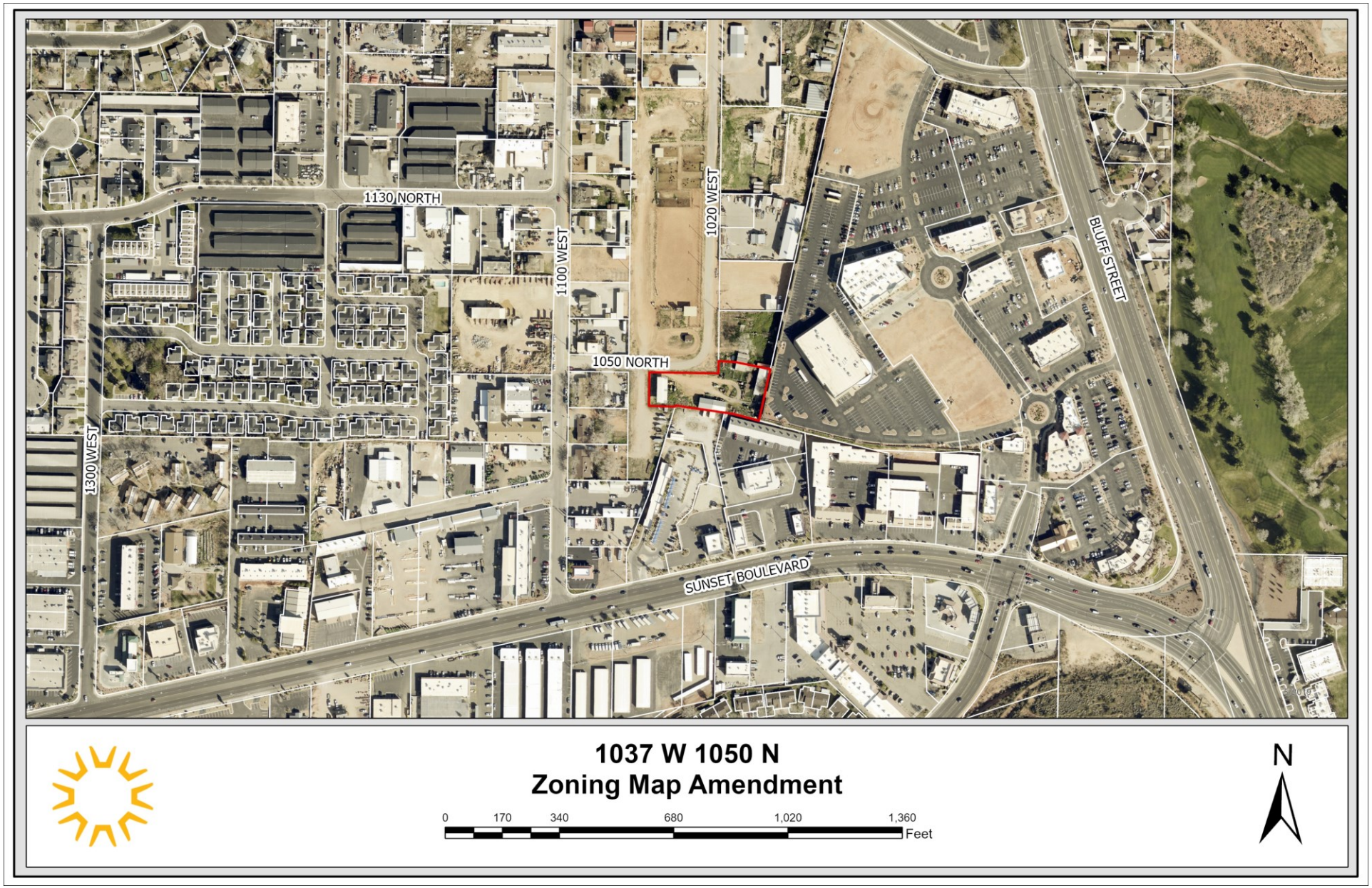
Exhibit A

Power Point Presentation

1037 W 1050 N

2025-ZC-016

Aerial Map


1130 NORTH
1100 WEST
1020 WEST
BLUFF STREET
1050 NORTH
1300 WEST
SUNSET BOULEVARD
1037 W 1050 N
Zoning Map Amendment
0
170
340
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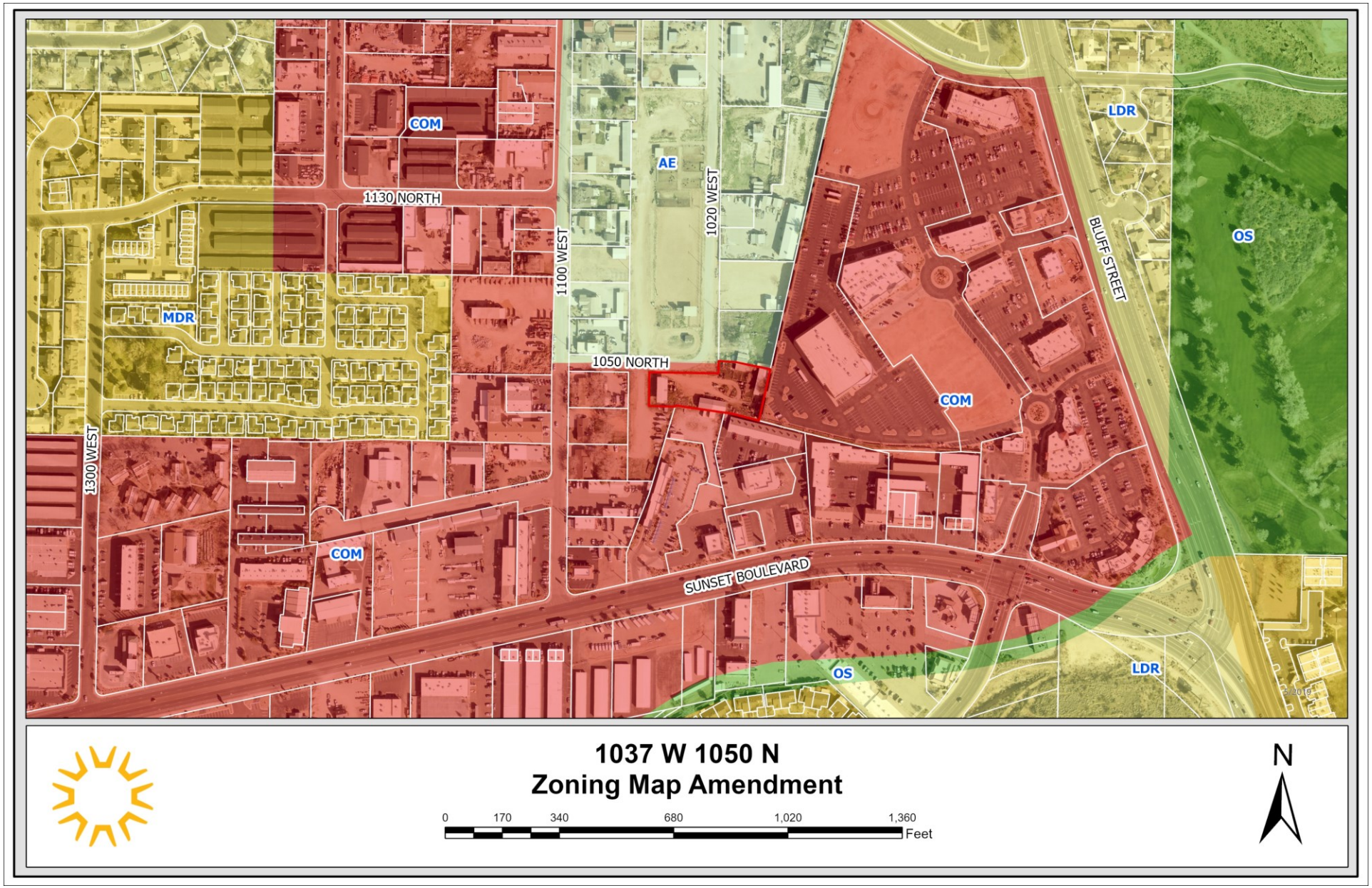
Land Use Map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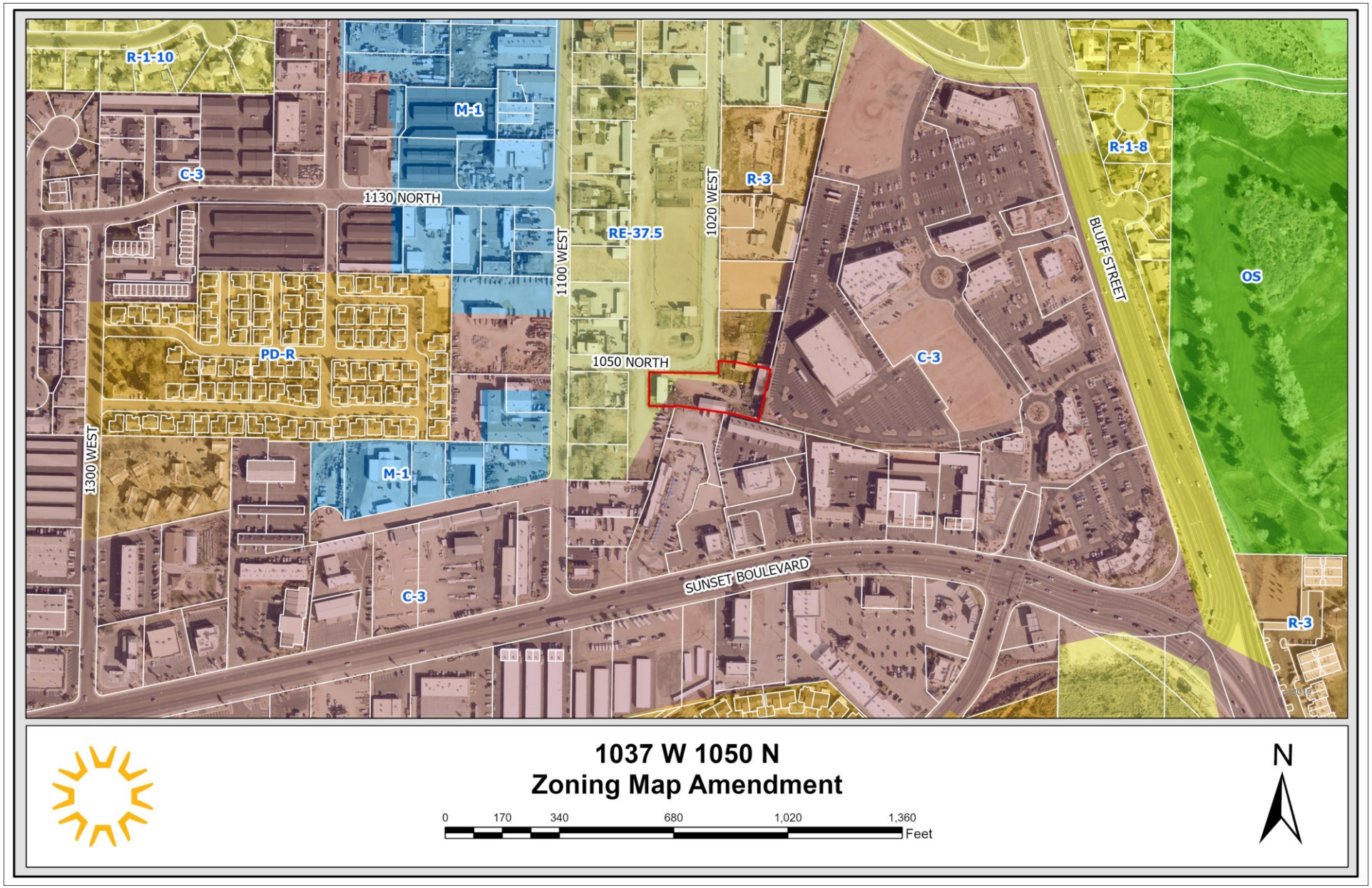
Zoning Map


R-1-10
M-1
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RE-37.5
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R-3
R-1-8
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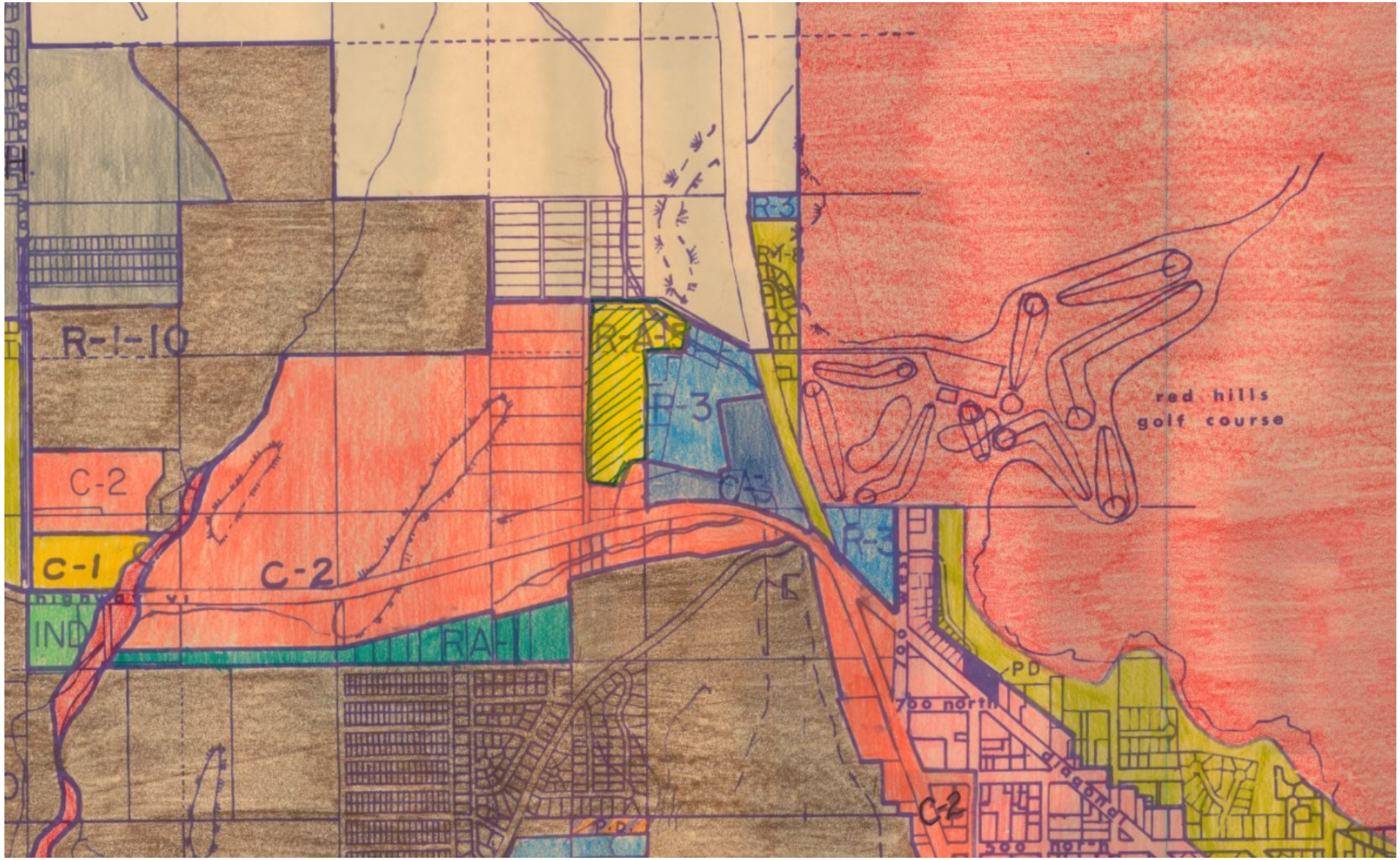
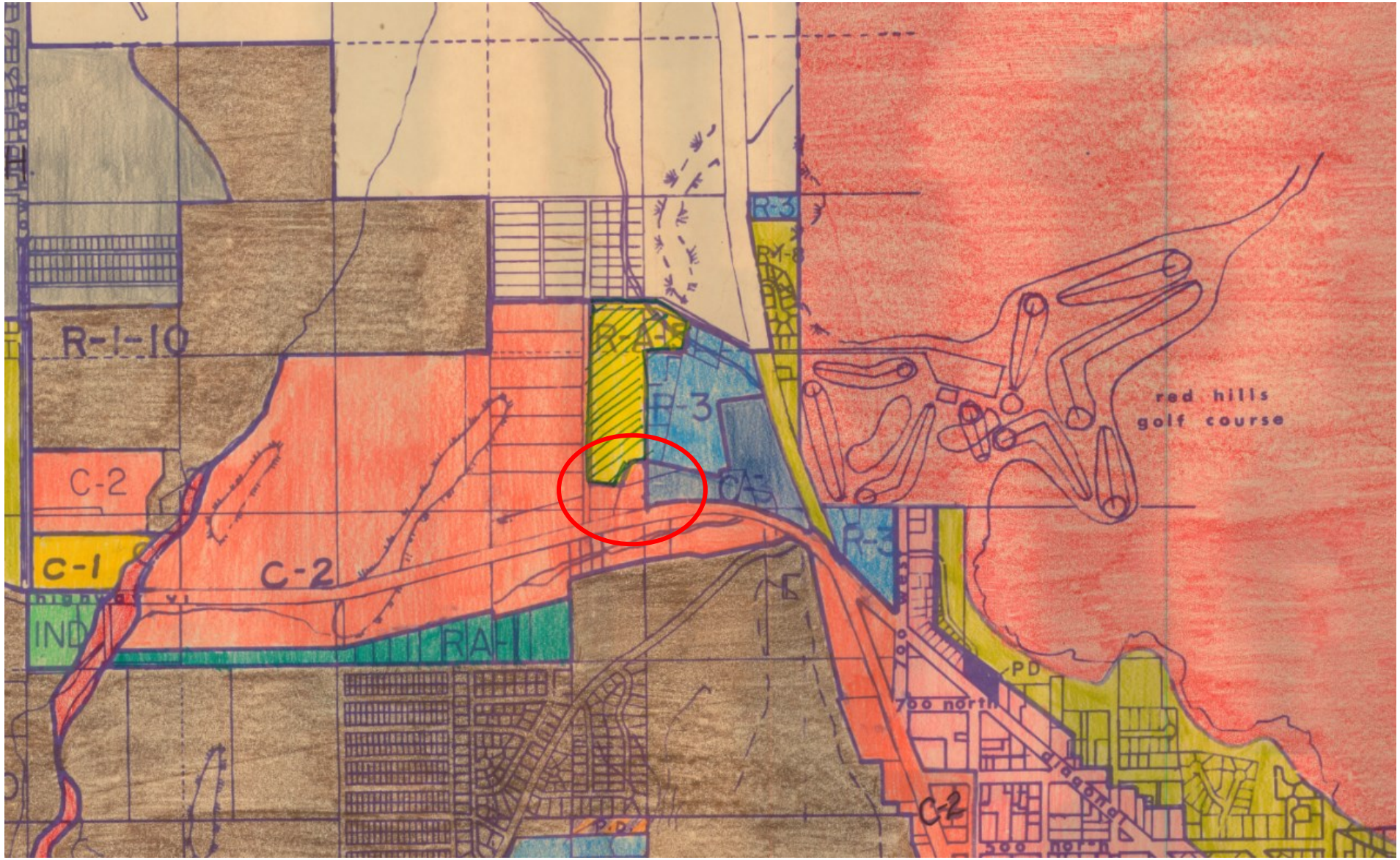
1979 Zoning


R-1-10
C-2
C-1
C-2
IND
RA-1
R-3
RA-3
R-3
C-5
R-3
red hills
golf course
PD
700 north
C-2
P.D.

1979 Zoning


R-1-10
C-2
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IND
RA-1
R-3
C-3
red hills
golf course
PD
700 north
C-2

Exhibit B

Public Comment

St.George
Community Development

ITEM 2
Planned Development Amendment

PLANNING COMMISSION AGENDA REPORT: 11/18/2025

311 West Mixed Use Planned Development Amendment (Case No. 2025-ZC-020)		
Request:	Consider a request to amend the City Zoning Map from C-4 (Central Business District) to PD-MU (Planned Development Mixed Use) on approximately 1.28 acres to allow for a new mixed-use project.	
Applicant:	Rosenberg Associates	
Representative:	Jared Bates	
Location:	311 West St. George Blvd.	
General Plan:	Downtown Connected Corridor (DTCC)	
Existing Zoning:	PD-MU (Planned Development Mixed-Use)	
Surrounding Zoning:	North	C-4 (Central Business District)
	South	C-4 (Central Business District)
	East	C-4 (Central Business District)
	West	C-3 (General Commercial)
Land Area:	Approximately 1.28 acres	

BACKGROUND:
On September 1, 2022, the City Council approved a zone change for this property from C-4 (Central Business District) to PD-MU (Planned Development Mixed Use). As part of that approval, a four-story, 55-foot-tall mixed-use building was authorized, consisting of 39 residential units located above ground-floor commercial space. This approval has since expired, resulting in a new application.

The subject property is located within the *Connected Corridor* designation of the Downtown Plan. This designation anticipates the gradual redevelopment of existing commercial properties into mixed-use and residential projects. The Downtown Plan further notes that the introduction of new housing in these corridors will help support complementary non-residential uses, such as office, dining, and retail establishments, particularly along key street frontages and intersections. Scale and design in the *Connected Corridor* designation calls for two to four story buildings with size and lot coverage that make efficient use of valuable Downtown land. New buildings are encouraged as vertical mixed use. Third and fourth stories of buildings should be set back from the street edge to soften their impact on street character.

The current proposal is a five-story building that includes 7,004 square feet of ground-floor commercial space fronting St. George Boulevard and 300 West Street. The interior portion of the ground floor will provide a residential lobby, community room, and bicycle storage area serving the 51 residential units located on the four upper floors. The second floor is stepped back 20 feet from the street edge softening building impact, which aligns with the Downtown Plan.

MIXED USE REQUIREMENTS:

I. **Allowed Uses** (10-8D-1): The requested use list is attached in Exhibit B.

II. **General Requirements** (10-8D-2): See the Zoning Requirements box below:

Zoning Requirements		
Regulation	**Proposal**	**Staff Comments**
Description of Use	Mixed-use project.	The use fits the requested zoning district
Height and Elevations	57’4” to the top of parapet 68’3” to the top of architectural feature	This district allows buildings up to 55’ tall. The city council, after recommendation from the planning commission, may approve increased building height upon making a finding
Density	40 du/ac	This meets regulations.
Schools,	There are no	No comments.

Churches, Open Space	proposed schools, churches, or open space with this project.	
Phasing Plan	No phasing	N/A
Landscape Plan	A conceptual landscape plan is provided with 20.8% of the area landscaped.	The project is required to have 20% of the area landscaped. This meets requirements.
Utilities	None shown.	These will be reviewed during the site plan review process.
Solid Waste Screening	The site plan shows the location for solid waste.	The site plan shows dumpster location with note to provide screening. During site plan review we will verify that the enclosure meets City code.
Lighting	A photometric plan has been provided.	The parking lot lighting will be required to be 1.0-foot candle or less at the property line. Staff will ensure it meets the regulations during the site plan process. The plan provided meets code.
Turning Space	Access aisle widths 28’ wide. Drive aisles are 25’ wide.	The site plan appears to meet code; this will be verified during the site plan review.
Signs	None provided	The applicants will be required to pull a sign permit when they are ready to put in their signs. All signs must meet the provisions of the sign code.
Parking	Surface parking is shown on the site plan the project is required to provide 56 spaces, they are showing 72 spaces.	Parking has been calculated per the PD-MU code at .5 spaces per bedroom plus 1 space per 5 units for guest parking The commercial is calculated at 1 space per 500 square feet.
EVCS And Bike Parking	There are 4 bicycle parking spaces shown. Future EV charging location station shown.	The site plan appears to meet code; this will be verified during the site plan review.

III. **Mixed Use Standards** (10-8D-8: The applicant will be required to meet the following standards (The wording in the yellow boxes are the responses from the applicant):

A. *Minimum Zone Requirements: Each Planned Development Commercial/ residential mixed use application shall include a minimum of one-half (1/2) acre.*

This project is 1.28 acres.

B. *Height Regulations: No structure shall be erected to a height less than ten feet (10') and no structure shall be greater than fifty-five feet (55'). The city council, after recommendation from the planning commission, may approve increased building height upon making a finding, as part of a zone change approval, that the increase in height will fit harmoniously into the neighborhood, minimizing any negative impacts, after considering the following:*

Please find applicant responses in the yellow boxes below.

The applicant is proposing a five-story building with a height of 69'-0". Multiple buildings nearby exceed the 55'height. See item 6 below.

1. *Proposed setbacks provide an appropriate buffer to neighboring properties;*

The applicant is proposing to place the building five to six feet from the back of sidewalk along St. George Blvd. Along 300 West, the building will have an additional setback to allow for greater visibility to the adjoining property owners. There are no existing residential buildings that adjoin this property.

Level 2 steps back from the Boulevard an additional 20'-0" from level 1. The building is setback from adjacent commercial properties 30'-0" or more.

2. *Increased landscaping enhances the project and reduces any negative impacts;*

The site is designed to have landscape on all sides of the building but especially in between this and the adjoining property. Currently the buffer is old cars, boats, weeds, broken glass, rotting wood, and many other unsightly things.

3. *Site layout and design enhance the project and reduce any negative impacts;*

The construction is pushed far away from the existing building as to maximize the distance. This proposed building improves the ingress and egress for all neighboring properties and has been designed to accommodate more than sufficient number of parking stalls.

4. *The massing and building scale is appropriate for the location;*

The building is 69 ft tall, that is with roughly 10 ft being architectural design. The top of the hard roof line is roughly 59 ft. This building is located in the Central Business District along St. George Boulevard. This location is where you would expect increased heights and density

5. *The proposed height increase is appropriate area; and*

There are no residentially zoned properties surrounding this location, and no adjacent properties have windows or direct driveway traffic- this would not block any views.

6. *The increase in height is consistent with any applicable master plan. Surrounding properties with similar or taller buildings:*

This proposal has been derived from carefully studying other similar properties in our communities and others and has attempted to build upon and improve on many of the positive aspects they designed around. The height is consistent with the area, in review of height vs stories those are often not a direct correlation. The request here is consistent with the zone and consistent with other approved buildings.
Heights of surrounding buildings: County Bldg 77’8”, Advenire/City View Apartments 62’, Joule Plaza 74’, IMC 58’9”’, Main St. Plaza 71’, State Bank 64’, Tabernacle 115’, Court House 75’6”-94’8”, Vintage 54-64’ Tabernacle Towers 57’, Utah Tech Classroom Building 66’6” – 79’

C. *Area, Coverage, Density, Yard, Common Area and Landscaping Requirements: The minimum lot area, maximum lot coverage, yard and common open space/ landscaping requirements are as follows:*

Lot Area Minimum/ Maximum Density	*Maximum lot area coverage*	*Minimum Area Common Open Space/ Landscaped Area*	*Minimum Yard Setbacks*		
			Front and Street Side	*Side*	*Rear*
Required					
½ acre/ 40 DUA	*70%*	*20%*	*Adjacent to single-family zone: 30’* *Otherwise: 0 – 10’ max*	*Adjacent to single-family zone 30’* *Otherwise: 0 – 10’* *0’ internal setback between PD-C zoned buildings*	*Adjacent to single-family zone 30’* *Otherwise: 0’ commercial 0’ manufacturing*
Proposal					
1.28 acres/ 40 DUA	62.89%	20.8%	4’2” - 7’	83’2”	52’ 8½”

D. *Mixed commercial and residential use is permitted in the PD-MU zone only as set forth herein:*

1. *All development projects seeking a PD-MU zone shall be new construction and shall submit a detailed site plan pursuant to section 10-8D-2 showing the entire development project and showing the added specificity requirements of this section. In granting such approval, the land use authority may impose and enforce such specific conditions as to the site plan, orientation of the buildings to the public street, phasing, building construction, and maintenance as it deems necessary to protect the health, safety and welfare of the residents of the city. All development projects shall comply with the site plan as approved and adopted by the land use authority.*

   This project will be new construction, and a site plan will be submitted.

2. *The entire ground floor of any building in the project shall only have commercial uses, except as provided in this section.* See #4

3. *Residential use shall be located above the ground floor commercial use. Allowed residential density shall be determined by the detailed site plan and subject to all approvals in subsection D6 of this section.*

   The residential units are above the ground floor and are calculated at 40 DUA (Dwelling Units per acre).

4. *The requirement that the ground floor be limited to only commercial use may be altered to allow residential use or a parking structure, if all of the following conditions are met:*

   a. *The view of the ground floor is obstructed from the public street by the building's location in the interior of the project, or its obstruction from street view by other buildings in the project;*

      All portions of the building that front St. George Blvd and 300 West Street are commercial lease spaces. The interior portions of the building are amenities for the residential units located above. They include two lobbies, a community center, and bike storage. These areas are not visible from the street.

   b. *A minimum of fifty percent (50%) of the ground floor area within the project shall be for commercial uses; and*

      58% of the ground floor of the building is commercial lease space.

   c. *For buildings that are perpendicular to the street so that the majority of the building is not adjacent to the street, the end of the building adjacent to the street must have commercial uses on the ground floor, but may have residential use or a parking structure on the remainder of the ground floor that is not oriented toward the public street, if the project complies with the other conditions provided in this section.*

N/A

5. *If the project is built in phases, each phase shall be all commercial or may include a mix of commercial and residential use. No phase shall be solely residential, unless fifty percent (50%) of the required commercial area has been built in previous phases.*

   There is no phasing in this project.

6. *All projects must meet the design standards set forth below:*

   a. *Minimum height of ground level commercial use shall be twelve feet (12') floor to ceiling;* Need to verify

      The ground level is proposed to have 12’ ceilings.

   b. *The front building façade and main entrance to all buildings shall be oriented toward and parallel to the public street. The setbacks for buildings adjacent to a public street shall be a minimum of zero feet (0') to a maximum of twenty feet (20') from the property line except:*

      1) *The setbacks may be increased as necessary to allow room for outdoor seating areas, landscaping, or other similar pedestrian and customer amenities,*

         A portion of the building is set back 33’4” to allow for an outdoor dining area on 300 West Street.

      2) *Interior buildings may be allowed without frontage on a public street if it is not possible to fit a building parallel to the street, all other requirements have been met, and the depth and size of the property and best use of the property would prevent all buildings from having frontage on a public street;*

         N/A

   c. *All buildings adjacent to a public street shall have primary frontage oriented toward the public street, and shall have a design typical of a commercial building front with integrated style features compatible with other street-facing buildings in the project, including a significant entryway;*

      This building fronts St. George Boulevard and has several ground floor commercial entrances. There is an outdoor dining area facing 300 West Street.

   d. *Building façades shall have architectural variations such as:*

      1) *Contrasting building materials and textures,*

This building has contrasting building materials and textures as seen on the materials board.

2) *Variations in rooflines, colors, reveals and belt courses,*

There are variations in the rooflines with contrasting colors.

3) *Recessed windows and doors, strongly expressed window mullions, and awnings,*

The windows and doors will be recessed with architectural framing around the entrances.

4) *Varying building setbacks from property lines, alcoves, outdoor sitting areas, and small public plazas,*

This building does have varying setbacks and an alcove designed for an outdoor sitting area. There will also be outdoor seating on the roof portion of the first level near St. George Blvd.

5) *Corner towers, cupolas, corner clock towers, corner spires, balconies and colonnades;*

Balconies are shown on floors two through four on the front and rear of the building.

e. *Buildings located on corners shall have the front façade wrap around the corner to the full depth of the building;*

The ground-floor commercial façade wraps around the corner.

f. *Awnings will be allowed; provided, that the building is designed to allow awnings, and/or awnings are part of the initial design. Awnings shall have a minimum eight-foot (8') head clearance and shall not project away from the building more than one-half (½) the distance from the building to the street, or no more than six feet (6'), whichever distance is less. Awnings shall be constructed of metal and/or high quality fire-resistant architectural fabrics. Vinyl awnings are prohibited;*

This building has one awing on the west side, comprised of bronze metal trim and stucco.

g. *Parking lots shall be located in the interior of a project and not adjacent to a public street, except that access driveways with parking spaces on one (1) or both sides, with a maximum width of seventy feet (70'), are permitted. For buildings fronting a public street, all parking shall be located to the rear or side of buildings, or may be located below-grade (underneath building). Buildings located in the interior of the project may have the parking area on any side of the building, as per the approved site plan. Underground parking is permitted only if such parking is accessible from the side*

or rear of the development and not from the primary street. All projects must comply with the parking requirements for commercial and residential uses specified in chapter 19 of this title;

The portion of the parking lot that is accessed from St. George Blvd. has a 30’ access, the width of the parking lot is 66’. There are two access points on 300 West Street, they are both 28’ wide and the width of the parking portion on both points is 43’6”. The rest of the parking area is located in the interior of this lot.

h. *Parking structures are permitted only if the parking structures do not front the public street and are not taller than the proposed buildings;*

There is no parking structure, all the parking provided is surface parking.

i. *Minimum Ground Floor Glass: The ground floor of the building elevation fronting the street on all mixed-use buildings shall contain not less than forty percent (40%) nonreflective glass surface (i.e., windows);*

The glazing percentage along St. George Blvd. is 45.1%; the calculation for 300 West Street is 46.2%.

j. *Landscaped Open Space: Mixed-use developments shall provide a minimum of twenty percent (20%) of the total site area in landscaping, which may include recreation facilities such as playgrounds, outdoor pools, tennis courts, and basketball courts. No more than one-half (½) of the total required landscape area may consist of recreation facilities. Other than the minimum landscape area requirements, which are set above, the landscape standards in chapter 23 of this title shall apply;*

The site provides 20.8% landscape, none of the 20.8% calculation includes the recreation facilities.

k. *Solid Waste Storage Facilities: All solid waste storage facilities shall be located at the rear of the main building or else behind a sight-obscuring fence or wall that will prevent the facility from being seen from a public street. Chain link fencing with sight-obscuring slats is not permitted;*

The solid waste is located appropriately toward the interior parking and called out to be screened. It will be reviewed during the site plan review process to ensure screening meets the City Municipal Code.

l. *Protection of Residential Property: A minimum six-foot (6') high solid masonry wall and a minimum ten-foot (10') wide planting strip along the adjoining property line is required for development that adjoins any lot or parcel of ground in any residential zone. (Ord. 2019-10-002, 10-10-2019; amd. Ord. 2020-06-002, 6-4-2020)*

This item is not applicable as there is no residential property abutting this property.

RECOMMENDATION:

This mixed-use project located on the southwest corner of St. George Boulevard and 300 West Street. It will refresh this corner, giving it new commercial and residential opportunities. The proposal will add engaging commercial spaces to create additional gathering places, and the residential units will offer convenient access to restaurants, bus routes, and downtown. This project is in the Connected Corridor of the Downtown Area Plan. It meets the intent of the plan by engaging pedestrians with the street level commercial spaces, activating an area of St. George Boulevard that has been dormant for an extended period.

Staff recommends approval. In order to build the project as presented, the height restriction will need to be increased to allow additional height as requested by the applicant and shown in this staff report as allowed per City Code 10-8D-8 B.

ALTERNATIVES:

1. Recommend approval as presented
2. Recommend approval with conditions
3. Recommend denial.
4. Table the proposed zone change amendment to a specific date.

POSSIBLE MOTION:

“I move that we forward a positive recommendation to City Council to amend City Zoning Map from C-4 to PD-MU on approximately 1.28 acres, case No. 2025-ZC-020, based on the findings listed in the staff report with the height restriction increased to allow for the additional height as requested by the applicant and shown in the staff report.”

FINDINGS FOR APPROVAL:

1. The proposed project meets the requirements of the planned development mixed use zone as found in the zoning regulations.
2. This project aligns with the visions found in the General Plan and Downtown Area Plan.
3. There will be adequate parking on site to facilitate the development.
4. The increase in height will fit harmoniously into the neighborhood, minimizing any negative impacts by considering the proposed setbacks provide an appropriate buffer to neighboring properties.

Exhibit A
Applicant's Narrative

ROSENBERG ASSOCIATES™
CIVIL ENGINEERS LAND SURVEYORS

Date: October 1, 2025

Subject: **311 West Mixed Use Development (SG-317)**
PD Amendment
Project Number: 13440-22

This document has been prepared for 3 Eleven STG MF LLC in support of the PD Amendment to establish the current development plan. The proposed project includes construction of a 5 story mixed use building (68'-3" total height and 58,136 sq ft. total area) along St. George Blvd.; with the bottom floor comprised of commercial uses, and the upper 4 floors used for apartments. A single access is proposed along St. George Blvd., with 2 accesses along 300 West matching existing access points. The existing Sun Country Glass building and parking will remain in place (located outside the parcel), with all other existing structures and improvements to be demolished. Utilities will be connected off of 300 west to minimize disturbance to St. George Blvd. Low Impact Development drainage considerations will be required for the project, with stormwater retention facilities proposed within landscaping along the south property boundary. Landscaping installed with the project will include additional street trees within planters along St. George Blvd. similar to adjacent development.

352 East Riverside Drive, Suite A-2 St. George, Utah 84790 • (435) 673-8586 Phone • (435) 673-8397 Fax
www.racivil.com

Exhibit B
300 West Mixed Use
Use List

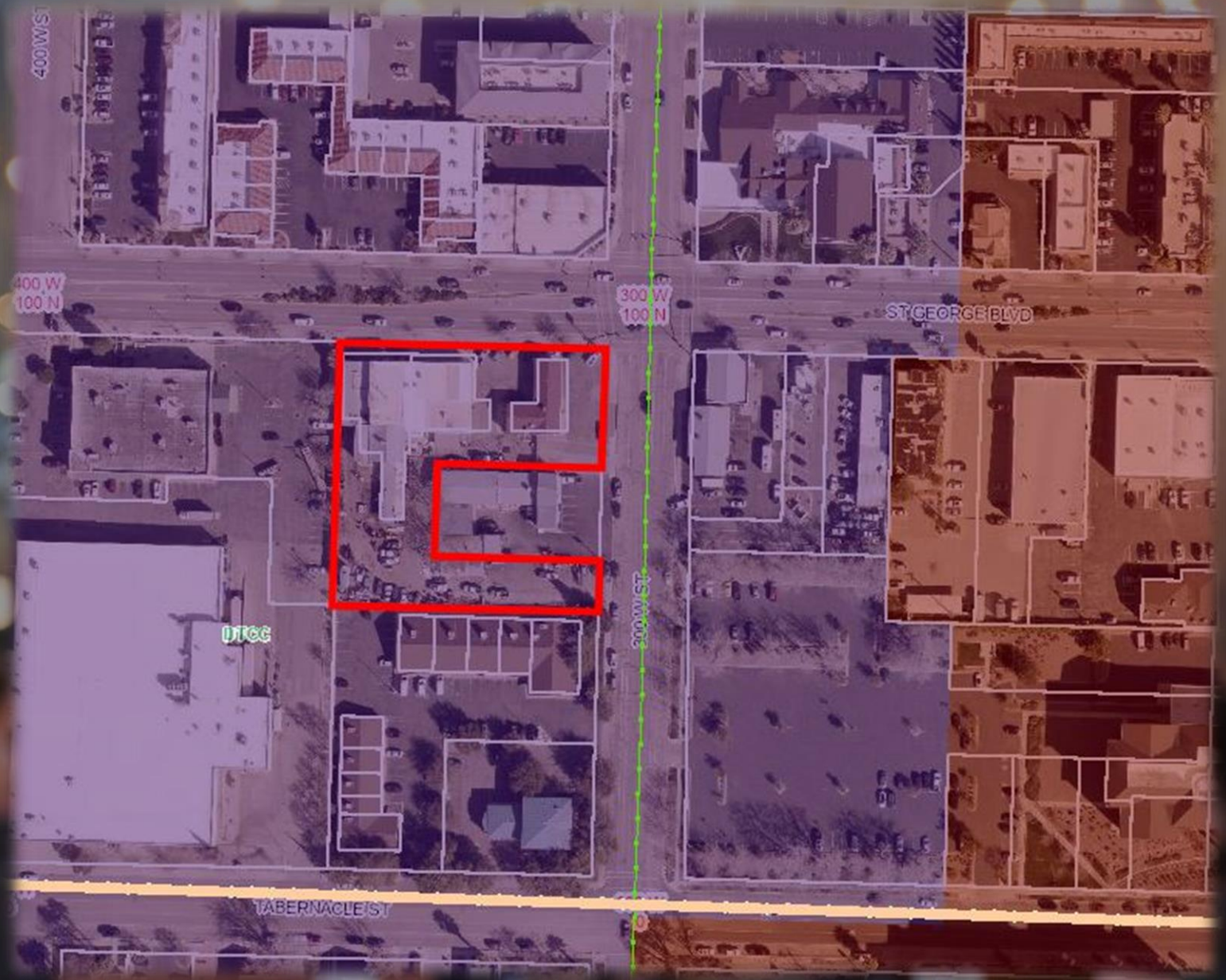
- Retail
- Office
- Financial, medical, and professional services
- Food service establishments
- School
- Religious Facility
- Personal Care Service
- Personal Instruction Service
- Payday lending/ title loans
- Amusement center, Indoor
- Service business as noted in C-1 thru C-4 below:
    - Body piercing
    - Childcare center
    - Construction trade services
    - Educational institutions
    - Gunsmith
    - Janitor service and supply
    - Locksmith
    - Permanent cosmetics with additional requirements as noted in 10-8B-1
    - Personal care service
    - Personal instruction service
    - Pest control
    - Printing
    - Psychic
    - Sign sales
    - Tattoo establishment

Exhibit C
PowerPoint Presentation

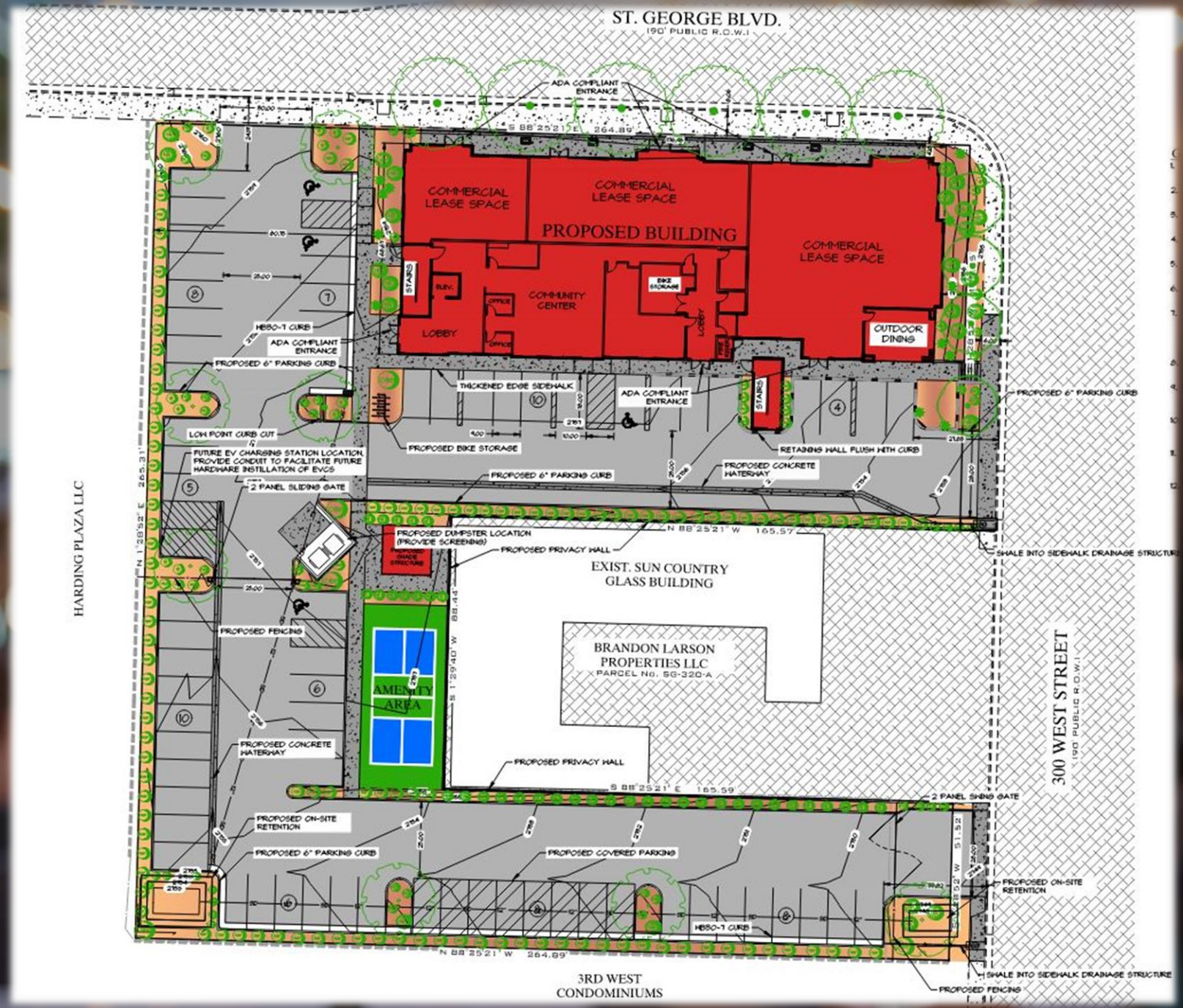
300 West Mixed Use

Zone Change 2022-ZC-020

400 W
100 N
300 W
100 N
ST GEORGE BLVD
300 W ST
TABERNACLE ST
300 W


400 W
100 N
300 W
100 N
ST GEORGE BLVD
300 W ST
DTCC
TABERNACLE ST

400 W ST
400 W
100 N
300 W
100 N
ST GEORGE BLVD
PD-MU
300 W ST
C-4
TABERNACLE ST
300 W


ST. GEORGE BLVD.
190' PUBLIC R.O.W.
ADA COMPLIANT ENTRANCE
S 88°25'21" E 264.89
COMMERCIAL LEASE SPACE
COMMERCIAL LEASE SPACE
PROPOSED BUILDING
COMMERCIAL LEASE SPACE
STAIRS
ELEV.
LOBBY
OFFICE
COMMUNITY CENTER
BIKE STORAGE
LOBBY
OFFICE
OUTDOOR DINING
HESS0-7 CURB
ADA COMPLIANT ENTRANCE
PROPOSED 6" PARKING CURB
THICKENED EDGE SIDEWALK
ADA COMPLIANT ENTRANCE
STAIRS
PROPOSED 6" PARKING CURB
LOW POINT CURB CUT
FUTURE EV CHARGING STATION LOCATION. PROVIDE CONDUIT TO FACILITATE FUTURE HARDWARE INSTILLATION OF EVCS
PROPOSED BIKE STORAGE
RETAINING WALL FLUSH WITH CURB
2 PANEL SLIDING GATE
PROPOSED 6" PARKING CURB
PROPOSED CONCRETE WATERWAY
HARDING PLAZA LLC
N 1°28'52" E 265.31'
PROPOSED DUMPSTER LOCATION (PROVIDE SCREENING)
PROPOSED PRIVACY WALL
N 88°25'21" W 165.57'
SHALE INTO SIDEWALK DRAINAGE STRUCTURE
EXIST. SUN COUNTRY GLASS BUILDING
BRANDON LARSON PROPERTIES LLC
PARCEL No. SG-320-A
300 WEST STREET
190 PUBLIC R.O.W.
PROPOSED FENCING
AMENITY AREA
S 1°29'40" W 88.44'
PROPOSED CONCRETE WATERWAY
PROPOSED PRIVACY WALL
S 88°25'21" E 165.59'
2 PANEL SLIDING GATE
PROPOSED ON-SITE RETENTION
PROPOSED 6" PARKING CURB
PROPOSED COVERED PARKING
S 1°28'52" W 51.52'
PROPOSED ON-SITE RETENTION
HESS0-7 CURB
N 88°25'21" W 264.89'
SHALE INTO SIDEWALK DRAINAGE STRUCTURE
PROPOSED FENCING
3RD WEST CONDOMINIUMS

PARKING:

18 (STUDIO) UNITS X 0.5 STALLS =	9 STALLS
21 (1 BED) UNITS X 0.5 STALLS =	11 STALLS
12 (2 BED) UNITS X 1 STALLS =	12 STALLS
51 UNITS / 5 FOR GUESTS =	11 STALLS
7,004 S.F. COMM./ 500 =	14 STALLS
TOTAL REQUIRED	**57 STALLS**
TOTAL PROVIDED	**72 STALLS**

COVERED PARKING

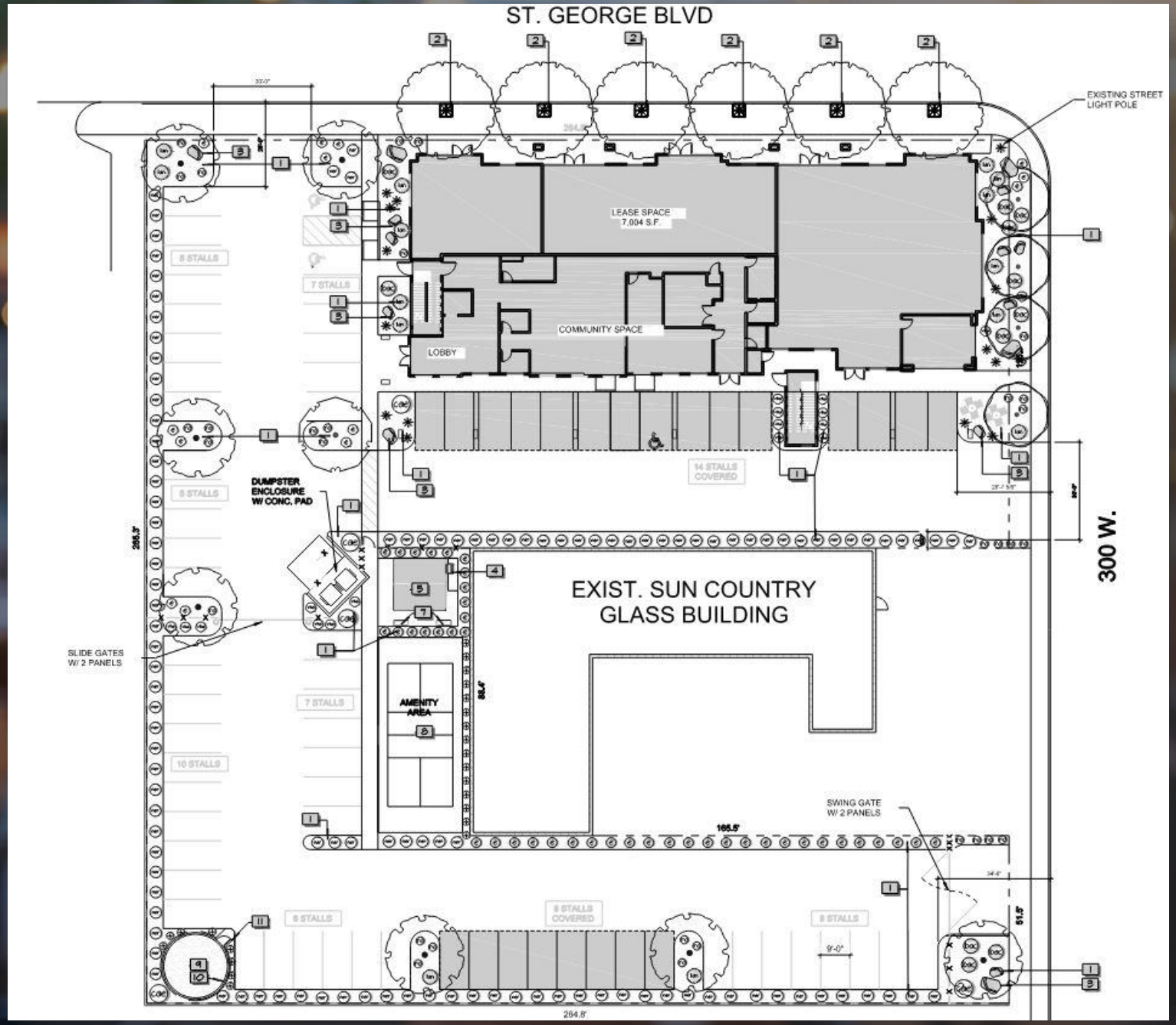
1/2 RESIDENTIAL STALLS
43 STALLS / 2 = 22 COVERED STALLS
22 COVERED STALLS PROVIDED

ADA ACCESSIBLE: 3
ADA VAN ACCESSIBLE: 3

BIKE PARKING

2 SPACES PER PROJECT
2 ADDITIONAL SPACES PER EVERY 100 CAR SPACES
57 > 100

2 SPACES REQUIRED
4 SPACES PROVIDED



PLANT SCHEDULE — A

SYMBOL	BOTANICAL / COMMON NAME	CONT	CAL	QTY
DECIDUOUS				
	Fraxinus oxycarpa 'Raywood' TM / Raywood Ash	B & B	2"	7
	Pistacia x 'Red Push' / Red Push Pistache	B & B	2"	4
	Prosopis glandulosa 'Maverick' TM / Maverick Thornless Honey Mesquite	B & B	2"	1
	Ulmus parvifolia / Lacebark Elm	B & B	2"	6

SYMBOL	BOTANICAL / COMMON NAME	SIZE	FIELD2	QTY
SHRUBS				
bac	Baccharis x 'Starn' / Starn Thompson® Coyote Brush	5 gal		11
cae	Caesalpinea gilliesii / Desert Bird of Paradise	5 gal		5
e	Euonymus japonicus 'Green Spire' / Green Spire Japanese Euonymus	5 gal		42
	Hesperaloe parviflora / Red Yucca	5 gal		15
ner	Nerium oleander 'Dwarf' / Dwarf Oleander	5 gal		119
rha	Rhaphiolepis indica 'Pinkie' / Pinkie Indian Hawthorn	5 gal		17
GRASSES				
	Calamagrostis acutifolia / Overdam Reed Grass	1 gal		23
PERENNIALS				
e	Encelia farinosa / Brittlebush	1 gal		13
lan	Lantana camara 'Radiation' / Radiation Lantana	5 gal		14
ro	Rosmarinus officinalis 'Prostratus' / Dwarf Rosemary	1 gal		32

2 EAST ELEVATION - PRESENTATION

SCALE: 1/8" = 1'-0"

68′3″

54′ 9 3/8″

14′

1 NORTH ELEVATION - PRESENTATION

SCALE: 1/8" = 1'-0"

64′3″

56′1″

14′

63′

53′ 6 3/8″

14′

68′3″

56′1″

14′

MAKA
BEAUTY SYSTEMS

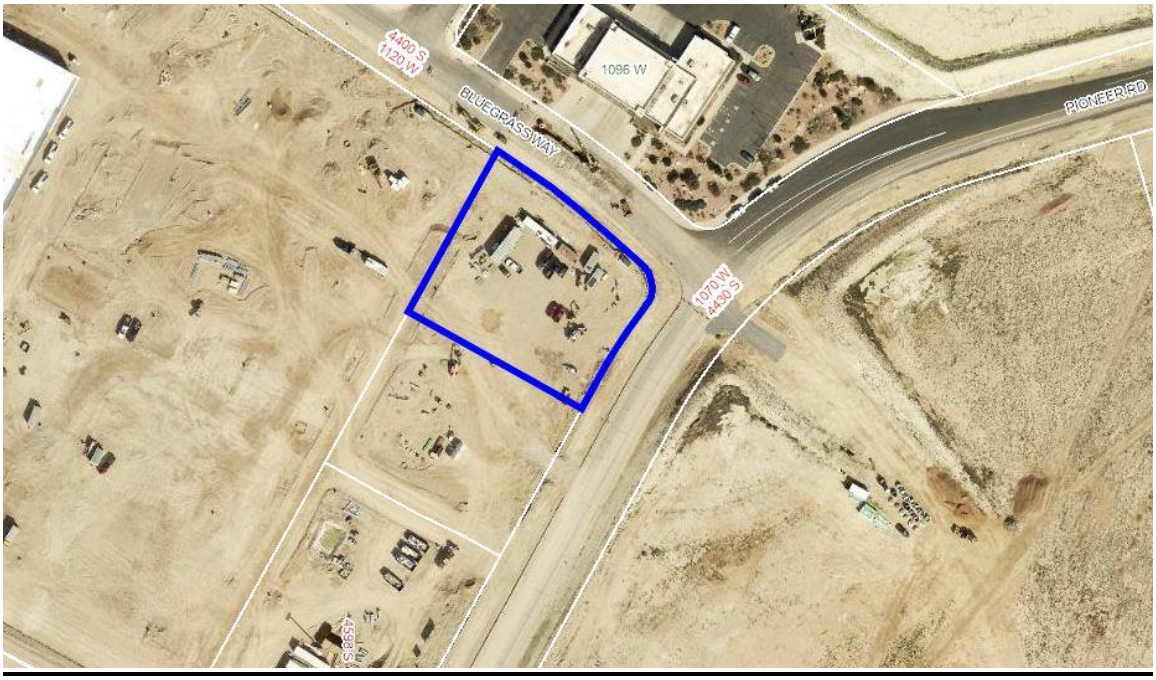
311
ST GEORGE BLVD
300 WEST
Sweet Basil Cafe

51’
62’
62’
62’
71’
94’8”
74’
115’
69’3”
77’8”
N 300 W ST
N 200 W ST
N 100 W ST
N MAIN ST
N 100 E ST
N TEMPLE CT
W ST GEORGE BLVD
E ST GEORGE BLVD
W TABERNACLE ST
E TABERNACLE ST
W 100 S ST
E 100 S ST
Post Office - St. George Downtown
Zion's Square
Fifth District Court
Town Square

"I move that we forward a positive recommendation to City Council to amend City Zoning Map from C-4 to PD-MU on approximately 1.28 acres, case No. 2025-ZC-020, based on the findings listed in the staff report with the height restriction increased to allow for the additional height as requested by the applicant and shown in the staff report."

PLANNING COMMISSION AGENDA REPORT: **11/18/2025**

Utah First Credit Union – Sun River Planned Development Amendment (Case No. 2025-PDA-031)		
Request:	Consider an ordinance to amend an approved PD-C (Planned Development Commercial) zone to allow the design and site plan for a new 3,420 sq. ft. financial institution on a 0.81-acre site as well as the addition of two monument signs to the Sun River Commons Master Sign Plan.	
Applicant:	Civil Science	
Representative:	Brandee Walker	
Location:	Located west of Pioneer Road and south of Bluegrass Way.	
General Plan:	PD (Planned Development)	
Existing Zoning:	PD-C (Planned Development Commercial)	
Surrounding Zoning:	North	PD-C (Planned Development Commercial)
	South	PD-C (Planned Development Commercial)
	East	PD-C (Planned Development Commercial)
	West	PD-C (Planned Development Commercial)
Land Area:	Approximately 0.81 acres	



BACKGROUND:
This project site is part of the Sun River Commons area and within the Atkinville Interchange Area Zone Plan (AIZP), Planning Area 3.1. The applicant is proposing a new credit union building approximately 3,420 square feet in size on a 0.81-acre site. The permitted uses list in the AIZP note "Financial Institution" as a permitted use in the MU (mixed use) zone, which is the designation for Planning Area 3.1

There are 19 parking spaces proposed and 14 spaces are required for the use. There is approximately 12,978 square feet of proposed landscaping which is about 37% of the project site, exceeding the AIZP minimum requirement of 25%. The proposed building would reach a height of 22 feet. The zone will allow for a 35-foot building height with architectural features up to 45 feet. The building will primarily be constructed of limestone and aluminum composite material paneling. Elevation drawings have been included in this packet.

Monument Signs Request
In October 2018, the City Council approved the Sun River Master Sign Plan. The purpose of the master sign plan is to maintain a cohesive design theme throughout the commercial area for all the freestanding signs, while preventing visual clutter by regulating sign design, quantity, size, and location. An amendment to the master sign plan was approved in May of 2025 to accommodate additional signage and design based on the continued development of Sun River Commons. The applicant proposes an amendment to the Sun River Commons Master Sign Plan by adding two additional freestanding monument signs as part of the development of this site that was not part of the most recent amendment.

Please see the table below for a summary of the zoning requirements.

Zoning Requirements			
Regulation	**Section Number**	**Proposal**	**Staff Comments**
Setbacks	AIZP 4.2	Proposed setbacks: Pioneer Road – 20' Bluegrass Way – 20' South Side – 43'4" West Side – 105'	The required setbacks are: Pioneer Road – 20' Bluegrass Way – 20' PD-C Zone Side – 10'
Pedestrian Circulation Plan	10-8-6	Pedestrian circulation is shown on the plans.	The plans appear to meet the required pedestrian circulation.
Uses		Financial Institution	The credit union is a permitted use under the AIZP.
Height and Elevation	AIZP 4.2	The proposed building height is 22' 9".	The AIZP will allow a maximum height of 35' with architectural features up to 45'.
Phasing Plan	10-8D-2	No phasing proposed.	No comment.

Landscape Plan	10-8D-2 & AICP 4.2	Conceptual landscape plan provided (approximately 37% of site) 20' landscape adjacent to Pioneer Rd and Bluegrass Way.	The AIZP requires a minimum open space of 25% of the site. The conceptual landscape plan meets the requirement. Approved street trees will be required as part of the site plan review.
Utilities	10-8D-2	None shown.	All utilities will be determined and designed during the JUC process. Staff will ensure this is completed during the site plan approval process.
Signs	10-8D-2	Two 6' 5" freestanding monument signs that appear to meet the Sun River Commons Master Sign plan design criteria are proposed .	The Sun River Commons Master Sign Plan does not show monument signs on this site.
Lighting	10-8D-2, 10-14-1	A photometric plan has been included and appears to meet code.	During site plan review, staff will ensure that site lighting meets the requirements in Title 10-14 (outdoor lighting).
Lot Coverage	10-8D-6	The proposed building on the lot will cover 3,420 sq ft. The lot is 35,225 sq ft (9.4%).	The site plan meets lot coverage regulations < 50%
Solid Waste	10-8D-6	Solid waste receptacle location is shown on the site plan.	Located away from the public street (Pioneer Rd and Bluegrass Way) and includes a solid screen wall.
Parking	10-19-5	19 parking stalls	14 parking stalls required
EVCS And Bike Parking	10-19-6	No EVCS conduit or Bike Parking are shown.	The project will be required to have conduit for a future EVCS for at least one parking space and provide bike parking.

RECOMMENDATION:

Staff recommends approval of this PD Amendment with the following conditions:

1. That a site plan must be applied for and approved prior to construction of the site.
2. That the Sun River Commons Master Sign Plan is amended and approved as proposed.

ALTERNATIVES:

1. Recommend approval as presented.
2. Recommend approval with modified conditions.
3. Recommend denial of the request.
4. Continue the proposed PD amendment to a later date.

FINDINGS FOR APPROVAL:

1. The proposed amendment complies with the applicable provisions of Title 10-8D and is consistent with the intent of the Atkinville Interchange Area Zone Plan (AIZP).
2. The proposed amendment complies with the applicable sign design standards and is consistent with the intent of the Sun River Commons Master Sign Plan.

POSSIBLE MOTION:

“I move that we forward a positive recommendation to the City Council for the PD Amendment for Utah First Credit Union, Case No. 2025-PDA-031, based on the findings and subject to the conditions listed in the staff report.”

Exhibit A
Applicants Narrative

Utah First Credit Union

Zone Change Narrative

This zone change request is to construct a credit union building within the Sun River Commons which is part of the Atkinville Interchange Area plan dated November 10, 2006 and amended December 6, 2006.

The proposed credit union building is located at 4560 W Pioneer Road, parcel SG-SURC-4-403. The lot area totals 0.81 acres with a building size of 3,420 square feet. The building height is 22' feet and meets all setback requirements. The size offers 19 total parking stalls with 14 being required.

The building has a unique design with its signature orange backlit features as shown on the provided building renderings. City staff have expressed concern with the lighting in the late-night hours and the impact to surrounding parcels. This site is surrounded by commercial on the north, west, and south with an existing fire station to the east. Understanding the concerns of staff, the applicant has provided the attached letter addressing the lighting and the owner's willingness to dim the backlit feature from 10pm to sunrise.

FFKR ARCHITECTS

MEMO

To:	**St. George Planning and Zoning Department**	Memo: 01
	175 East 200 North	Date: 09/24/2025
	St. George, Ut. 84070	**Project: Utah First Credit Union – Sun River**
From:	FFKR Architects	
		FFKR Project #: 25090

Remarks:

In response to the concerns raised during our Pre-Application meeting with the City of St. George on September 3, 2025, regarding the brightness of the proposed building, we would like to provide clarification.

The design includes the Credit Union's signature orange 3form backlit feature, which serves as an important brand identifier. To address the concern of excessive brightness, the Owners have agreed to incorporate a dimmer control system. This system will automatically reduce the lumen output of the feature from 10:00 p.m. until sunrise.

We note that the Credit Union's two existing branches in the Valley—one in Washington and one in St. George at Mall Drive and Riverside Drive—do not currently have this dimmer control. This new approach reflects the Owners' willingness to be responsive to community feedback and sensitive to the City's lighting standards.

Please let us know if you have any additional questions or require further information.

Rob Merrick AIA, NCARB

Senior Associate | Architect
D 801.534.4275 M 801.910.8126
rmerrick@ffkr.com

FFKR ARCHITECTS
SALT LAKE CITY · TEMPE · ST. GEORGE · BOISE

Exhibit B
PowerPoint Presentation

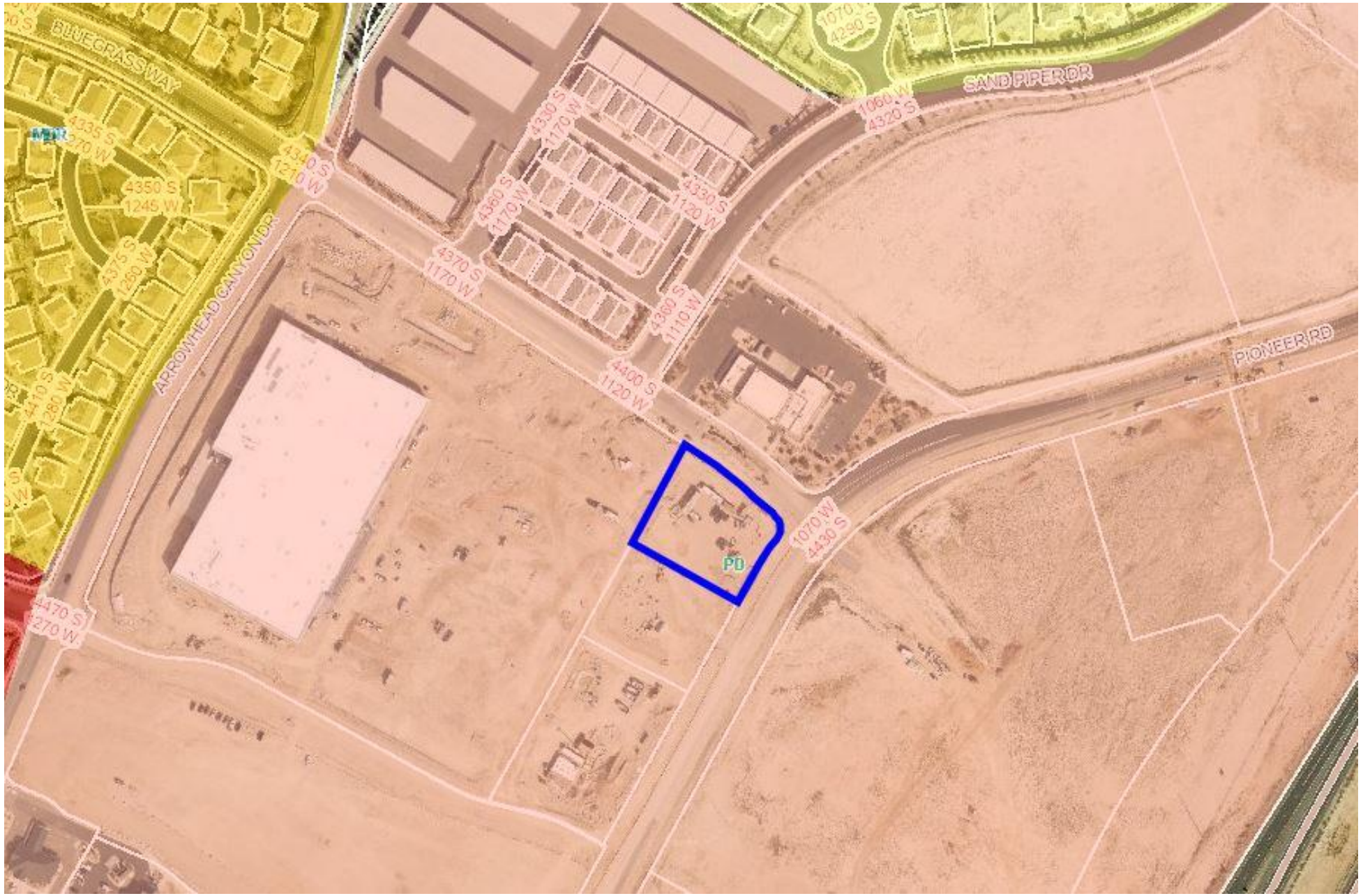
Utah First Credit Union

Planned Development Amendment
2025-PDA-031

Aerial Map

BLUEGRASS WAY
4335 S
1270 W
4340 S
1210 W
4350 S
1245 W
4375 S
1260 W
ARROWHEAD CANYON DR
4410 S
1280 W
4470 S
1270 W
4370 S
1170 W
4360 S
1170 W
4330 S
1170 W
4330 S
1120 W
4360 S
1110 W
4400 S
1120 W
1070 W
4290 S
SAND PIPER DR
1060 W
4320 S
PIONEER RD
1070 W
4430 S

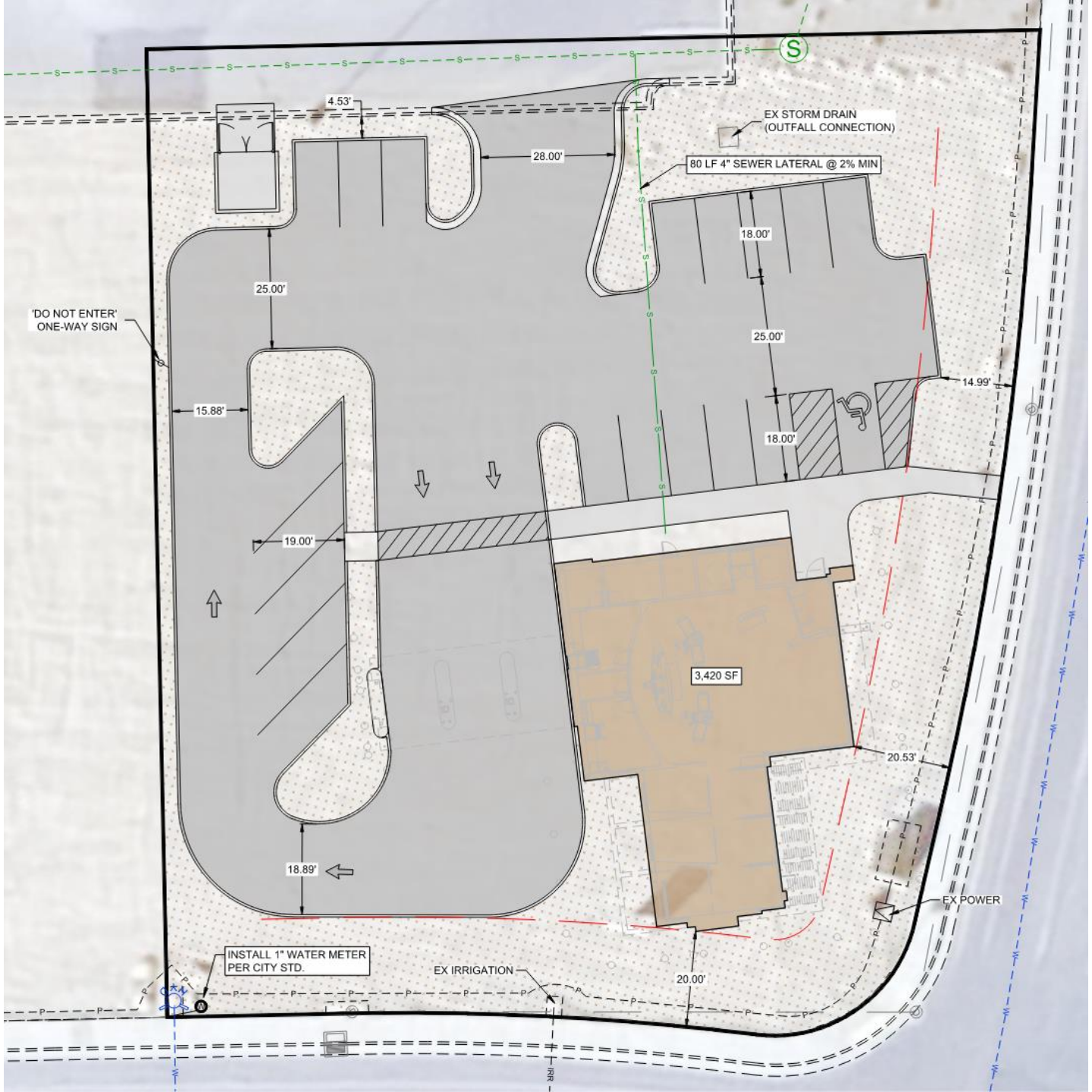
Land Use Map


BLUEGRASS WAY
ARROWHEAD CANYON DR
SAND PIPER DR
PIONEER RD
PD
4335 S 1270 W
4350 S 1245 W
4375 S 1260 W
4410 S 1280 W
4470 S 1270 W
4370 S 1170 W
4360 S 1170 W
4330 S 1170 W
4330 S 1120 W
4380 S 1110 W
4400 S 1120 W
1070 W 4290 S
1060 W 4320 S
1070 W 4430 S

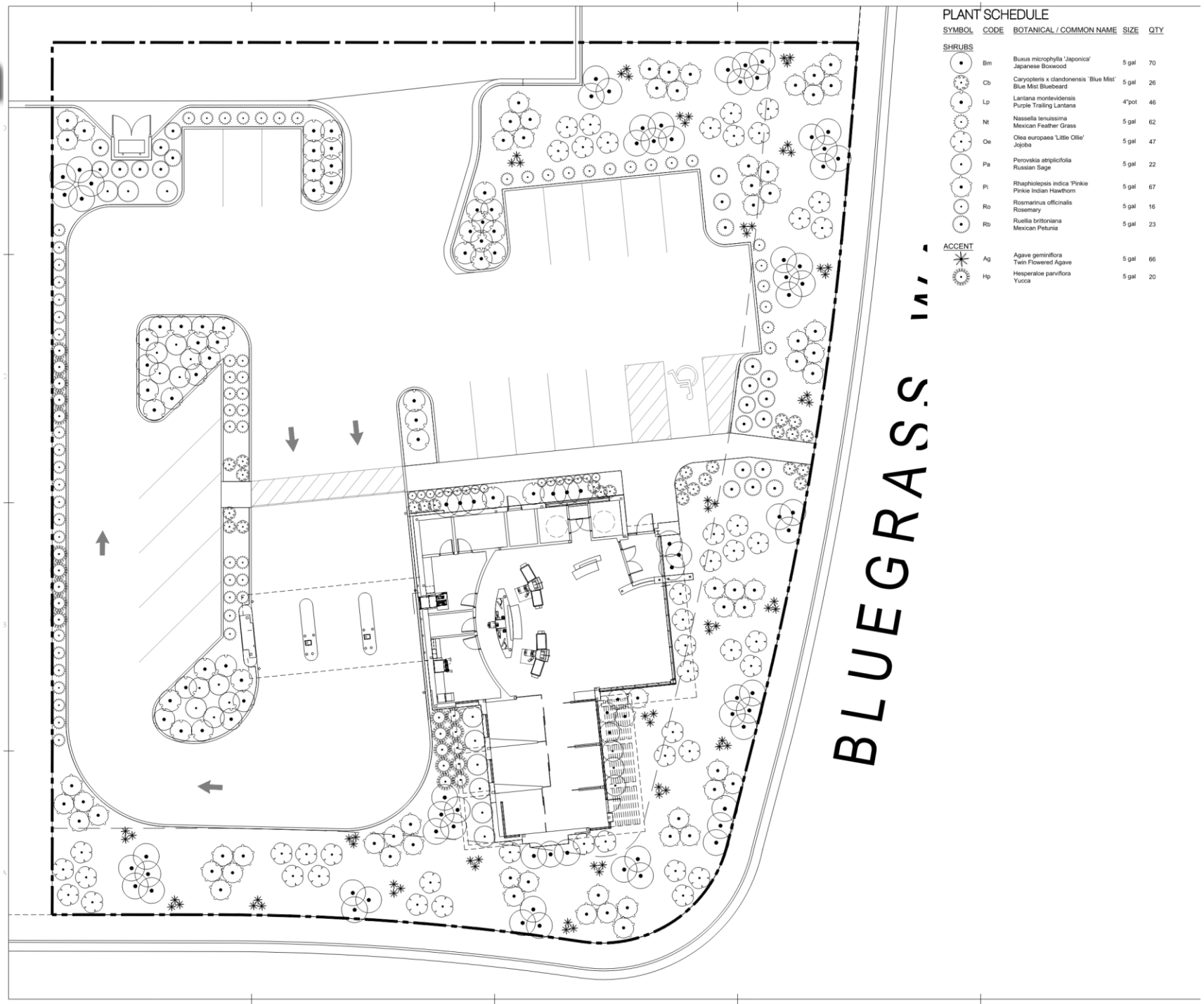
Zoning Map

BLUEGRASS WAY
ARROWHEAD CANYON DR
SAND PIPER DR
PIONEER RD
4335 S 1270 W
4340 S 1210 W
4350 S 1245 W
4375 S 1280 W
4410 S 1280 W
4470 S 1270 W
4370 S 1170 W
4360 S 1170 W
4330 S 1170 W
4330 S 1120 W
4360 S 1110 W
4400 S 1120 W
1070 W 4430 S
1060 W 4320 S
1070 4290 S

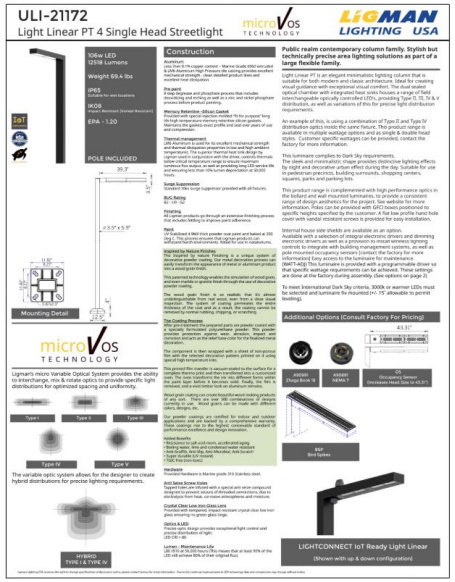
Site Plan

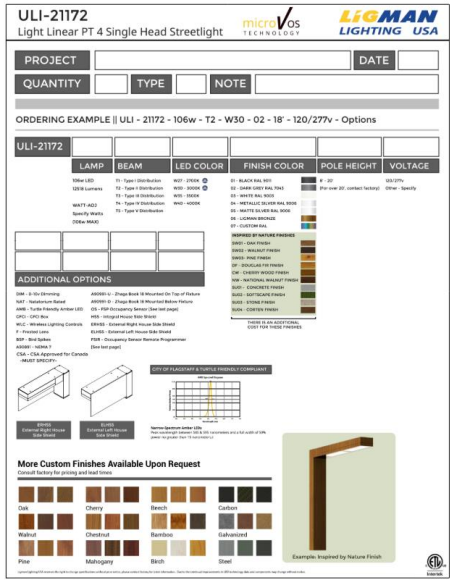

4.53'
28.00'
EX STORM DRAIN
(OUTFALL CONNECTION)
80 LF 4" SEWER LATERAL @ 2% MIN
18.00'
25.00'
'DO NOT ENTER'
ONE-WAY SIGN
25.00'
14.99'
15.88'
18.00'
19.00'
3,420 SF
20.53'
18.89'
EX POWER
INSTALL 1" WATER METER
PER CITY STD.
EX IRRIGATION
20.00'

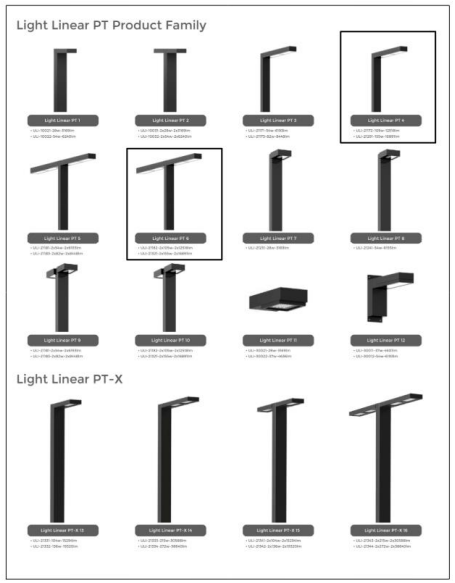
Landscape Plan

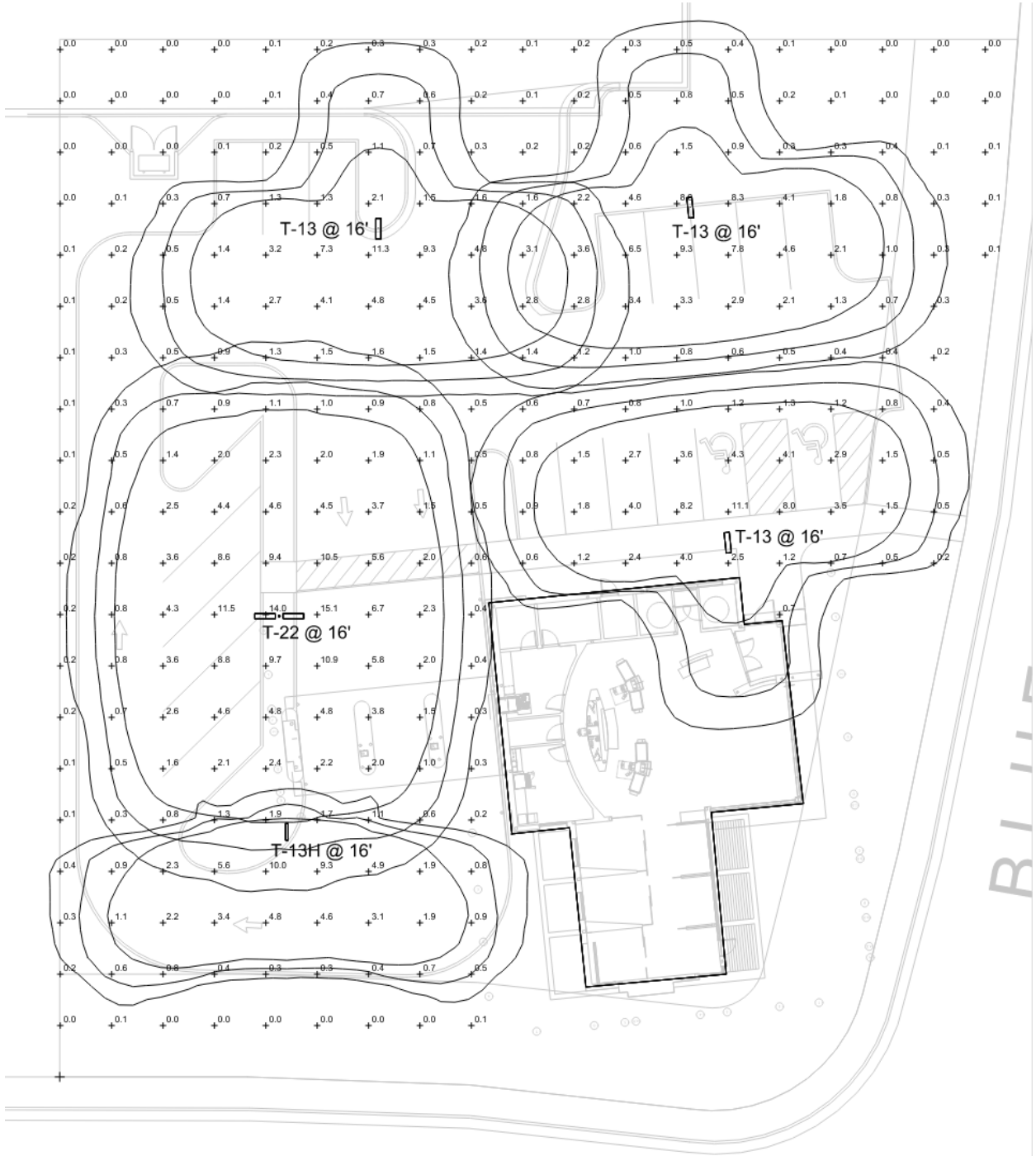


Photometric Plan

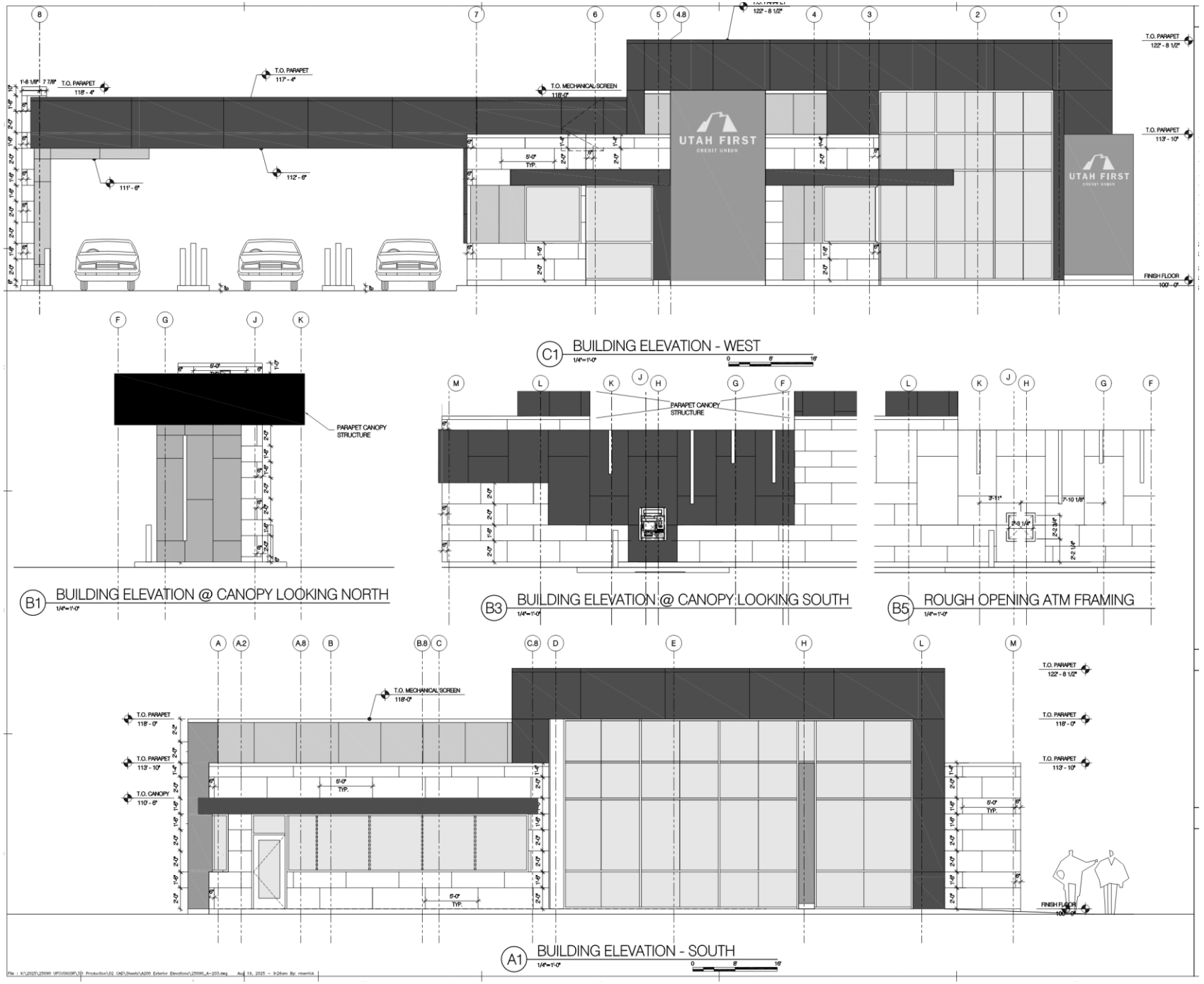




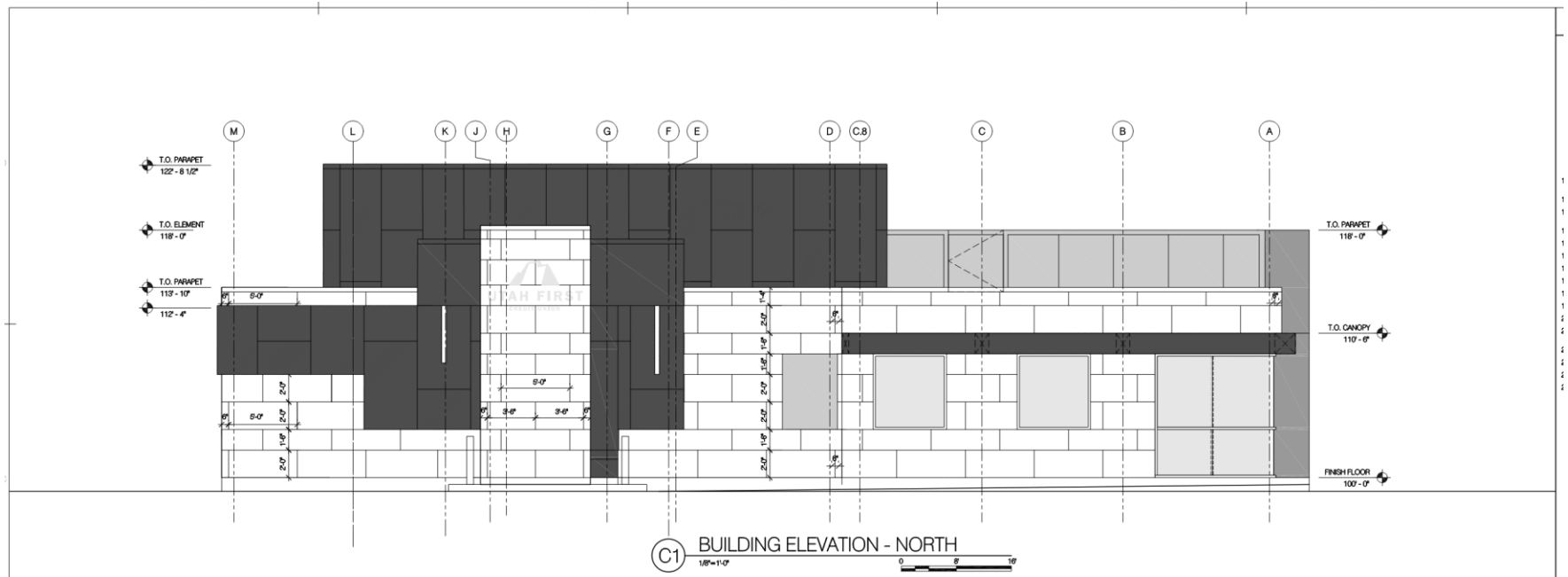




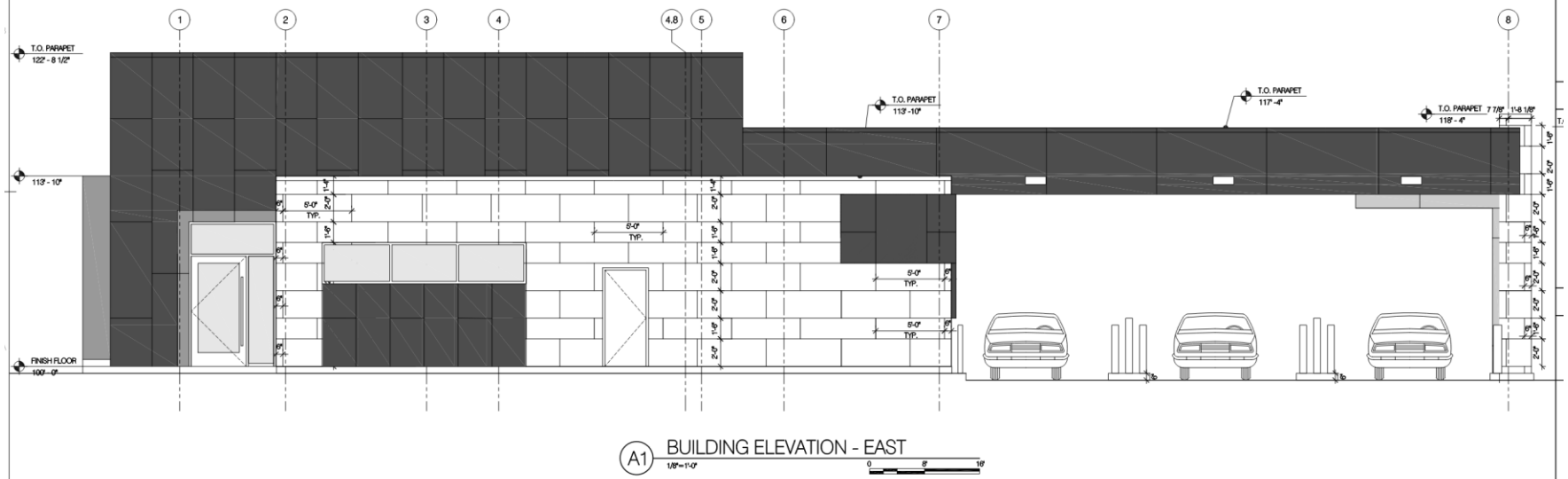
Elevations


C1 BUILDING ELEVATION - WEST
1/4"=1'-0"
B1 BUILDING ELEVATION @ CANOPY LOOKING NORTH
1/4"=1'-0"
B3 BUILDING ELEVATION @ CANOPY LOOKING SOUTH
1/4"=1'-0"
B5 ROUGH OPENING ATM FRAMING
1/4"=1'-0"
A1 BUILDING ELEVATION - SOUTH
1/4"=1'-0"
UTAH FIRST
CREDIT UNION
PARAPET CANOPY STRUCTURE
T.O. PARAPET
T.O. MECHANICAL SCREEN
T.O. CANOPY
FINISH FLOOR

Elevations



C1 BUILDING ELEVATION - NORTH
1/8"=1'-0"

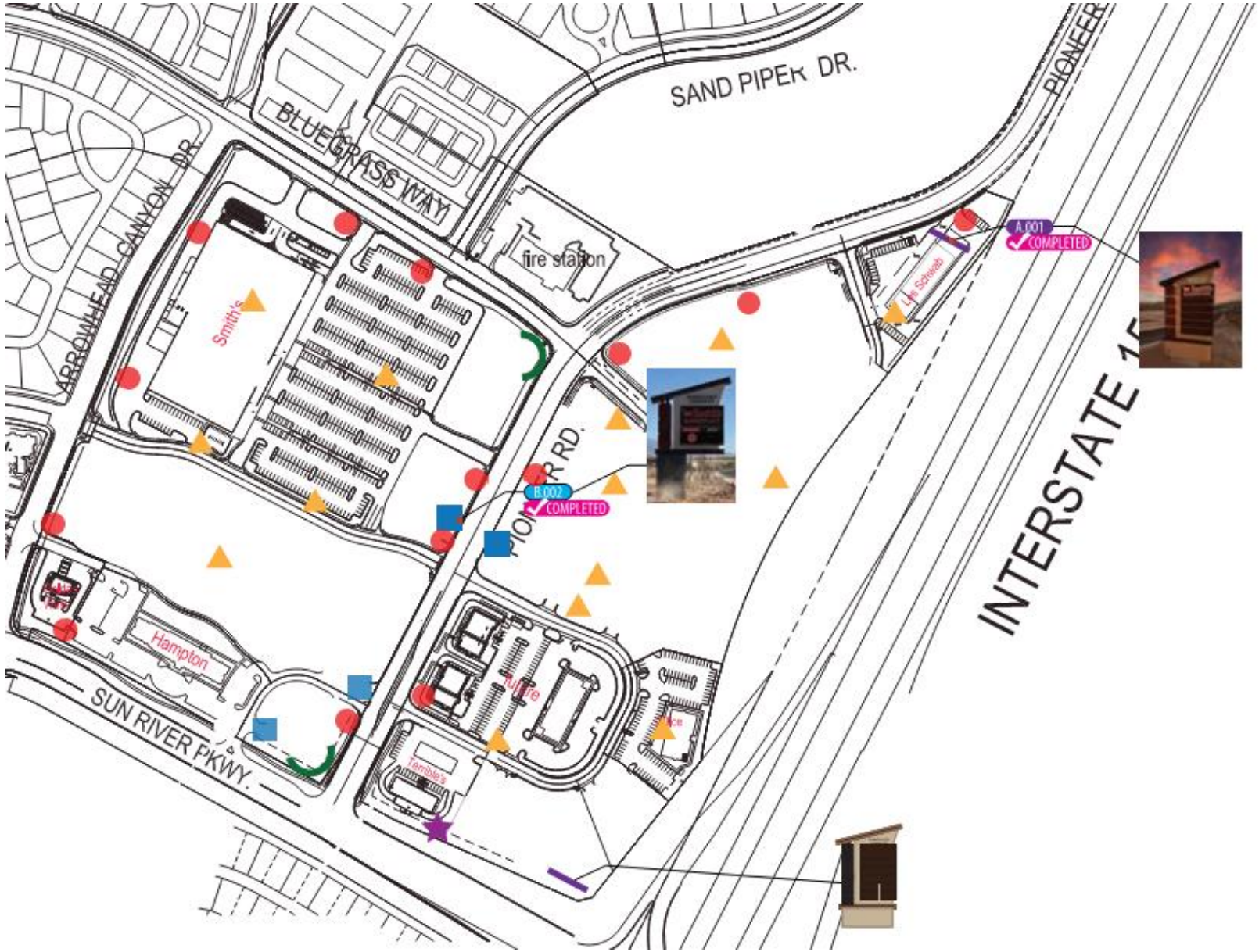


A1 BUILDING ELEVATION - EAST
1/8"=1'-0"

Renderings

Materials Board

Sun River Commons Master Sign Plan



SITE SIGNAGE

Traffic Pattern Direction

Sign Type A : 53' Pylon	A	2
Sign Type B : 30' Pylon	B	4
Sign Type C : 10' Monument	C	14
Sign Type D : 6'-5" Monument	D	14
Sign Type E : ID Monument	E	2
Sign Type E : ID Monument	F	1

Sun River Commons Master Sign Plan

YESCO

DESIGN

4679 South River Road
St. George, UT 84790
435.628.0350
www.yesco.com

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This drawing was created to assist you in visualizing our proposal. The original ideas herein are the property of YESCO LLC. Permission to copy or revise this drawing can only be obtained through a written agreement with YESCO.
The colors shown are only approximated on any computer monitor, inkjet or laser print. The final product may vary slightly in color from your computer monitor or print.

This sign is installed in accordance with the requirements of Article 600 of the National Electrical Code and / or other applicable local codes. This includes proper grounding and bonding of the sign.

Revisions

No.	Date / Description
Org.	03.12.2018 [CTL]
1	03.12.2018 update angle CTL
	03.28.2018 update CTL
	04.03.2018 match angles of cust. prov art LC
	04.05.2018 redlines as per customer call LC
	11.09.2018 redlines as per customer CTL
	12.31.2018 change height CTL
	01.29.2024 TY

JO #

Approval

A/E Sign / Date

Client Sign / Date

Sun River

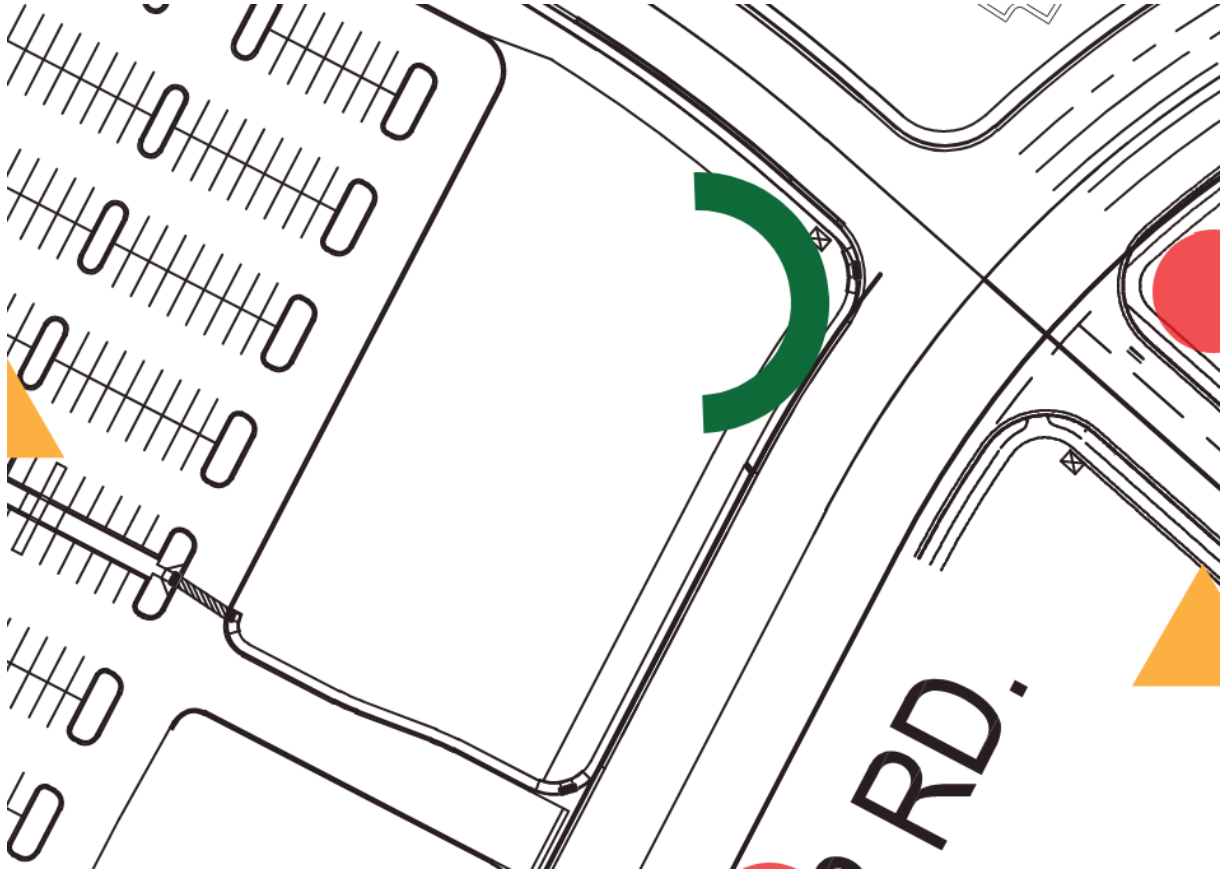
Sun River Parkway
St. George, UT

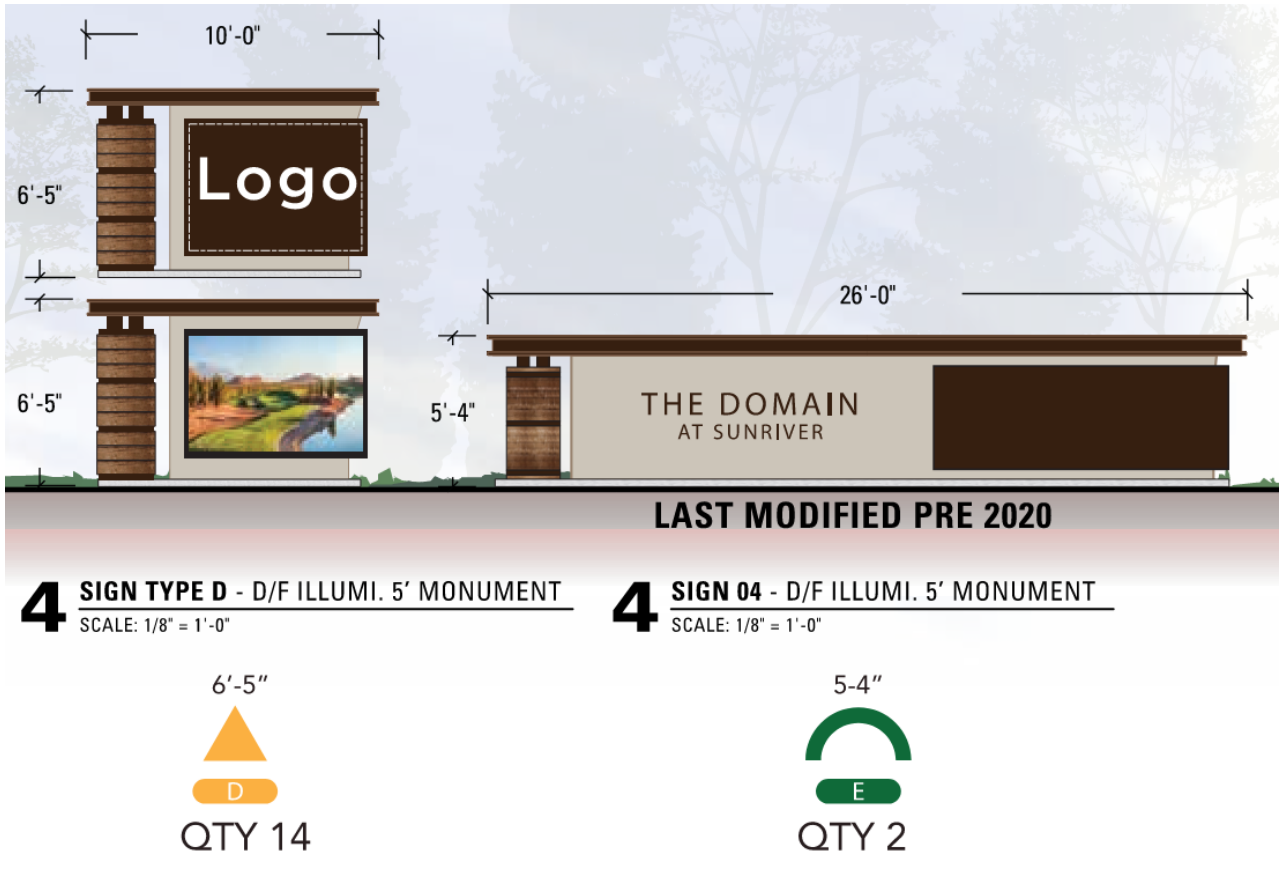
Acct. Exec: Ray Draper
Designer: Cheryl Lewis/Tyler Young

OPY-12571 MR10

ART 0.1

Sun River Commons Master Sign Plan





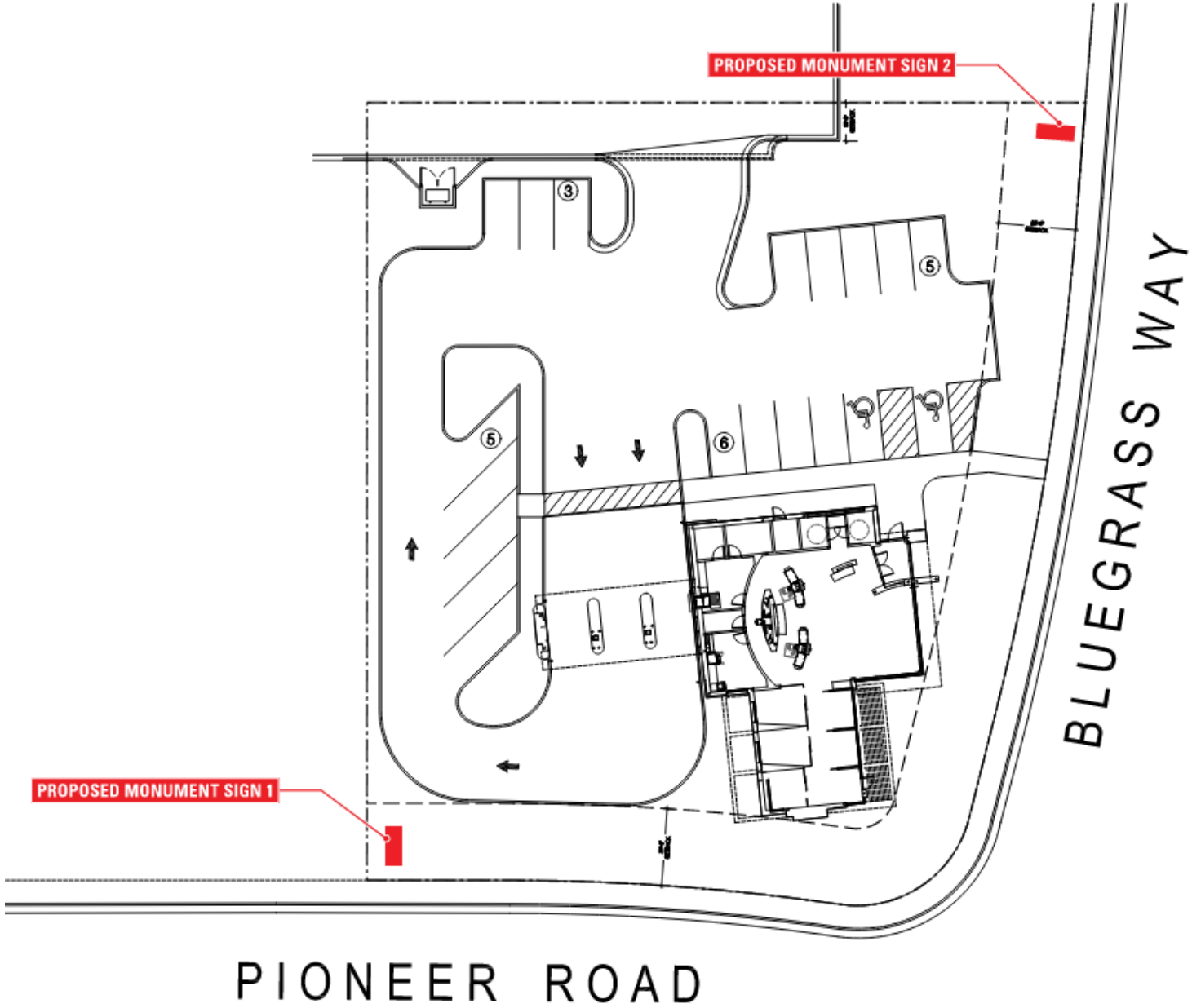
4 **SIGN TYPE D** - D/F ILLUMI. 5' MONUMENT
SCALE: 1/8" = 1'-0"

6'-5"
D
QTY 14

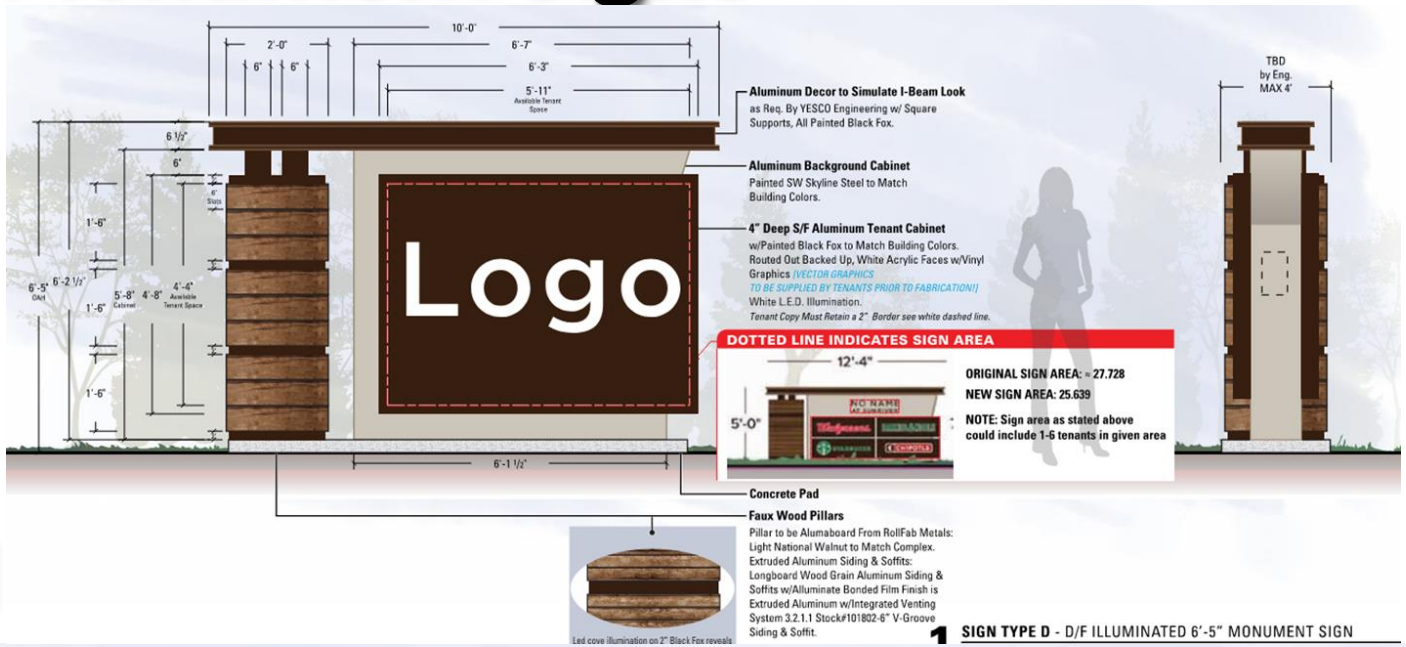
4 **SIGN 04** - D/F ILLUMI. 5' MONUMENT
SCALE: 1/8" = 1'-0"

5-4"
E
QTY 2

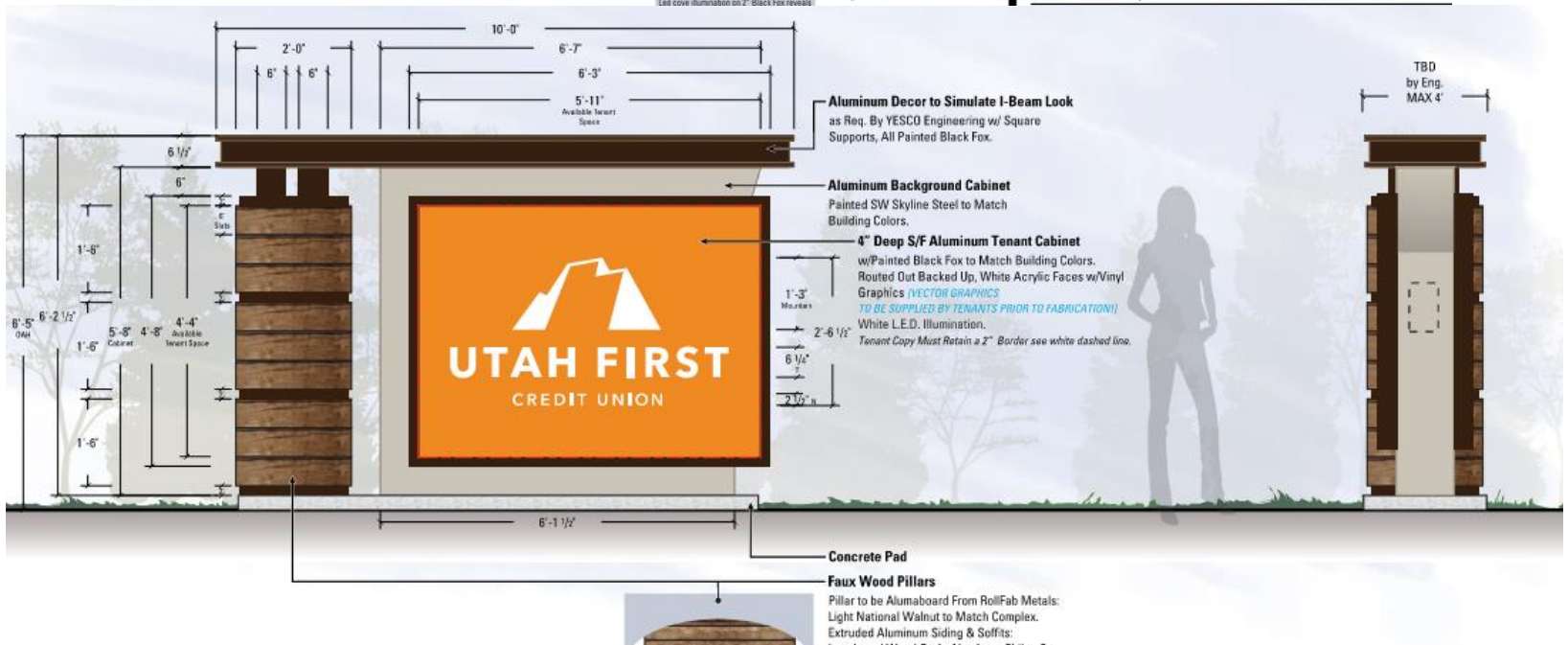
Proposed Monument Signs



Approved Monument Signs



Proposed



Approved Monument Signs

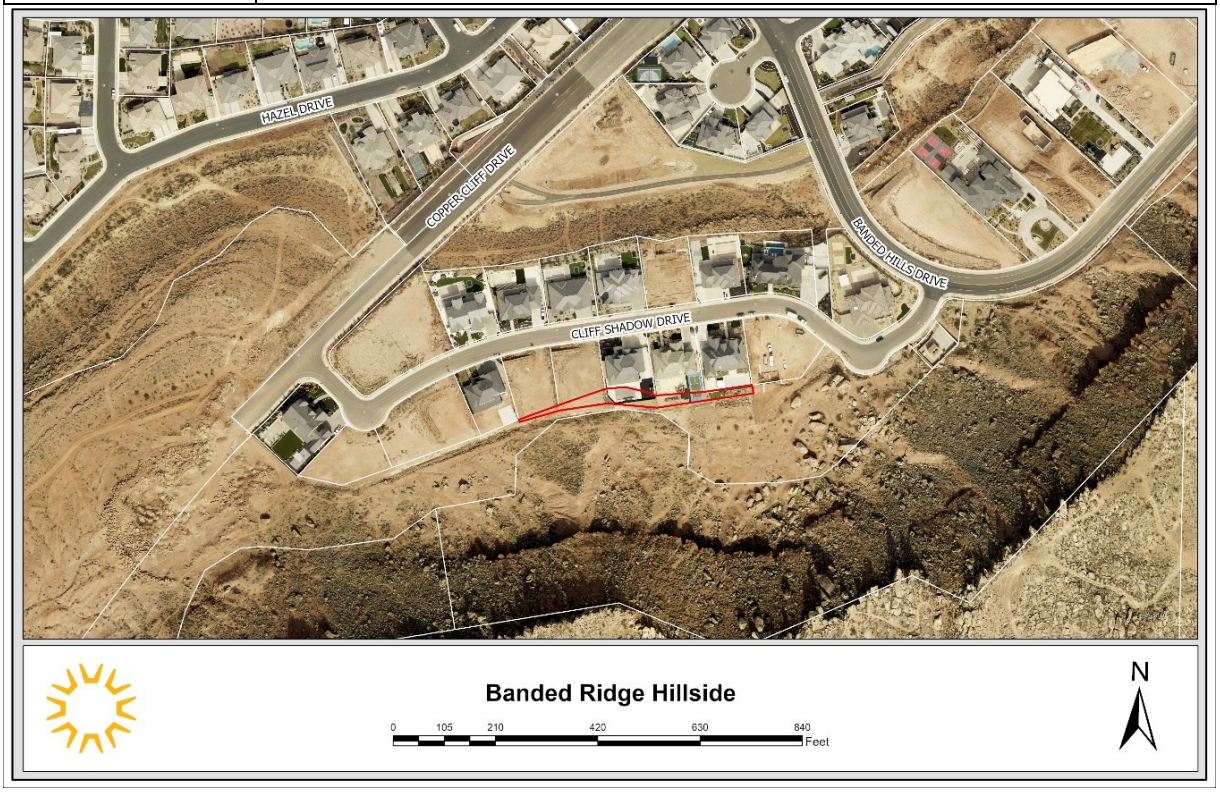
Proposed

St.George
Community Development

ITEM 4
Hillside Permit

HILLSIDE REVIEW BOARD AGENDA REPORT: **10/22/2025**
PLANNING COMMISSION AGENDA REPORT: **11/18/2025**

Banded Ridge Hillside Revision Hillside Development Permit (Case No. 2025-HS-009)		
Request:	The applicant is requesting modifications to the approved location of the rock fall hazard line approved with the original Hillside permit.	
Applicant:	RS Custom Homes	
Representative:	Ryan Shaw	
Location:	The open space south of the existing Banded Ridge Subdivision	
General Plan:	OS (Open Space)	
Existing Zoning:	OS (Open Space)	
Surrounding Zoning:	North	R-1-10 (Single Family Residential, 10,000 ft² lots)
	South	OS (Open Space)
	East	R-1-10 (Single Family Residential, 10,000 ft² lots)
	West	R-1-10 (Single Family Residential, 10,000 ft² lots)
Land Area:	Approximately 10,177 ft² (0.23 acres) – area that is affected by request	



BACKGROUND

In 2018, a hillside permit and preliminary plat were approved on the property that later resulted in the Banded Ridge plat. The plat was later recorded in August of 2021. The Hillside permit delineated the location of the edge of the rockfall runoff, the furthest point believed that rock or rock debris would travel in the event of a rock fall. The line drawn in that report was then drawn as the southern boundary of the Banded Ridge subdivision as was recorded and stands today. The property south of that southern boundary was dedicated to St. George City as open space.

The owner of one of the adjacent lots has asked AGEC to review the rock fall report and to analyze the accuracy of the rock fall runoff line. AGEC produced a new report which pushes that line to the south away from lots 16-20.

On October 22, 2025, the Hillside Review Board met to discuss the application and look at the site. After discussion, they recommended that that the Planning Commission and City Council approve the hillside permit which included the revision to the rockfall runoff with a recommendation that it be noted that the drainage ditch catchment berm needs to have periodic inspections and maintenance, as required.

APPLICABLE ORDINANCE(S) *(Selected portions)*

10-13B-2: Development in Geologic Hazard Areas

A. *Geologic Hazard Areas (UGS 1 – 4: subsections A1 through A4 of this section):* For any development in the city with a geologic hazard listed below, applicant shall submit a report prepared by a qualified, licensed geologist specializing in engineering geology, or a licensed civil engineer, trained and experienced in the practice of geotechnical engineering. Development in the geologic hazard overlay for high category rockfall areas shall be reviewed by the hillside review board.

1. Surface fault rupture and earthquake: well-defined Holocene, and well-defined fault areas, red and purple lines/categories (extending five hundred feet (500') on the downthrown side and two hundred fifty feet (250') on the upthrown side of each red/purple fault line).
2. Liquefaction: Very High category.
3. Landslide: Very High category.
4. Rockfall: High category.

B. *General Requirements for Development in a Geologic Hazard Area:*

1. Submit a site-specific report prepared by a qualified, licensed geologist specializing in engineering geology, or a licensed civil engineer, trained and experienced in the practice of geotechnical engineering with the following minimum requirements:

a. Identify all geologic hazard areas (UGS 1 – 4: subsections A1 through A4 of this section);

b. Identify any other geologic hazards, not listed above (UGS 1 – 4: subsections A1 through A4 of this section), which present an unacceptable risk to development;

c. Demonstrate which areas of the development are suitable for the proposed use;

d. Recommend specific measures necessary to make the land suitable for the proposed use;

e. Recommend the optimal placement of all structures, roadways, utilities, trails and infrastructure in relation to the geologic hazard area;

f. Slope stability analysis: conclusions and recommendations concerning the effects of material removal, introduction of water, both on and off site, including, where applicable, on mesa tops, seismic activity, and erosion on slope stability;

g. Foundation investigation: conclusions and recommendations concerning the effects of soil conditions on foundation and structural stability, including bearing capacity, sheer strength, and shrink/swell potential of soils;

h. Spring location: the location and yield of springs and seeps which shall be shown on the site plan;

i. Structural features: structural features including any geological limitations;

j. Surface hazards: existence of surface hazards including potential for rockfalls and toppling failures to cliffs, slopes and overhangs above the subject property; and

k. Effect of geologic conditions: conclusions and recommendations regarding the effect of geologic conditions on the proposed development, together with recommendations identifying the means proposed to minimize any hazard to life or property, or adverse impact on the natural environment.

2. The city shall review the applicant's report. If the applicant's report is deemed adequate by the city engineer or designee, development may proceed if the report recommendations are followed. If the report is deemed incomplete or inadequate by the city engineer or designee, the development application shall be denied. If denied, the applicant may request an independent review, and the city engineer or designee may order a review by independent, qualified professionals. The professionals selected by the city shall review and prepare written findings and comments on the applicant's report. The cost of the independent, qualified professionals shall be paid to the city by applicant. Applicant may develop if the independent review and written findings and comments are implemented, in addition to any nonconflicting recommendations in the initial report of applicant. The city engineer or designee is the land use authority for the decision. The reports

shall be specifically identified on the plat and available to all owners and interested parties.

3. All development shall be outside the geologic hazard areas in subsections A1 through A4 of this section, unless:

a. The city has accepted applicant's report, prepared by a qualified, licensed geologist specializing in engineering geology or a licensed professional engineer trained and practicing in the field of geotechnical engineering, and it recommends development, and shows hazards can be adequately mitigated for the proposed land use;

b. If the city has not accepted applicant's report, the applicant also adopts and implements the independent review and writing findings and comments, in addition to any nonconflicting recommendations in applicant's report;

c. All report recommendations, and HDOZ permit conditions (when required), are adopted by the city and are conditions of development.

4. Hold the city harmless from all claims resulting from any damage related to development within a geologic hazard area by executing a "geologic hazard disclaimer of liability and agreement" and by placing a "notice of hazard" on the final plat.

5. The applicant may appeal a decision in accordance with chapter 3 of this title.

C. *Compliance:* No structure or land shall be constructed, located, extended, converted or altered without full compliance with the terms of this chapter and other applicable regulations.

D. *Abrogation and Greater Restrictions:* This chapter is not intended to repeal, abrogate or impair any existing easement, covenant or deed restriction; however, where this chapter and another ordinance, easement, covenant or deed restriction conflict or overlap, the more stringent restriction shall prevail.

E. *Interpretation:* In the interpretation and application of this chapter, all provisions are minimum requirements in addition to applicable provisions of this title.

EXHIBITS PROVIDED

1. Exhibit A – Rockfall Study
   Exhibit A in the packet is a revised study conducted by AGEC, dated August 11, 2025, for the Banded Ridge Subdivision.

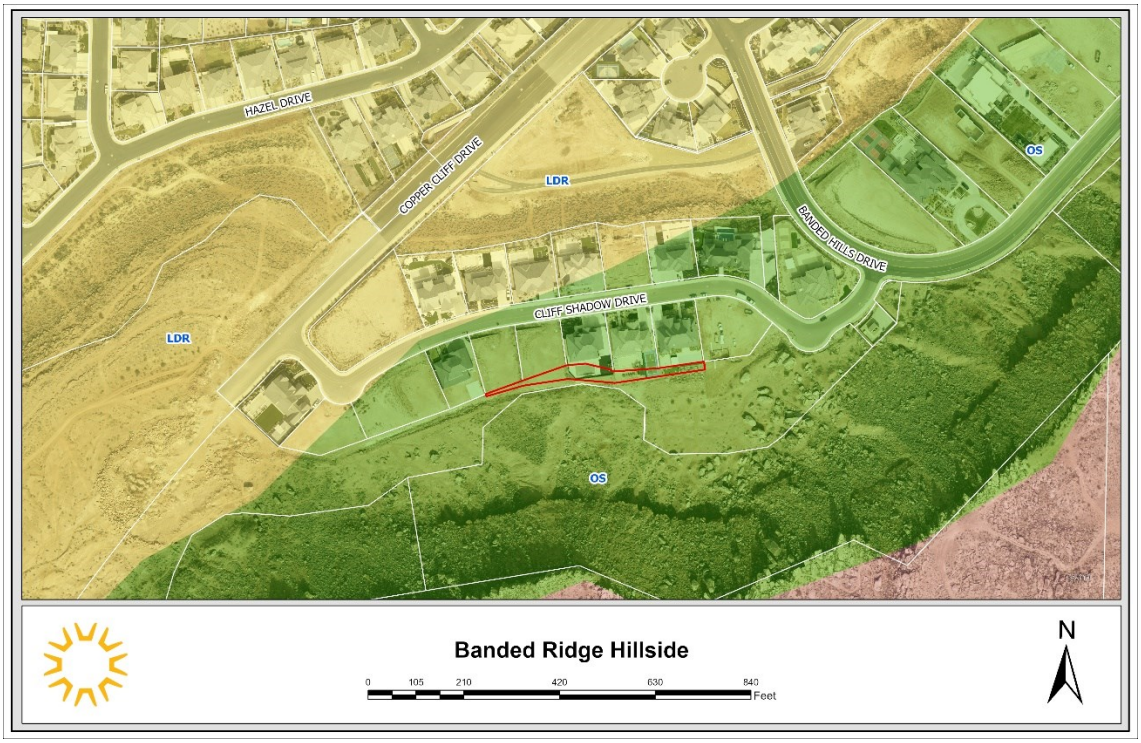
2. Exhibit B – Revised Plat

Exhibit B is a revised plat showing the areas requested to be taken out of the rock fall area.

RECOMMENDATION

On October 22, 2025, the Hillside Review Board held a meeting on the site to determine their recommendation to the Planning Commission and City Council. At that meeting, they recommended approval of the modification to the rockfall runoff line with a note that the drainage ditch catchment berm needs to have periodic inspections and maintenance, as required.

General Plan – OS (Open Space)



Zoning – OS (Open Space)

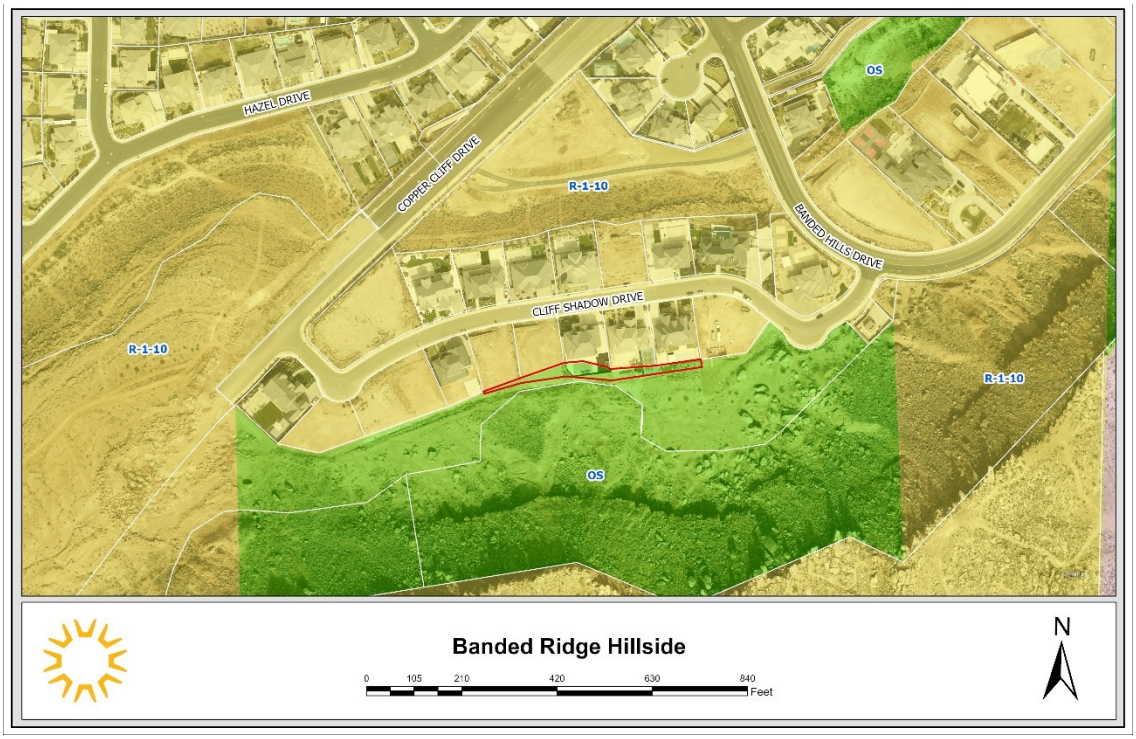


EXHIBIT A

Rockfall Study

Applied GeoTech

August 11, 2025

RS Custom Homes
3490 Rim Runner Drive
St. George, Utah 84790

Attention: Ryan Shaw
EMAIL: rscustomhome@gmail.com

Subject: Banded Ridge Rockfall Evaluation
Lots 16 through 18
Banded Ridge Subdivision
St. George, Utah
Project No. 2250528

Mr. Shaw:

Applied Geotechnical Engineering Consultants, Inc. (AGEC) was requested to update our rockfall hazard analysis incorporating the grading that was accomplished between the building lots and the source of rockfall.

We previously conducted a geologic hazard study for Banded Ridge Subdivision and reported our findings in a letter dated April 30, 2018 under Project No. 2180168.

A rockfall setback line was included in the above-referenced letter. This setback line is also included on a grading plan for the Banded Ridge Subdivision prepared by Development Solutions Group Drawing G-1 dated May 11, 2018 under Project No. 15-028.

Subsequent to construction of many of the homes, a drainage channel was constructed south of the developed properties. This modification has been documented on a Banded Ridge Channel Topo map prepared by Bush and Gudgell Inc. dated August 5, 2025 under Project No. 251162.

SECTION ANALYSIS

The rockfall hazard analysis was conducted using the original topography including the drainage channel configuration. Based on the findings of our analysis, the rockfall setback can be modified to coincide with the north top edge of the channel for Lots 16, 17 and 18.

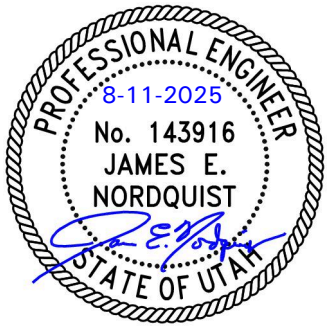
LIMITATIONS

This letter has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the letter are based on the topographic information developed by others. If the conditions are significantly different from what is described above, we should be notified to reevaluate our recommendations.

If you have any questions or if we can be of further service, please call.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

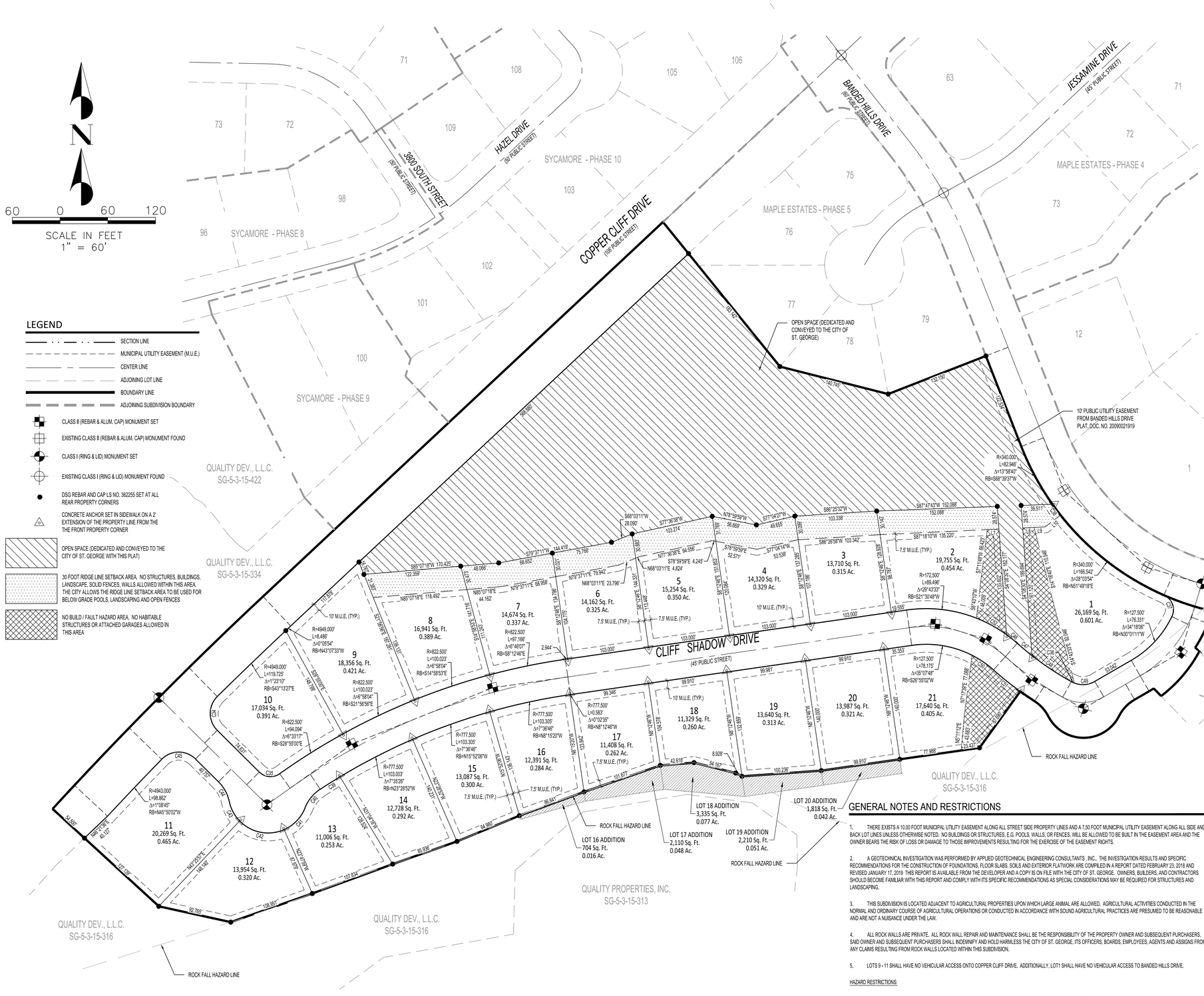


James E. Nordquist, P.E., D.GE

JEN/rs

EXHIBIT B

Revised Plat



CURVE TABLE					
CURVE	RADIUS	LENGTH	DELTA	CH. BRG.	CH. DIST.
C1	20.000'	27.332'	78°18'00"	S60°57'26"W	25.254'
C2	172.500'	34.026'	11°18'06"	S27°27'14"W	33.970'
C3	175.000'	74.383'	24°21'12"	S40°34'17"W	73.824'
C4	172.500'	6.852'	2°16'34"	S58°50'32"W	6.852'
C5	50.000'	28.905'	33°07'23"	S43°25'08"W	28.504'
C6	50.000'	109.842'	125°52'11"	S89°47'33"W	89.049'
C7	50.000'	26.069'	29°52'24"	N42°12'34"W	25.775'
C8	422.500'	21.888'	2°58'06"	N55°39'43"W	21.885'
C9	500.000'	78.811'	9°01'52"	N33°44'33"W	78.729'
C10	500.000'	68.830'	7°53'14"	N25°17'00"W	68.775'
C11	310.000'	280.761'	51°53'30"	S47°17'08"E	271.263'
C12	310.000'	348.532'	64°25'03"	N74°33'38"E	330.464'
C13	310.000'	312.494'	57°45'24"	N71°13'46"E	299.430'
C14	310.000'	36.039'	6°39'39"	S76°33'42"E	36.018'
C15	310.000'	37.808'	6°59'16"	S69°44'14"E	37.784'
C16	310.000'	242.953'	44°54'14"	S43°47'29"E	236.783'
C17	5000.000'	129.532'	1°29'04"	S46°07'55"W	129.528'
C18	5000.000'	53.366'	0°36'41"	S45°05'03"W	53.365'
C19	5000.000'	53.431'	0°36'44"	S44°28'20"W	53.430'
C20	5000.000'	100.002'	1°08'45"	S43°35'35"W	100.000'
C21	5000.000'	40.500'	0°27'51"	S42°47'17"W	40.500'
C22	150.000'	23.326'	8°54'36"	N21°13'25"E	23.303'
C23	150.000'	89.802'	34°18'06"	N42°49'46"E	88.467'
C24	150.000'	13.180'	5°02'03"	N19°17'09"E	13.175'
C25	150.000'	99.948'	38°10'38"	N40°53'30"E	98.109'
C26	52.500'	54.061'	58°59'56"	N89°28'47"E	51.704'

CURVE TABLE					
CURVE	RADIUS	LENGTH	DELTA	CH. BRG.	CH. DIST.
C27	400.000'	68.703'	12°42'21"	S54°40'04"E	68.522'
C28	400.000'	27.050'	3°52'29"	S59°05'00"E	27.045'
C29	400.000'	61.653'	8°49'52"	S52°43'50"E	61.592'
C30	150.000'	130.632'	49°53'52"	N73°15'49"W	126.543'
C31	800.000'	380.602'	27°15'31"	S68°09'29"W	377.023'
C32	800.000'	349.592'	25°02'16"	S69°16'07"W	346.817'
C33	800.000'	31.010'	2°13'15"	S55°38'21"W	31.008'
C34	30.000'	47.444'	90°36'41"	S00°05'03"W	42.652'
C35	20.000'	28.012'	80°14'59"	S85°20'47"E	25.778'
C36	30.000'	4.260'	8°08'08"	S65°05'18"E	4.256'
C37	20.000'	32.087'	91°55'19"	N20°16'57"W	28.755'
C38	340.000'	16.976'	2°51'39"	S36°44'52"E	16.975'
C39	777.500'	29.565'	2°10'43"	S57°50'20"W	29.563'
C40	50.000'	30.732'	35°13'00"	S39°08'29"W	30.251'
C41	50.000'	38.980'	44°40'02"	N43°52'00"E	38.000'
C42	50.000'	60.744'	69°36'27"	S78°59'45"E	57.077'
C43	50.000'	28.007'	32°05'36"	S28°08'44"E	27.642'
C44	50.000'	28.905'	33°07'23"	N28°35'37"W	28.504'
C45	30.000'	47.444'	90°36'44"	S89°28'20"W	42.652'
C46	172.500'	17.262'	5°44'01"	S51°10'54"E	17.255'
C47	377.500'	24.152'	3°39'57"	N50°08'52"W	24.148'
C48	377.500'	59.561'	9°02'24"	S55°30'02"E	59.500'
C49	30.000'	26.632'	50°51'49"	N85°24'44"E	25.766'
C50	127.500'	32.863'	14°46'04"	S55°41'56"E	32.772'
C51	422.500'	43.233'	5°51'47"	N51°14'47"W	43.215'
C52	172.500'	43.469'	14°26'18"	N61°16'03"W	43.355'

LINE TABLE		
LINE	BEARING	LENGTH
L1	N43°58'42"W	13.344'
L2	S59°58'49"W	21.177'
L3	S16°46'08"W	30.678'
L4	N61°01'14"W	44.534'
L5	N48°18'53"W	44.534'
L6	S54°31'43"W	35.820'
L7	S87°18'10"W	14.688'
L8	S87°18'10"W	14.415'
L9	S87°18'10"W	13.972'
L10	N52°07'34"E	24.358'

GENERAL NOTES AND RESTRICTIONS

1. THERE EXISTS A 10.00 FOOT MUNICIPAL UTILITY EASEMENT ALONG ALL STREET SIDE PROPERTY LINES AND A 7.50 FOOT MUNICIPAL UTILITY EASEMENT ALONG ALL SIDE AND BACK LOT LINES UNLESS OTHERWISE NOTED. NO BUILDINGS OR STRUCTURES, E.G. POOLS, WALLS, OR FENCES, WILL BE ALLOWED TO BE BUILT IN THE EASEMENT AREA AND THE OWNER BEARS THE RISK OF LOSS OR DAMAGE TO THOSE IMPROVEMENTS RESULTING FOR THE EXERCISE OF THE EASEMENT RIGHTS.

2. A GEOTECHNICAL INVESTIGATION WAS PERFORMED BY APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS , INC.. THE INVESTIGATION RESULTS AND SPECIFIC RECOMMENDATIONS FOR THE CONSTRUCTION OF FOUNDATIONS, FLOOR SLABS, SOILS AND EXTERIOR FLATWORK ARE COMPILED IN A REPORT DATED FEBRUARY 23, 2018 AND REVISED JANUARY 17, 2019. THIS REPORT IS AVAILABLE FROM THE DEVELOPER AND A COPY IS ON FILE WITH THE CITY OF ST. GEORGE. OWNERS, BUILDERS, AND CONTRACTORS SHOULD BECOME FAMILIAR WITH THIS REPORT AND COMPLY WITH ITS SPECIFIC RECOMMENDATIONS AS SPECIAL CONSIDERATIONS MAY BE REQUIRED FOR STRUCTURES AND LANDSCAPING.

3. THIS SUBDIVISION IS LOCATED ADJACENT TO AGRICULTURAL PROPERTIES UPON WHICH LARGE ANIMAL ARE ALLOWED. AGRICULTURAL ACTIVITIES CONDUCTED IN THE NORMAL AND ORDINARY COURSE OF AGRICULTURAL OPERATIONS OR CONDUCTED IN ACCORDANCE WITH SOUND AGRICULTURAL PRACTICES ARE PRESUMED TO BE REASONABLE AND ARE NOT A NUISANCE UNDER THE LAW.

4. ALL ROCK WALLS ARE PRIVATE. ALL ROCK WALL REPAIR AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE PROPERTY OWNER AND SUBSEQUENT PURCHASERS. SAID OWNER AND SUBSEQUENT PURCHASERS SHALL INDEMNIFY AND HOLD HARMLESS THE CITY OF ST. GEORGE, ITS OFFICERS, BOARDS, EMPLOYEES, AGENTS AND ASSIGNS FROM ANY CLAIMS RESULTING FROM ROCK WALLS LOCATED WITHIN THIS SUBDIVISION.

5. LOTS 9 - 11 SHALL HAVE NO VEHICULAR ACCESS ONTO COPPER CLIFF DRIVE. ADDITIONALLY, LOT1 SHALL HAVE NO VEHICULAR ACCESS TO BANDED HILLS DRIVE.

HAZARD RESTRICTIONS:

6. A GEOLOGIC - HAZARD STUDY DATED APRIL 30, 2018 BY APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS AS PART OF THE HILLSIDE APPROVAL FOR THIS PROJECT. THIS REPORT IS AVAILABLE FROM THE DEVELOPER AND A COPY IS ON FILE WITH THE CITY OF ST. GEORGE. BY PURCHASING PROPERTY WITHIN THIS PLAT THE PURCHASER ASSUMES ANY AND ALL RISK OF DAMAGE AND PERSONAL INJURY AS A RESULT OF ITS PROXIMITY TO A HILLSIDE AND/OR ROCK FALL AND DOES INDEMNIFY AND HOLD THE CITY OF ST. GEORGE, ITS OFFICERS, BOARDS, EMPLOYEES, AGENTS AND ASSIGNS, HARMLESS FROM ANY AND ALL CLAIMS OF INJURY, DAMAGE, EXPENSE OR LOSS OF WHATEVER NATURE WHICH MAY ARISE AS A DIRECT OR INDIRECT RESULT OF HAZARDS REFERRED TO HEREIN. BUILDERS AND CONTRACTORS SHOULD BECOME FAMILIAR WITH THIS PROJECT REPORT.

Subdivision Final Plat for

BANDED RIDGE SUBDIVISION

Located in Section 15, Township 43 South, Range 15 West, SLB&M

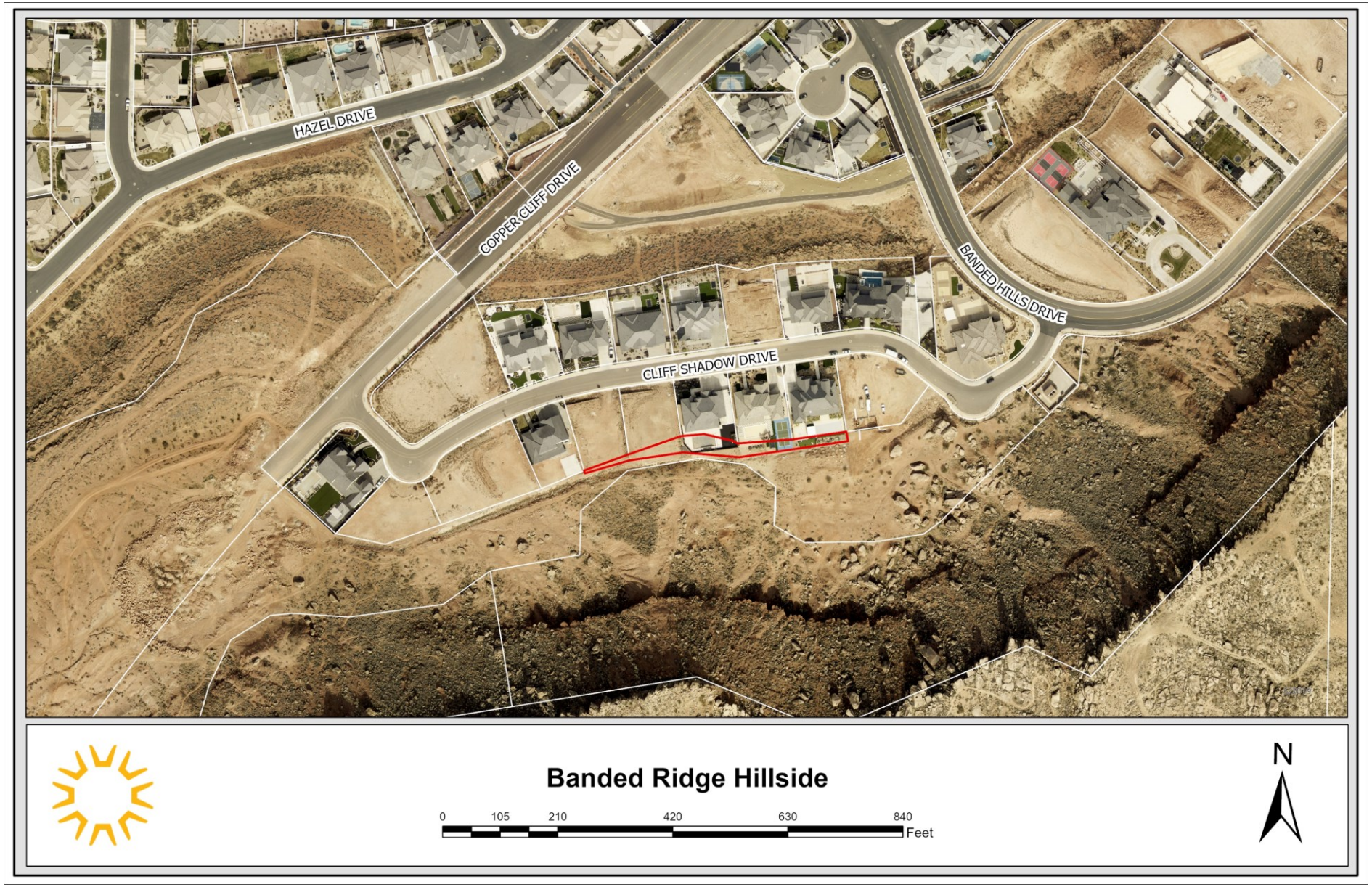
EXHIBIT C

PowerPoint Presentation

Banded Ridge Hillside

2025-HS-009

Aerial Map


HAZEL DRIVE
COPPER CLIFF DRIVE
BANDED HILLS DRIVE
CLIFF SHADOW DRIVE
Banded Ridge Hillside
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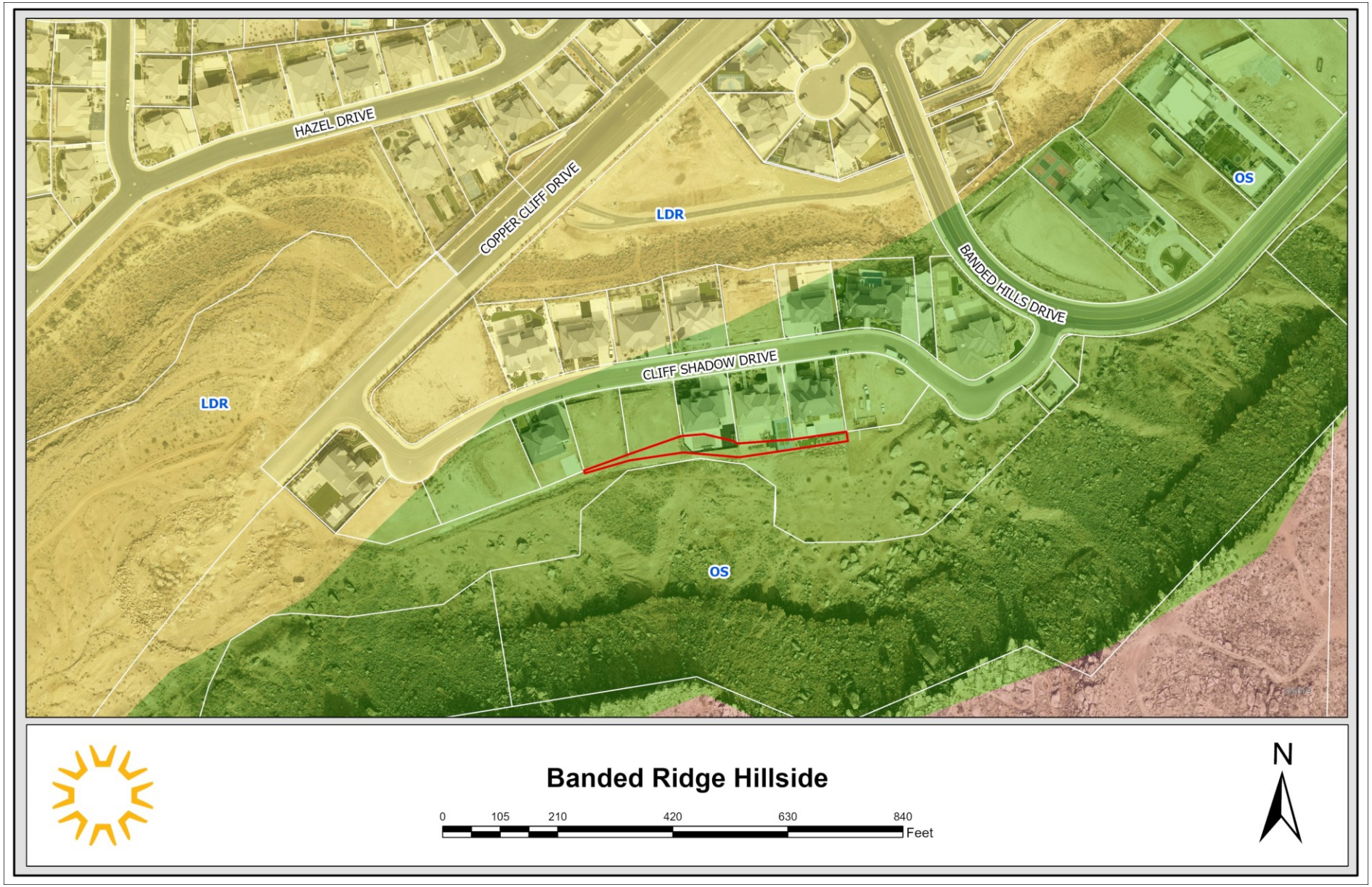
Land Use Map


HAZEL DRIVE
COPPER CLIFF DRIVE
BANDED HILLS DRIVE
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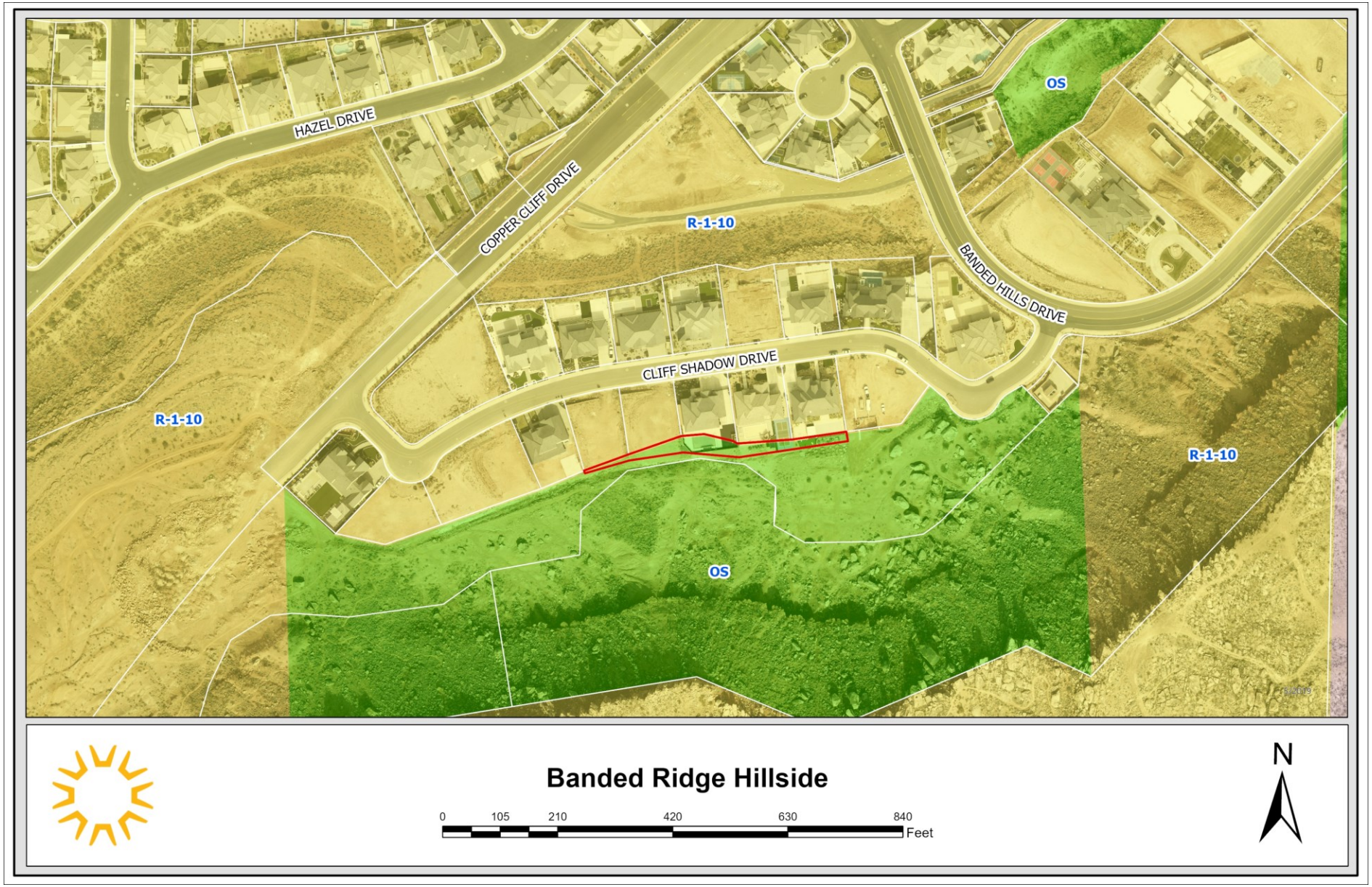
Zoning Map


HAZEL DRIVE
COPPER CLIFF DRIVE
BANDED HILLS DRIVE
CLIFF SHADOW DRIVE
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R-1-10
R-1-10
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Banded Ridge Hillside
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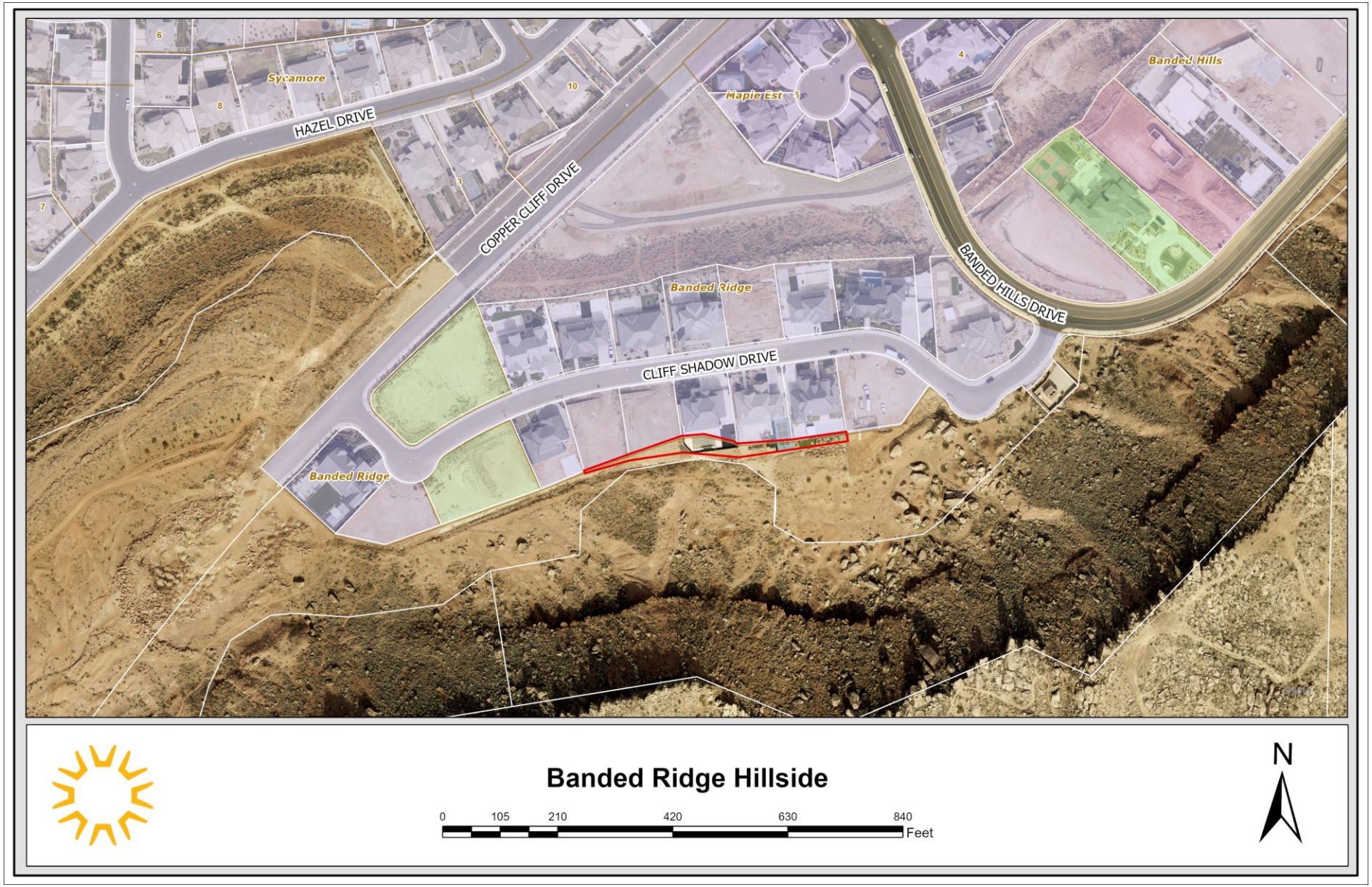
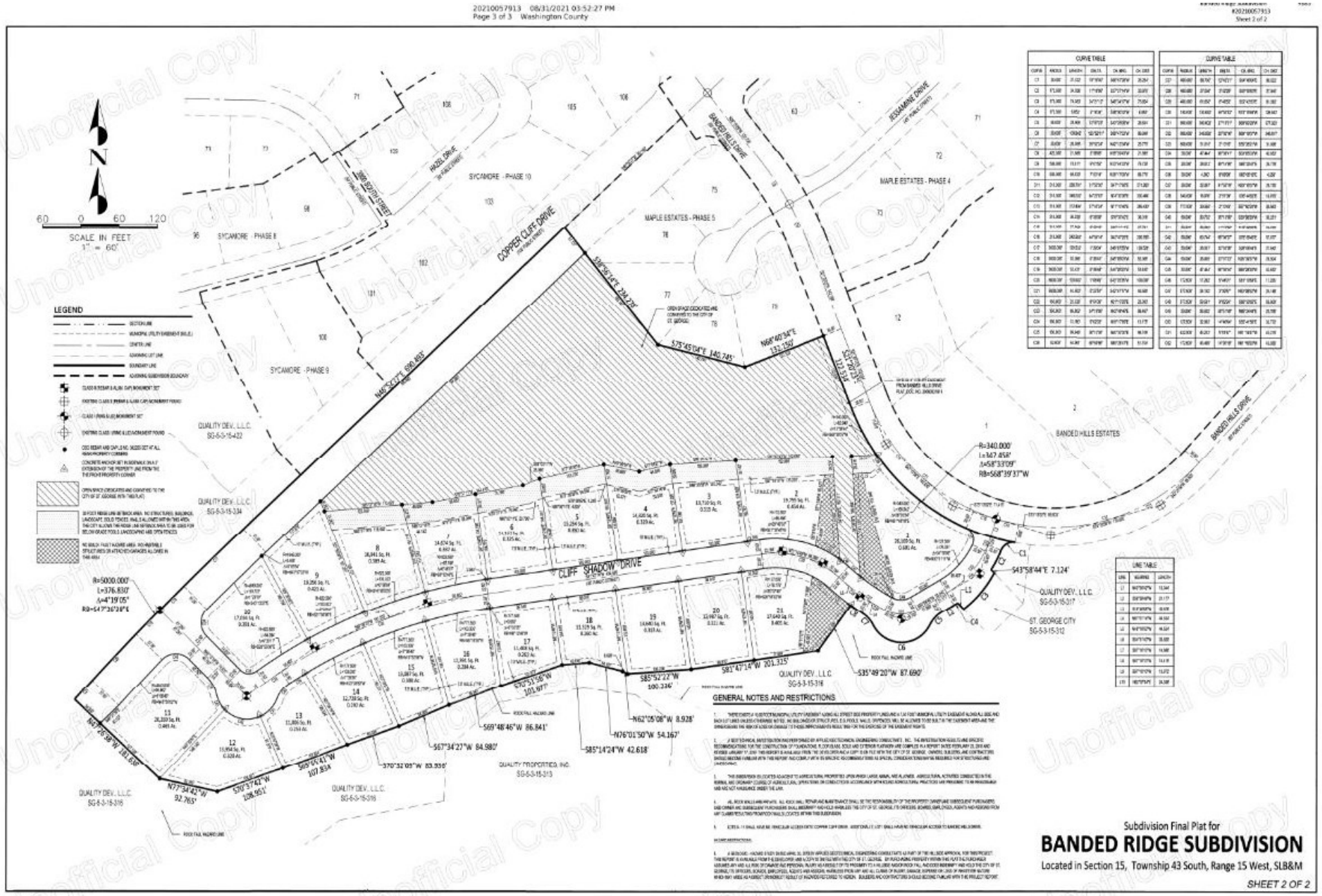
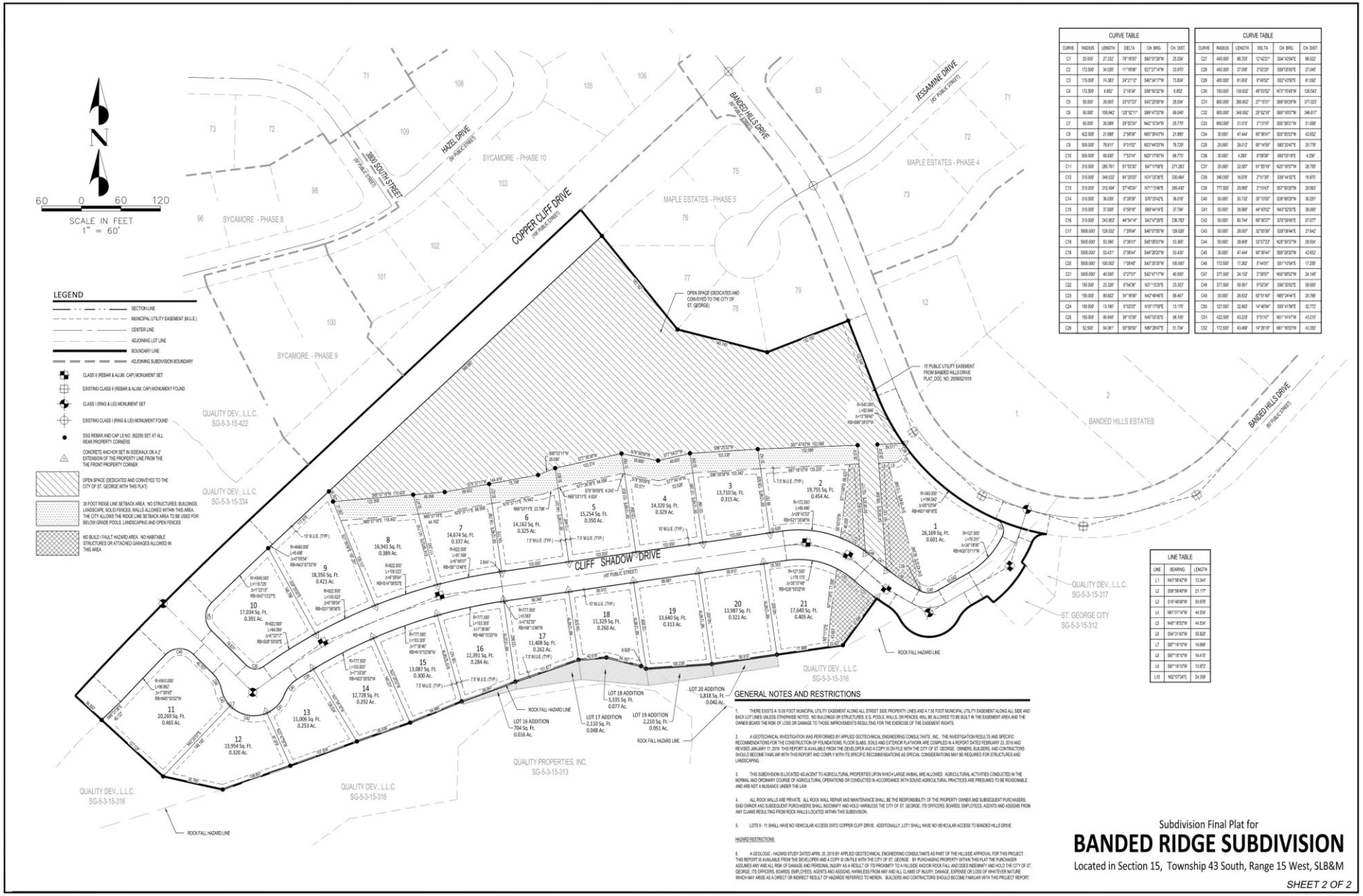
Subdivision Map



Recorded Plat Map



Revised Plat



CURVE TABLE					
CURVE	RADIUS	LENGTH	DELTA	CH. BRG.	CH. DIST.
C1	20.000'	27.332'	78°18'00"	S80°13'28"W	25.254'
C2	172.500'	34.026'	11°18'08"	S27°21'14"W	33.970'
C3	175.000'	74.383'	24°21'12"	S40°34'17"W	73.824'
C4	172.500'	6.852'	2°16'34"	S59°36'32"W	6.852'
C5	50.000'	28.965'	33°12'23"	S43°25'09"W	28.564'
C6	50.000'	109.842'	125°52'11"	S89°47'32"W	89.049'
C7	50.000'	26.089'	29°52'34"	N42°15'34"W	25.775'
C8	422.500'	21.888'	2°58'08"	N55°39'47"W	21.885'
C9	508.000'	78.611'	8°51'52"	N53°44'33"W	78.720'
C10	508.000'	68.830'	7°45'74"	N25°13'70"W	68.775'
C11	310.000'	280.761'	51°53'33"	S47°11'08"E	271.283'
C12	310.000'	349.532'	64°35'03"	N74°13'36"E	330.464'
C13	310.000'	312.494'	57°45'24"	N71°11'49"E	299.430'
C14	310.000'	36.039'	6°39'38"	S70°13'42"E	36.016'
C15	310.000'	37.595'	6°56'15"	S63°44'14"E	37.756'
C16	310.000'	242.902'	44°54'14"	S43°47'23"E	236.782'
C17	5800.000'	129.552'	1°16'04"	S46°15'55"W	129.526'
C18	5800.000'	53.380'	0°38'41"	S45°18'03"W	53.380'
C19	5800.000'	53.431'	0°38'44"	S44°26'20"W	53.430'
C20	5800.000'	100.002'	1°58'48"	S43°38'30"W	100.000'
C21	5800.000'	40.580'	0°27'51"	S42°47'17"W	40.580'
C22	150.000'	23.326'	8°54'38"	N21°13'25"E	23.303'
C23	150.000'	89.882'	34°18'59"	N42°46'46"E	88.497'
C24	150.000'	13.180'	5°02'03"	N19°11'09"E	13.175'
C25	150.000'	99.948'	38°10'38"	N40°53'35"E	98.100'
C26	52.500'	54.061'	59°00'00"	N89°28'47"E	51.704'

CURVE TABLE					
CURVE	RADIUS	LENGTH	DELTA	CH. BRG.	CH. DIST.
C27	400.000'	88.703'	12°42'21"	S54°45'04"E	88.522'
C28	400.000'	27.056'	3°52'29"	S59°09'09"E	27.045'
C29	400.000'	61.652'	8°49'52"	S52°43'55"E	61.592'
C30	150.000'	138.632'	49°39'52"	N73°15'49"W	134.343'
C31	800.000'	366.652'	27°15'31"	S68°09'29"W	371.023'
C32	800.000'	349.592'	25°02'59"	S69°16'07"W	346.811'
C33	800.000'	31.016'	2°13'05"	S55°39'21"W	31.008'
C34	30.000'	47.444'	90°36'43"	S00°10'03"W	42.652'
C35	20.000'	28.012'	80°14'59"	S85°20'46"E	25.778'
C36	30.000'	4.280'	8°08'36"	S65°05'18"E	4.276'
C37	20.000'	32.057'	91°50'19"	N25°16'57"W	28.755'
C38	340.000'	16.976'	2°51'39"	S36°44'52"E	16.973'
C39	777.500'	29.995'	2°12'43"	S57°50'20"W	29.993'
C40	50.000'	30.732'	35°12'50"	S39°08'20"W	30.257'
C41	50.000'	38.996'	44°40'52"	N43°52'07"E	38.009'
C42	50.000'	80.744'	69°05'27"	S76°59'48"E	57.077'
C43	50.000'	28.005'	32°05'36"	S28°06'44"E	27.642'
C44	50.000'	28.905'	33°07'23"	N28°39'37"W	28.504'
C45	30.000'	47.444'	90°36'44"	S89°20'20"W	42.652'
C46	172.500'	17.262'	5°44'31"	S51°10'54"E	17.255'
C47	377.500'	24.152'	3°39'57"	N50°39'52"W	24.148'
C48	377.500'	59.561'	9°02'24"	S56°30'52"E	59.555'
C49	30.000'	26.632'	50°51'49"	N85°24'44"E	25.769'
C50	127.500'	32.863'	14°46'54"	S55°41'56"E	32.772'
C51	422.500'	43.233'	5°51'47"	N51°14'47"W	43.215'
C52	172.500'	43.469'	14°26'18"	N61°16'03"W	43.355'

LINE TABLE		
LINE	BEARING	LENGTH
L1	N43°58'42"W	13.344'
L2	S59°58'49"W	21.177'
L3	S16°48'08"W	30.678'
L4	N61°01'14"W	44.554'
L5	N48°18'53"W	44.554'
L6	S54°31'43"W	35.820'
L7	S87°18'10"W	14.998'
L8	S87°18'10"W	14.415'
L9	S87°18'10"W	13.972'
L10	N52°07'34"E	24.358'

GENERAL NOTES AND RESTRICTIONS

1. THERE EXISTS A 10.00 FOOT MUNICIPAL UTILITY EASEMENT ALONG ALL STREET SIDE PROPERTY LINES AND A 7.53 FOOT MUNICIPAL UTILITY EASEMENT ALONG ALL SIDE AND BACK LOT LINES UNLESS OTHERWISE NOTED. NO BUILDINGS OR STRUCTURES, E.G. POOLS, WALLS, OR FENCES, WILL BE ALLOWED TO BE BUILT IN THE EASEMENT AREA AND THE OWNER BEARS THE RISK OF LOSS OR DAMAGE TO THOSE IMPROVEMENTS RESULTING FOR THE EXERCISE OF THE EASEMENT RIGHTS.

2. A GEOTECHNICAL INVESTIGATION WAS PERFORMED BY APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS , INC. THE INVESTIGATION RESULTS AND SPECIFIC RECOMMENDATIONS FOR THE CONSTRUCTION OF FOUNDATIONS, FLOOR SLABS, SOILS AND EXTERIOR FLATWORK ARE COMPILED IN A REPORT DATED FEBRUARY 23, 2018 AND REVISED JANUARY 17, 2019. THIS REPORT IS AVAILABLE FROM THE DEVELOPER AND A COPY IS ON FILE WITH THE CITY OF ST. GEORGE. OWNERS, BUILDERS, AND CONTRACTORS SHOULD BECOME FAMILIAR WITH THIS REPORT AND COMPLY WITH ITS SPECIFIC RECOMMENDATIONS AS SPECIAL CONSIDERATIONS MAY BE REQUIRED FOR STRUCTURES AND LANDSCAPING.

3. THIS SUBDIVISION IS LOCATED ADJACENT TO AGRICULTURAL PROPERTIES UPON WHICH LARGE ANIMAL ARE ALLOWED. AGRICULTURAL ACTIVITIES CONDUCTED IN THE NORMAL AND ORDINARY COURSE OF AGRICULTURAL OPERATIONS OR CONDUCTED IN ACCORDANCE WITH SOUND AGRICULTURAL PRACTICES ARE PRESUMED TO BE REASONABLE AND ARE NOT A NUISANCE UNDER THE LAW.

4. ALL ROCK WALLS ARE PRIVATE. ALL ROCK WALL REPAIR AND MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE PROPERTY OWNER AND SUBSEQUENT PURCHASERS. SAID OWNER AND SUBSEQUENT PURCHASERS SHALL INDEMNIFY AND HOLD HARMLESS THE CITY OF ST. GEORGE, ITS OFFICERS, BOARDS, EMPLOYEES, AGENTS AND ASSIGNS FROM ANY CLAIMS RESULTING FROM ROCK WALLS LOCATED WITHIN THIS SUBDIVISION.

5. LOTS 5 - 11 SHALL HAVE NO VEHICULAR ACCESS ONTO COPPER CLIFF DRIVE. ADDITIONALLY, LOT1 SHALL HAVE NO VEHICULAR ACCESS TO BANDED HILLS DRIVE.

HAZARD RESTRICTIONS:

6. A GEOLOGIC - HAZARD STUDY DATED APRIL 30, 2018 BY APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS AS PART OF THE HILLSIDE APPROVAL FOR THIS PROJECT. THIS REPORT IS AVAILABLE FROM THE DEVELOPER AND A COPY IS ON FILE WITH THE CITY OF ST. GEORGE. BY PURCHASING PROPERTY WITHIN THIS PLAT THE PURCHASER ASSUMES ANY AND ALL RISK OF DAMAGE AND PERSONAL INJURY AS A RESULT OF ITS PROXIMITY TO A HILLSIDE AND/OR ROCK FALL AND DOES INDEMNIFY AND HOLD THE CITY OF ST. GEORGE, ITS OFFICERS, BOARDS, EMPLOYEES, AGENTS AND ASSIGNS, HARMLESS FROM ANY AND ALL CLAIMS OF INJURY, DAMAGE, EXPENSE OR LOSS OF WHATEVER NATURE WHICHMAY ARISE AS A DIRECT OR INDIRECT RESULT OF HAZARDS REFERRED TO HEREIN. BUILDERS AND CONTRACTORS SHOULD BECOME FAMILIAR WITH THIS PROJECT REPORT.

Subdivision Final Plat for

BANDED RIDGE SUBDIVISION

Located in Section 15, Township 43 South, Range 15 West, SLB&M

SHEET 2 OF 2

PLANNING COMMISSION AGENDA REPORT: 11/18/2025

REQUEST: Consider a request to adopt a comprehensive general plan update to add a Water Use and Preservation Element to the General Plan (2025-GPA-016)

BACKGROUND:
The City of St. George has been working on a comprehensive general plan update to add a Water Use and Preservation Element. In 2022, Utah State Legislature recognized the need to address the state's water use practices and required that each municipal General Plan includes a water use and preservation element to address water capacity, water use, and the effect that different land development could have on the water supply and availability.

The Water use and Preservation Element is to address the following:

1. The effect of permitted development on the water demand and water infrastructure
2. Methods of reducing water demand and per capita water use for existing development.
3. Methods of reducing water demand and per capita water use for future development.
4. Modifications that can be made to a local government's operations to reduce and eliminate wasteful water practices.

There are nine sections in the proposed Water Use and Preservation Element. Below is a summary of each section:

Introduction
St. George, located in southwest Utah near the Arizona border, has over 105,000 residents and is among the state's fastest-growing cities. Its popularity as a tourist destination often increases its temporary population. The City operates a comprehensive culinary water system and an expanding secondary irrigation system serving a 49,000-acre area that includes residential, commercial, industrial, and recreational users. Committed to water conservation, St. George collaborates with the Washington County Water Conservancy District (WCWCD) and has adopted multiple planning documents to meet all state-mandated water use and preservation requirements.

Culinary Water System Overview

- Sources: 24 groundwater wells, 16 springs, and water purchased from the Washington County Water Conservancy District (WCWCD), mainly from Quail Creek and Sand Hollow.
- Dependency: 60% of culinary water comes from WCWCD; this share is expected to rise.

- Infrastructure: ~900 miles of pipelines, 22 reservoirs (50.5 million gallons storage), and 31 pressure zones.
- Regional Partnership: Since 2006, the WCWCD oversees development of new sources under a Regional Water Supply Agreement.

Secondary Irrigation Water System Overview

- Sources**:** Water from Virgin and Santa Clara Rivers, groundwater wells, and reuse water from the city's tertiary treatment facility.
- Infrastructure: ~200 miles of pipelines, 22 reservoirs (9 million gallons), and 14 pump stations serving 19 pressure zones.

Current Water Use

- Total delivered in 2024: 10.5 billion gallons (≈32,500 acre-feet)
    - Culinary: 8.93 billion gallons
    - Secondary: 1.88 billion gallons
- Total annual Consumption varies from year to year
- Use breakdown: 63% residential; 25% Industrial; 11% Commercial; 1% Institutional
- Since 2020 use has been consistent but 5,800 new connections have been made
- Seasonal variation: Summer use ≈4× more than winter use due to landscaping

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Projected Water Use

- Growth expected to continue, with build-out by ~2053.
- Annual growth rate: ~4.76% initially, slowing toward build-out.
- Demand (2023–2053): Total municipal and industrial demand to rise from 41,000 to ~69,500 acre-feet.
- WCWCD's 20-year plan adds 42,746 acre-feet of new water supply through reuse, conservation, groundwater optimization, and agricultural conversion.

Land Use Ordinances

Adopted ordinances in 2022 require:

- Residential: Lawn area limited to 8% of lot size (≤1,500–2,000 sq. ft.); Lawn prohibited in park strips; no turf on slopes >15% or in strips < 8 ft; native plants and efficient irrigation required; water feature limited to 50 gallon capacity
- Non-Residential: Lawn only permitted in active recreation areas; no turf on slopes; trees must be water-conserving species; mandatory separate metering and WaterSense smart controllers.
- General: Prohibition of non-functional turf; seasonal limits on misting systems; mandatory secondary system use where available.

Water Conservation

- Goal: Reduce regional water use by 18% (2022–2042).
- Four pillars of successful conservation: Regulation, pricing, incentives, and education.
- Pricing: Tiered rate structure plus WCWCD surcharge for excessive use (up to $10 per 1,000 gallons beyond threshold).
- Loss reduction: Apparent water losses at 9.85% (≈3,000 acre-feet); city aims to reduce to < 8%.
- Technology: Citywide rollout of Advanced Metering Infrastructure (AMI) for real-time leak detection and customer awareness.

Goals and Objectives

Goal 1 – Reduce Indoor Use:

- Enforce hot-water recirculation system requirements
- Promote efficiency rebates (e.g., high-efficiency toilets)

Goal 2 – Reduce Outdoor Use:

- Support WCWCD rebate programs
- Extend secondary irrigation system coverage
- Install AMI metering citywide
- Enforce waterwise ordinance requirements
- Convert city facilities to secondary water

- Implement “Net Zero Landscaping” (replace new turf with equivalent turf removal elsewhere)

Goal 3 – Increase Education:

- Expand public outreach on xeriscaping and support WCWCD desert garden programs

Goal 4 – Reduce Wasteful Practices:

- Cut system water loss to 8%
- Implement a proactive pipe replacement and leak detection programs

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In Summary

The *Water Element* provides a robust, compliance-oriented framework aligning growth with sustainable water management. St. George integrates infrastructure investment, conservation ordinances, pricing strategies, and technology upgrades to secure its long-term water supply amid rapid growth and arid conditions.

RECOMMENDATION:
Staff recommends approval of this amendment to the General Plan to add the Water Use and Preservation Element.

ALTERNATIVES:
1. Recommend approval of this amendment to the General Plan to add the Water Use and Preservation Element
2. Recommend denial of this amendment to the General Plan to add the Water Use and Preservation Element
3. Continue the proposed amendment to the General Plan to add the Water Use and Preservation Element

POSSIBLE MOTION:
The Planning Commission recommends approval of this amendment to the General Plan to add the Water Use and Preservation Element as presented.

Exhibit A
Water Use and Preservation Element of the General Plan

Water Use and Preservation Element of the General Plan

Introduction

Located in the extreme southwestern region of Utah, the City of St. George has a current estimated population of over 105,000 residents and is one of the fastest growing municipalities in the State. Due to the attractive nature of the City as a tourist and vacation destination, temporary occupancy of the City can be significantly higher. St. George operates a culinary water system that serves all of its service area, and an expanding secondary irrigation system that serves smaller portions of the area. The total service area encompasses over 49,000 acres of land and borders the State of Arizona to the south. In addition to permanent residents, the City provides water service to a number of golf courses, resorts, and many other commercial, industrial, and institutional entities.

In 2022, the Utah State Legislature recognized the need to address the state's water use practices and required that each municipal General Plan includes a water use and preservation element to assess water capacity, water use, and the effect that different types of land development could have on the water supply and availability. Utah State Statute 10-20-404 was enacted and requires the following components to be included and addressed in a municipalities General Plan.

5. The effect of permitted development on the water demand and water infrastructure
6. Methods of reducing water demand and per capita water use for existing development.
7. Methods of reducing water demand and per capita water use for future development.
8. Opportunities for the municipality to modify the municipality's operations to eliminate practices or conditions that waste water.

The City of St. George is committee to conserve water in Southwest Utah and has worked diligently within Washington County to address all four mandated components listed above. The following documents illustrate the dedication of the municipalities along with the Washington County Water Conservancy District (WCWCD) to conserve water in Washington County. These adopted documents address all four component requirements mandated by the state.

1. City of St. George *2025 Culinary Water Master Plan*
2. *2025 Secondary Irrigation Master Plan*
3. Washington County Water Conservancy District's *2025 Joint Agency Water Conservation Plan*
4. WCWCD *2023 Regional Water Master Plan*

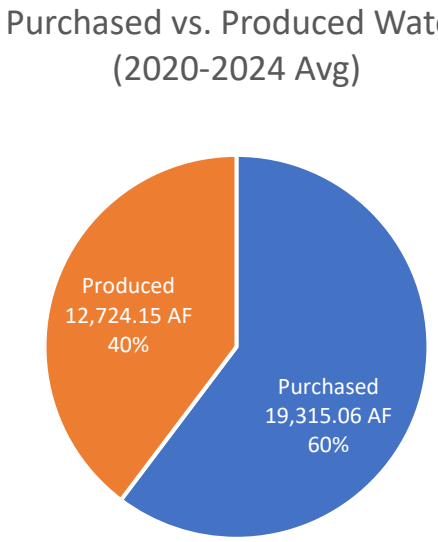
5. WCWCD *2023 20-year Plan to Secure New Water Supplies*
6. City of St. George Municipal Code.

Culinary Water System Overview

The City of St. George's *2025 Culinary Water Master Plan* provides a comprehensive evaluation of the City's existing culinary water infrastructure and provides a detailed plan of improvements and investments necessary to sustain long term growth and infrastructure improvements through the year 2045.

The City relies on various sources of water for its culinary irrigation water needs. The City owns and operates 24 groundwater wells and 16 spring sources to supply the culinary water needed. In addition, the City purchases culinary water from the WCWCD from its Quail Creek Water Treatment Plant and its Sand Hollow groundwater well sources.

As shown in the figure below, currently 60% of the culinary water provided to the City is water that has been purchased from the WCWCD.



While the City currently produces approximately 40% of its culinary water from its own water sources, it is anticipated that the percentage of water produced from its own sources will continue to decrease over time.

In 2006, the City of St. George, along with seven other regional municipal partners, joined the WCWCD in a Regional Water Supply Agreement (RWSA). The RWSA stipulates that the development of new water sources necessary for continued growth of the region will be the responsibility of the WCWCD, not individual municipalities. The City continues to work closely with the WCWCD in planning and developing new water sources for the region. The City has assisted the WCWCD in developing the *WCWCD*

2025 Joint Agency Water Conservation Plan, the *WCWCD 2023 Regional Water Master Plan*, and the *WCWCD 2023 20-year Plan to Secure New Water Supplies* documents. The City's culinary water distribution system is complex and extensive. The culinary water system includes nearly 900 miles of pipelines, ranging from 2 inches to 30 inches in diameter. The distribution system includes 50.5 million gallons of storage in 22 storage reservoirs, and 18 booster pumps conveying water through 31 different pressure zones.

Secondary Irrigation Water System Overview

The City of St. George's *2025 Secondary Irrigation Water Master Plan* provides a comprehensive evaluation of the City's existing secondary irrigation water infrastructure and provides a detailed plan of improvements and investments necessary to sustain long term growth and infrastructure improvements through the year 2045.

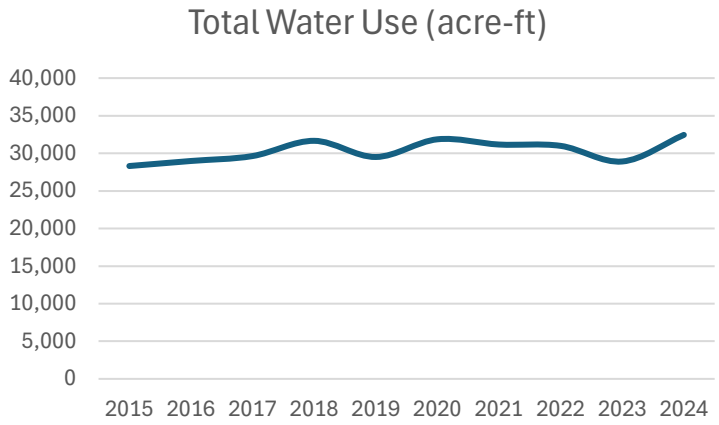
There are numerous sources of irrigation water supplying the secondary irrigation system. The City owns shares in seven different private irrigation companies, with the City being the majority shareholder in most. Most of the water provided to these companies is water diverted from the Virgin River or Santa Clara River. In addition, the City operates several groundwater wells, which also supply water to its irrigation distribution system. In 2006, the City commissioned a water reuse plant, which treats a portion of the wastewater effluent from the St. George Regional Water Reclamation Facility with tertiary filtration to produce Type I Reuse water, suitable for outdoor irrigation and safe for human contact.

The City's secondary irrigation distribution system includes over 200 miles of pipeline, ranging from 4 inch to 30 inch in diameter. The system also includes 22 tanks or reservoirs, providing over 9 million gallons of storage, and 14 pump stations, ranging from 700 to 5,280 gallons per minute flow capacity, pumping to 19 separate pressure zones throughout the system.

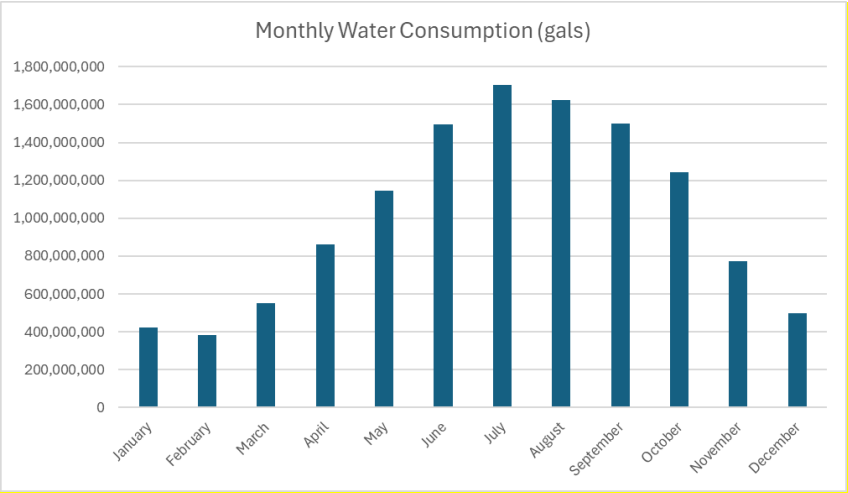
Current Water Use

In 2024, the City delivered approximately 10.5 billion gallons (32,500 acre-ft) of water to its customers. Of that, 8.93 billion gallons (26,700 acre-ft) was culinary water, while 1.88 billion gallons (5,800 acre-ft) was secondary irrigation water.

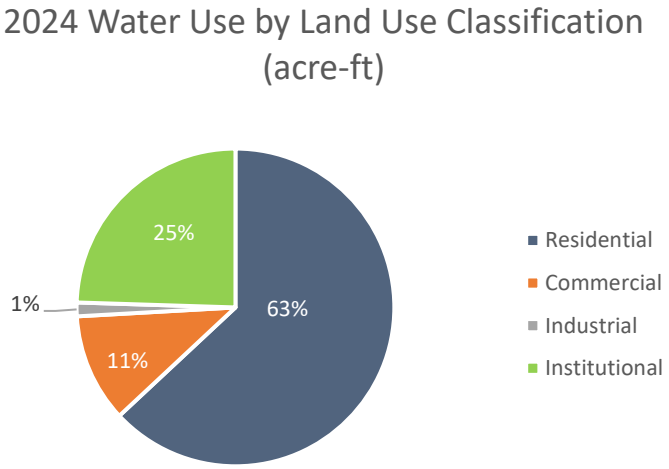
The following figure Illustrates the total water use over the past 10 years from 2015 to 2024.



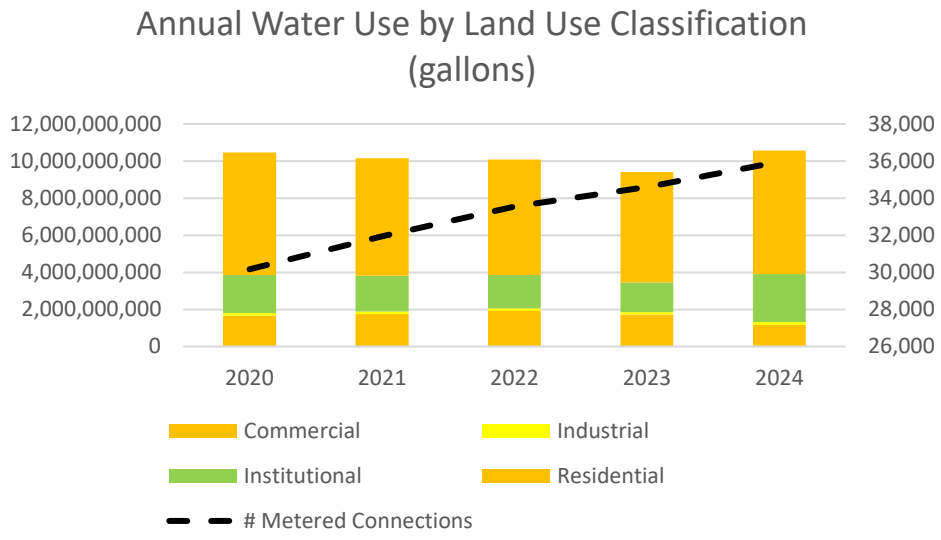
As shown above, the total annual water consumption varies from year to year. This variation occurs for a number of reasons, with climate and temperatures being major factors in these annual variations. As illustrated in the following figure, monthly water use during summer months is approximately four times (4X) the water use during winter months, directly attributed to outdoor irrigation of landscaped areas. It is estimated that over 60% of water used in the City is used for outdoor irrigation of landscaped areas, where temperatures and precipitation are a direct factor in the amount of water required to sustain landscaped areas.



While the total water use or consumption fluctuates annually, the water use relative to the different types of land use tends to be fairly consistent. When evaluating total water use for residential, commercial, industrial, and institutional land uses, the relative percentage of water use between these uses is fairly consistent, with residential water use accounting for approximately 63% of the total water use, as illustrated in the following figure.



While the total amount of annual water use varies from year to year, from 2020 through 2024, the overall water use has been relatively consistent at approximately 10 billion gallons consumed annually. During that same time period, the total number of connections to the water system increased by nearly 5,800, or about 1,160 connections added per year.



Projected Water Use

As detailed in the City's 2025 Culinary Water Master Plan and 2025 Secondary Irrigation Master Plan, a comprehensive evaluation of water use and growth projections has been conducted. This analysis builds upon the City's significant growth over the past four decades, as illustrated in the following table.

Year	City of St. George Population	% Growth	Avg. Annual Growth Rate
1990	28,572		
2000	49,663	73.8%	5.7%
2010	72,897	46.8%	3.9%
2020	95,342	30.8%	2.7%

It is anticipated that St. George City will continue to see rapid growth. The Kem C. Gardner (KCG) Institute publishes long-term growth data for Washington County through the year 2060. The KCG data does not subcategorize growth within the county. However, the WCWCD's updated master plan develops subcounty growth projections based on the KCG baseline household growth scenario.

The growth rate developed by the WCWCD is for an equivalent residential connection (ERC). Subcounty growth was established by analyzing anticipated growth in each municipality based on input from St. George City and other regional supply partners. The projected subcounty growth was calibrated to meet the overall projected county growth rate determined by the Kem C. Gardner baseline household growth. It is anticipated that the annual growth rate will be approximately 4.76% but will steadily decline over the next three decades as the growth approaches build out conditions near 2053.

Build-out is realized when all developable land in the City has been developed. The amount of remaining developable land in St. George has been estimated using the City's current land use and zoning plans. The land use and zoning plans identify the location and type of development that has been approved for specific areas throughout the City.

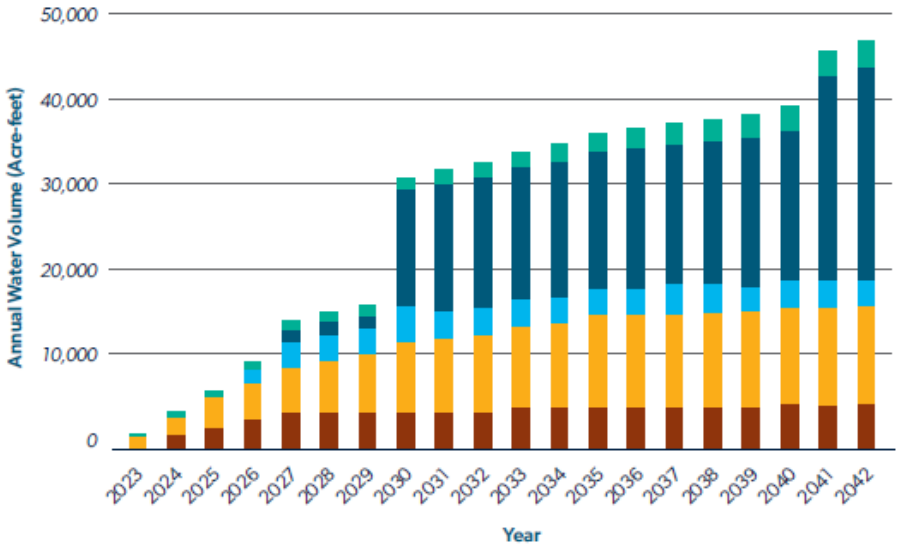
The following table estimates the projected water demand for both culinary water and secondary irrigation water over the next several years.

Year	Total Municipal and Industrial Demand (ac-ft)	Potable Demand (ac-ft)	Secondary Demand (ac-ft)
2023	41,075	34,833	6,242
2024	42,576	35,803	6,772
2025	44,061	36,758	7,303
2026	45,625	37,791	7,833
2027	47,145	38,781	8,364
2028	48,633	39,739	8,894
2029	50,076	40,651	9,425
2030	50,535	40,580	9,955
2031	51,617	41,131	10,486

Year	Total Municipal and Industrial Demand (ac-ft)	Potable Demand (ac-ft)	Secondary Demand (ac-ft)
2032	52,716	41,700	11,016
2033	53,860	42,314	11,547
2034	55,031	43,373	11,658
2035	55,731	43,962	11,769
2036	57,065	45,185	11,880
2037	58,350	46,358	11,991
2038	59,591	47,489	12,103
2039	60,790	48,576	12,214
2040	61,936	49,611	12,325
2041	63,023	50,586	12,436
2042	64,051	51,503	12,547
2043	65,015	52,357	12,658
2044	65,918	53,149	12,770
2045	66,752	53,872	12,881
2046	67,396	54,404	12,992
2047	67,957	54,854	13,103
2048	68,435	55,221	13,214
2049	68,833	55,508	13,325
2050	69,152	55,715	13,436
2051	69,356	55,809	13,548
2052	69,486	55,827	13,659
2053	69,517	55,747	13,770

Since the City of St. George joined the WCWCD Regional Water Supply Agreement in 2006, the responsibility of developing new water sources shifted from the City to the WCWCD. In order to sustain the anticipated growth over the next twenty years, the WCWCD has developed a source development plan, with elements comprising of water reuse projects, water conservation, groundwater optimization projects, and agricultural conversion.

The following figure identifies the estimated annual yield of each of the water source elements of their 20-year source development plan.



New Water Supplies	Estimated Annual Yeild (AFY)
Water Reuse	24,716
Conservation	11,421
New Potable Water Projects	4,787
Groundwater Optimization	3,000
Agriculatural Conversion	3,216
Total New Water	**47,141**
Total Volume Required for 20-Year Growth	**42,746**

Over the next twenty years, it is anticipated that the WCWCD will develop 42,746 acre-ft of new water sources. During that same time period, it is anticipated that the City water demand will increase by approximately 24,000 acre-feet as a result of the anticipated growth.

Land Use Ordinances

The City of St. George's land use ordinances are found in Title 10 of the St. George City Municipal Code. In 2022, the City, along with other regional municipal partners, developed and adopted uniform water efficiency standards. These standards were included in the land use zoning ordinances. Below is a summary of current landscape requirements found in the land use Zoning Ordinances of the City of St. George.

Residential:

- The total lawn area for any residential lot or common/limited common areas associated with a private pad, regardless of zoning, shall not exceed eight percent (8%) of the total lot size up to a maximum of one thousand five hundred (1,500) square feet for lots up to twenty thousand (20,000) square feet. Lots which are greater than twenty thousand (20,000) square feet may have a lawn area of up to two thousand (2,000) square feet.
- Lawn shall be prohibited in park strips, all landscape areas less than eight feet (8') wide and on any slope that exceeds fifteen percent (15%). Areas with soil slopes greater than fifteen percent (15%) shall have erosion control measures and may be landscaped with deep-rooting, water-conserving plants that do not include grass.
- Exterior decorative water features are limited to one (1) with a fifty (50) gallon or less capacity and maintained recirculating pump.

- The use of native plants and other water-conserving plants is required to promote water conservation.

Non-Residential:

- At least fifty percent (50%) of the required landscaped area shall be covered with a combination of foliage of shrubs, permitted lawn, and live-vegetative ground cover within five (5) years of planting. Water-conserving trees and the tree canopy shall not be counted in this fifty percent (50%) requirement.
- Lawn is limited to eight percent (8%) of the landscaped area. In no event shall lawn be placed within ten feet (10') of any roadway or parking lot, which is the paved area intended for vehicular travel or parking, not including sidewalk and gutter.
- In addition to the shrubs, grass, and ground cover, one (1) water-conserving tree with a minimum one and one-half inch (1 1/2") caliper trunk shall be planted for every four thousand (4,000) square feet of landscaped area with a minimum of one (1) water-conserving tree per property. Water-conserving tree species suitable for desert landscapes are required to meet this requirement
- Lawn is not permitted outside of an active recreation area. In addition, lawn is prohibited in park strips, all landscape areas less than eight feet (8') wide, and within ten feet (10') of any roadway or parking lot, which is the paved area intended for vehicular travel or parking, not including sidewalk and gutter.
- No lawn shall be planted on slopes greater than fifteen percent (15%). Lawn should be reserved for areas where it is functional, including active recreation areas. Choose lawn species with lower water requirements. Choose lawn configurations for irrigation efficiency.
- Park strips and other landscaped areas less than eight feet (8') wide shall be landscaped with water-conserving plants and/or mulch, rock, or other appropriate materials.
- All individually platted multifamily or commercial units shall be separately metered, sub-metered or equipped with alternative technology capable of tracking the water use of the individual unit. The information shall be made available to the resident of each unit. and meters.
- All non-single-family development shall have separate water meters for landscape irrigation of areas more than five thousand (5,000) square feet.
- outside misting systems shall only operate during the May-through-September time period where the daily high temperature is ninety (90) degrees Fahrenheit or greater.
- If secondary irrigation water is available, each project shall connect to the secondary system for all outdoor water use.
- It is required that landscaped areas use a WaterSense-labeled smart irrigation controller, which automatically adjusts the frequency and/or duration of irrigation events in response to changing weather conditions. All controllers shall be equipped with automatic rain delay or rain shutoff capabilities and have memory retention capability to retain preprogrammed irrigation schedules. Sites are not exempt from water waste prohibitions.

Water Conservation

Water conservation is an essential element of the regional water supply plan. It is estimated that water conservation will account for over 11,400 acre-feet of the 42,750 acre-feet of water that is required to sustain growth in the region over the next 20 years. To support this objective, the City of St. George recently adopted the WCWCD *2025 Joint Agency Regional Water Conservation Plan*. This plan identifies the regional water conservation goal of reducing its water use by 18 percent between 2022 and 2042, with an anticipated 7.7 percent reduction by 2030.

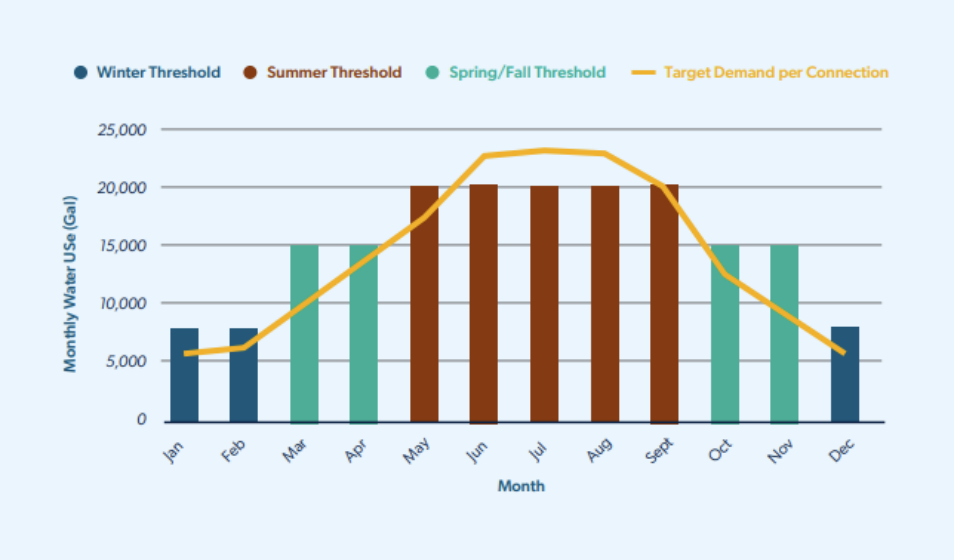
The regional water conservation plan identifies four pillars of a successful water conservation program as regulation, pricing, incentives, and education. Each of these components plays a critical role in achieving the region's long-term conservation goals.

As previously noted, the City has recently adopted some very aggressive uniform water efficiency standards and has codified those standards in its municipal land use zoning ordinances. The enforcement of these standards is expected to significantly reduce water demand in future developments, contributing directly to the City's conservation objectives.

To further promote conservation among both existing and future customers, the City has also implemented progressive water pricing strategies designed to encourage reduced water use. The City's tiered water rate structure applies increasingly higher volumetric rates as consumption rises, creating a financial incentive for users to use water more efficiently. A summary of the current tiered rate structure is provided below.

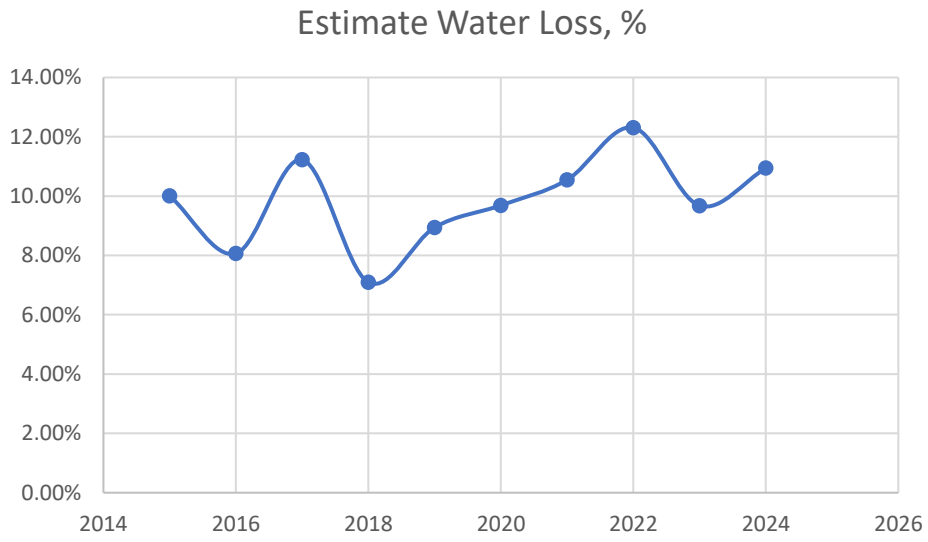
BASE RATE +		$1.58 per 1,000 GAL.	$2.08 per 1,000 GAL.	$2.38 per 1,000 GAL.	$2.68 per 1,000 GAL.	$3.23 per 1,000 GAL.	$3.88 per 1,000 GAL.	$4.63 per 1,000 GAL.
(REFER TO CHART BELOW)		(REFER TO CHART BELOW FOR GALLON THRESHOLD)						
METER SIZE	BASE RATE	TIER 1 THRESHOLD	TIER 2 THRESHOLD	TIER 3 THRESHOLD	TIER 4 THRESHOLD	TIER 5 THRESHOLD	TIER 6 THRESHOLD	TIER 7 THRESHOLD
3/4"	$22.75	Up to 7,500 gal.	7,501 – 15,000 gal.	15,001 – 22,500 gal.	22,501 – 30,000 gal.	30,001 – 37,500 gal.	37,501 – 45,000 gal.	45,001 gal. +
1"	$56.88	Up to 15,000 gal.	15,001 – 30,000 gal.	30,000 – 45,000 gal.	45,001 – 60,000 gal.	60,001 – 75,000 gal.	75,001 – 90,000 gal.	90,000 gal. +
1 1/2"	$91.37	Up to 30,000 gal.	30,001 – 60,000 gal.	60,001 – 90,000 gal.	90,001 – 120,000 gal.	120,001 – 150,000 gal.	150,001 – 180,000 gal.	180,001 gal. +
2"	$162.43	Up to 50,000 gal.	50,001 – 100,000 gal.	100,001 – 150,000 gal.	150,001 – 200,000 gal.	200,001 – 250,000 gal.	250,001 – 300,000 gal.	300,001 gal. +
3"	$365.48	Up to 100,000 gal.	100,001 – 200,000 gal.	200,001 – 300,000 gal.	300,001 – 400,000 gal.	400,001 – 500,000 gal.	500,001 – 600,000 gal.	600,001 gal. +
4"	$649.74	Up to 200,000 gal.	200,001 – 400,000 gal.	400,001 – 600,000 gal.	600,001 – 800,000 gal.	800,001 – 1,000,000 gal.	1,000,001 – 1,200,000 gal.	1,200,001 gal +
6"	$1,461.92	Up to 300,000 gal.	300,001 – 600,000 gal.	600,001 – 900,000 gal.	900,001 – 1,200,000 gal.	1,200,001 – 1,500,000 gal.	1,500,001 – 1,800,000 gal.	1,800,001 gal. +

In addition to the tiered water rate structure, the WCWCD assesses an Excessive Water Use Surcharge for any water used over a set monthly threshold. For all homes constructed prior to 2022, there is a $1.00 surcharge per 1,000 gallons of water used over 36,000 per month. For all homes constructed after 2002, the excess surcharge is $10.00 per 1,000 gallons over a monthly threshold as shown in the figure below, with the monthly thresholds varying seasonally:



In an effort to reduce water use on a city-wide scale, the City is taking proactive measures to reduce the apparent water losses within it's water distribution system.

Over the past 10 years, the City has experienced apparent water losses of approximately 9.85% annually, as illustrated below.



While apparent water losses below 10% are considered acceptable losses, the City is proactively working to reduce those losses, as an apparent water loss of 9.85% represents approximately 3,000 acre-feet of water, or nearly 10 million gallons of water.

In an effort to conserve water for sustainable growth, the City is also implementing an Advanced Metering Infrastructure (AMI) project. The City is installing AMI metering endpoints to all water meters throughout the City. The AMI endpoints will provide near-real time water use data to the City and it's customers. With the availability of this data, customers can be notified of a potential leak; track hourly, daily, and monthly uses; and receive additional information regarding their water use.

Goals and Objectives

The following goals and objectives will help the City of St. George improve water use and practices.

Goal 1. Reduce indoor water use.

a. Ensure every new home has the required hot water recirculation systems by performing and recording inspections during the building process.
b. Continue to promote indoor water conservation efforts and incentives, like the high efficiency toilet rebate program.

Goal 2. Reduce outdoor water use

a. Residential
    i. Continue to support WCWCD with grass rebate and smart irrigation controller incentive programs.

   ii. Continue to add secondary water systems
   iii. Ensure AMI metering endpoints to all water meters throughout the City
b. Commercial
   i. Continue to support the WCWCD grass rebate program.
   ii. Continue to enforce waterwise ordinance requirements are met with all commercial users through documented inspections.
c. City Facilities
   i. Convert all city facilities to secondary water.
   ii. Implement a Net Zero landscaping program, where for every square foot of turfgrass added to new park facilities, an equal amount of turfgrass is removed from non-functional landscaped areas throughout the City.

Goal 3. Increase educational activities
a. Educate public on best xeriscape practices.
b. Continue to support the WCWCD Desert Garden conservation programs.

Goal 4. Reduce and eliminate wasteful water practices
a. Reduce water loss to 8% annual water loss
   i. Institute and follow a pipe replacement program.
   ii. Explore and implement new technologies for active leak detection.

Exhibit B
PowerPoint Presentation

Water Use and Preservation Element of the General Plan

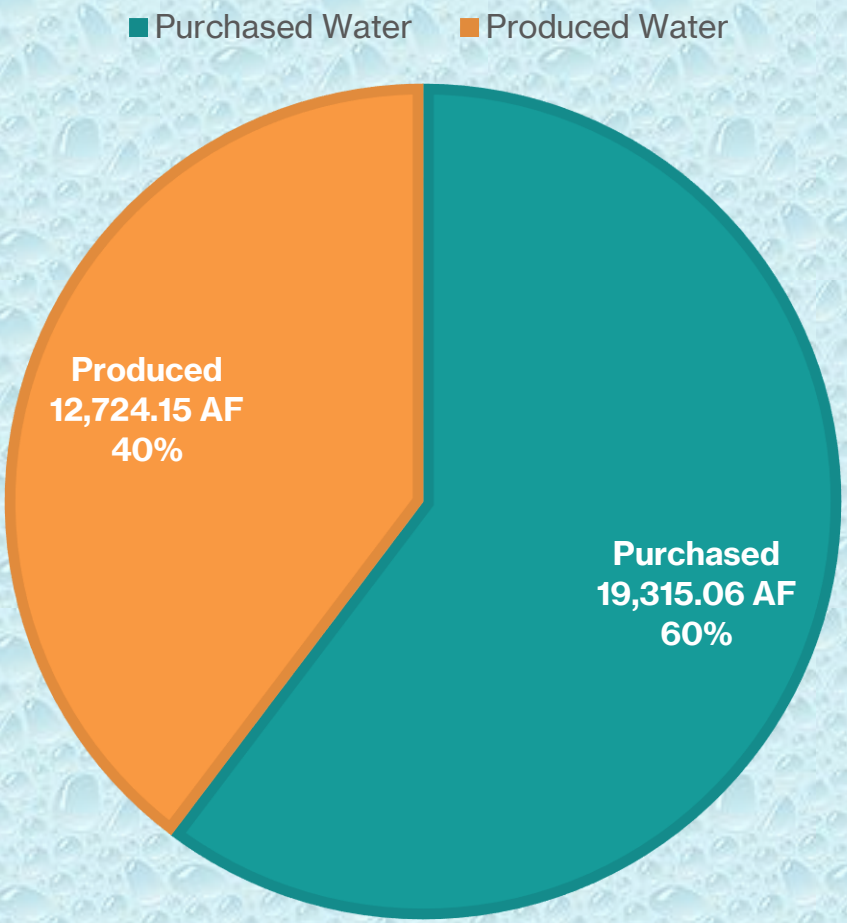
2025-GPA-016

State Requirements

Water use and Preservation Element is to address the following:

1. The effect of **permitted development** on the water demand and water infrastructure
2. Methods of **reducing water demand** and per capita water use for **existing** development.
3. Methods of **reducing water demand** and per capita water use for **future** development.
4. Modifications that can be made to a local government's operations to **reduce** and **eliminate wasteful water practices**.

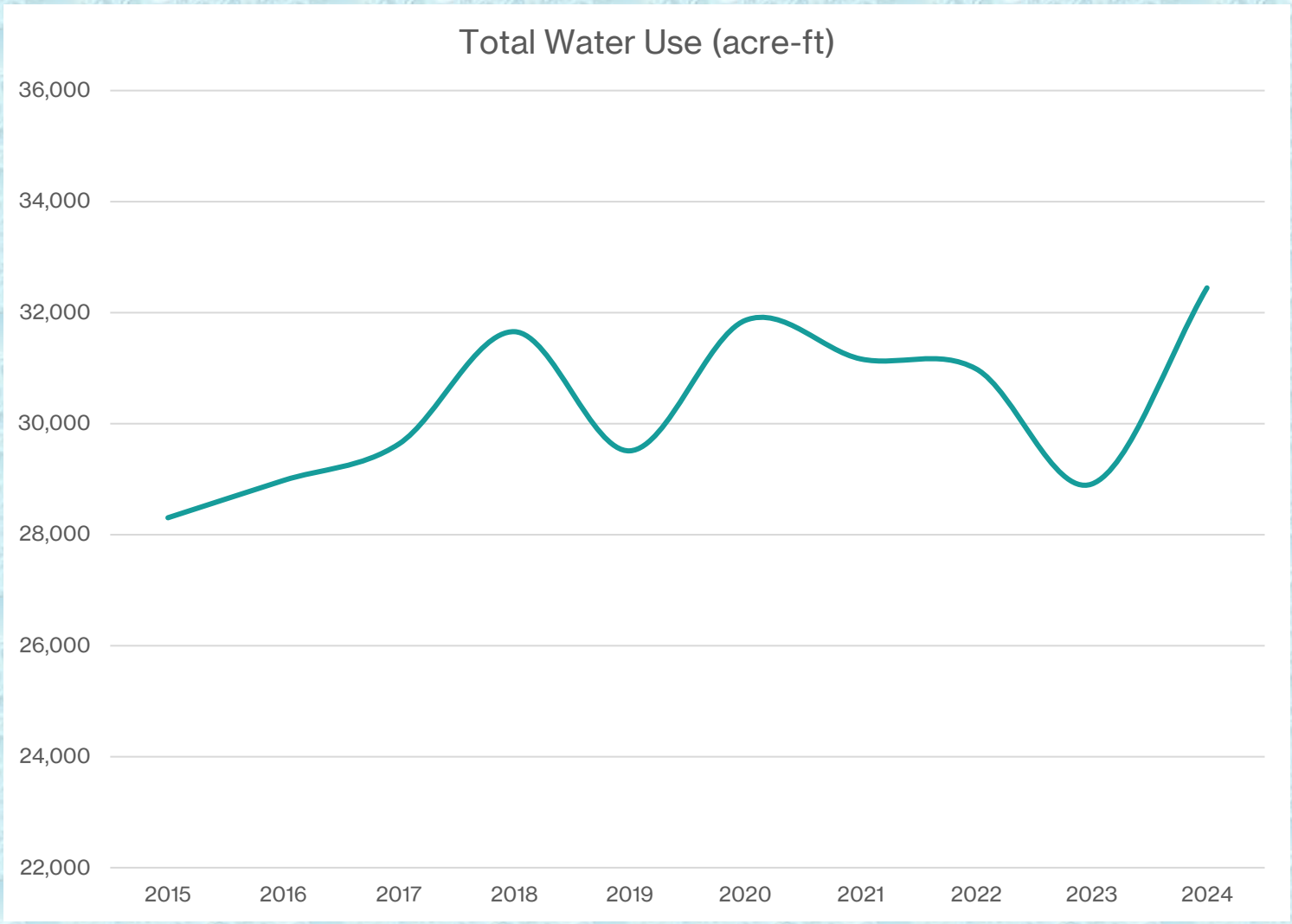
Purchased vs. Produced Water 2020-2024



Secondary Water System Overview

- Sources: Water from Virgin and Santa Clara Rivers, groundwater wells, and reuse water from the city's tertiary treatment facility.
- Infrastructure: ~200 miles of pipelines, 22 reservoirs (9 million gallons), and 14 pump stations serving 19 pressure zones.

Current Water Use



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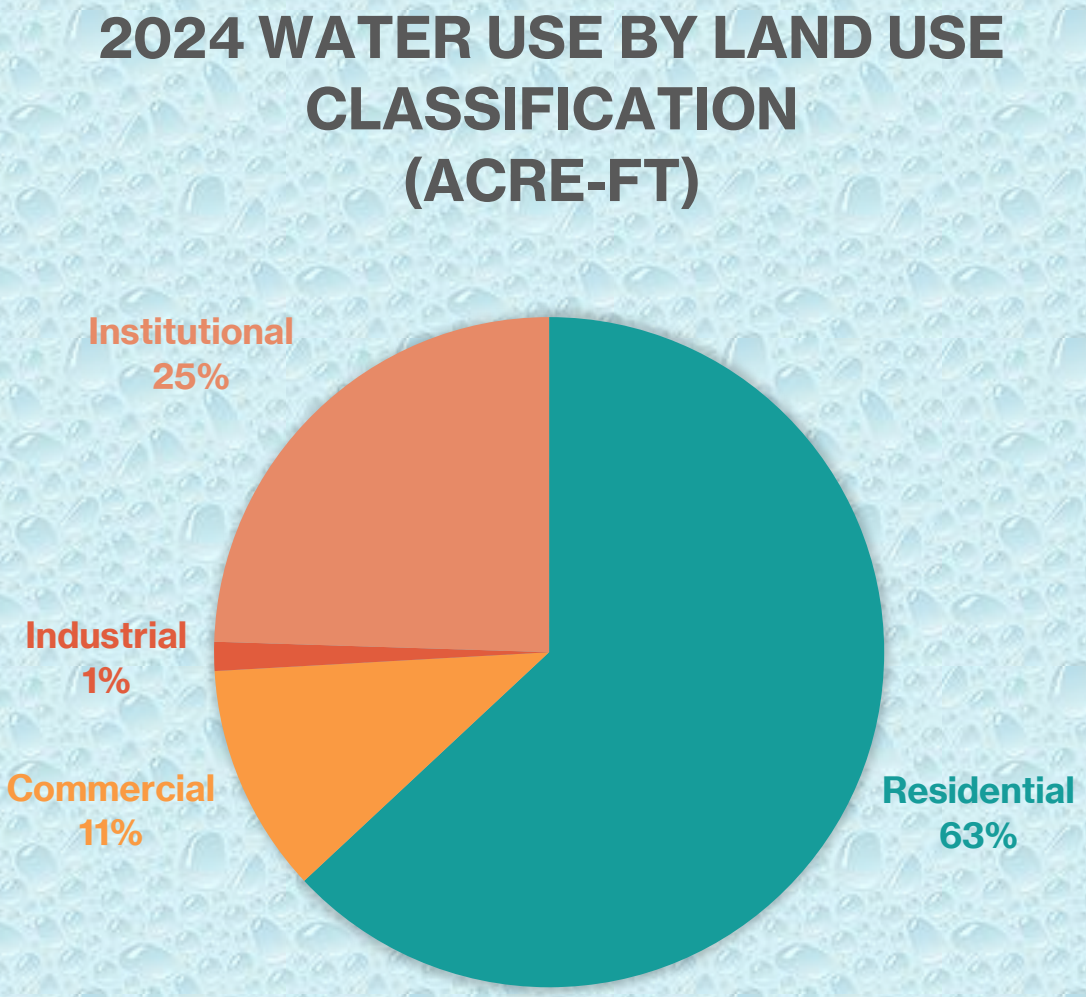
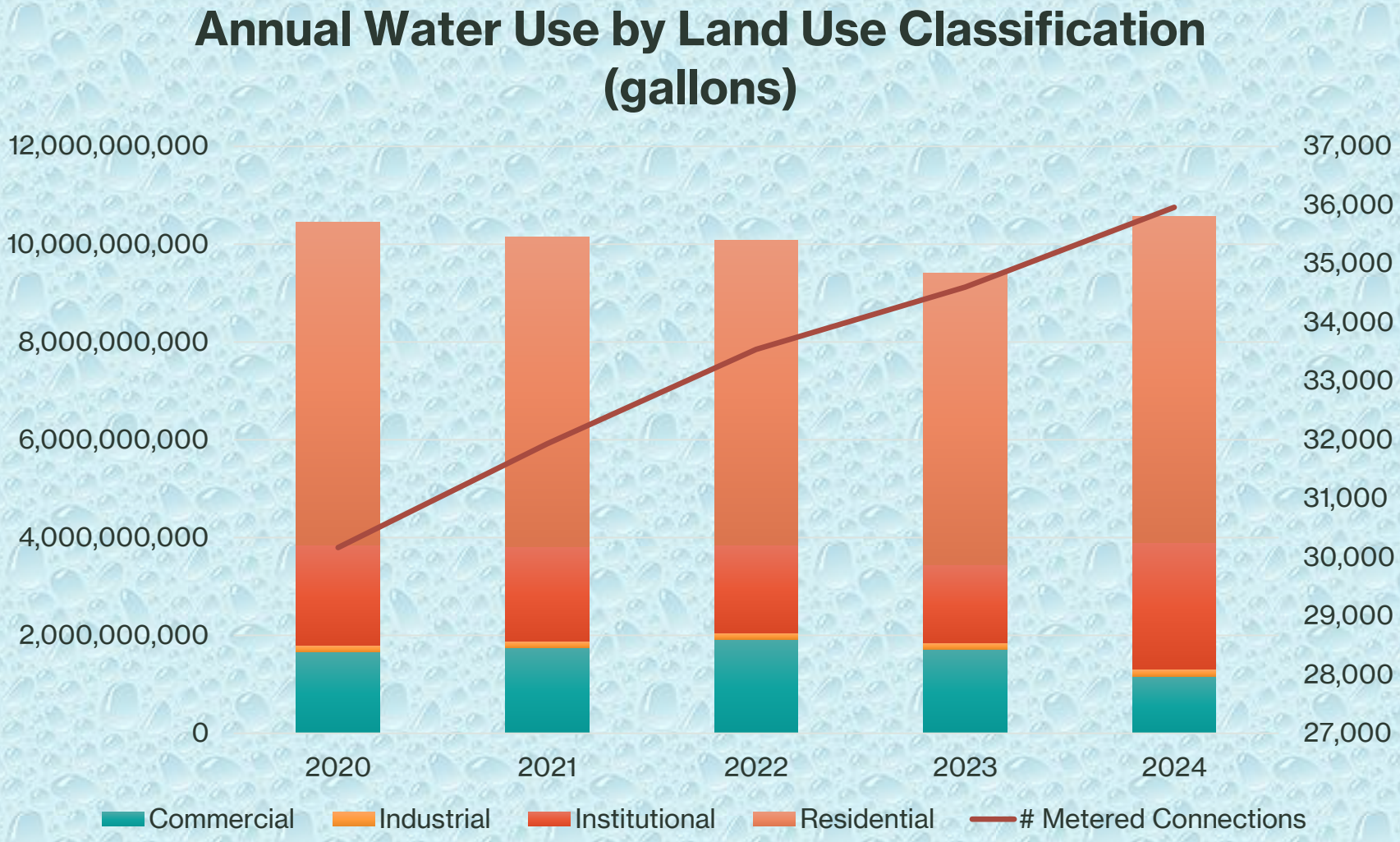


Current Water Use



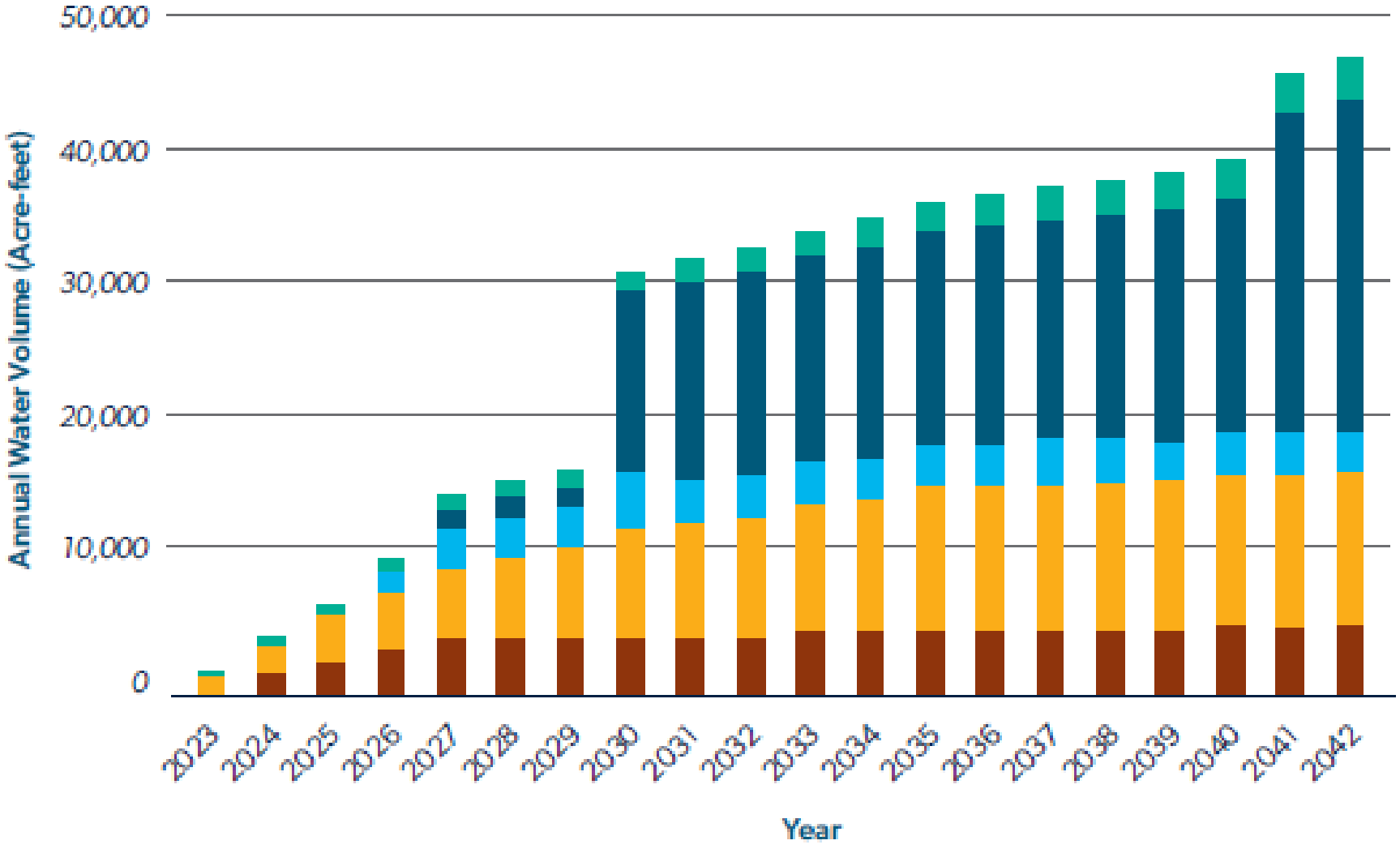
Projected Water Use

Year	City of St. George Population	% Growth	Average Annual Growth Rate
1990	28,572		
2000	49,663	73.8%	5.7%
2010	72,897	46.8%	3.9%
2020	95,342	30.8%	2.7%

Projected Water Use

Year	Total Municipal and Industrial Demand (ac-ft)	Potable Demand (ac-ft)	Secondary Demand (ac-ft)
2023	41,075	34,833	6,242
2024	42,576	35,803	6,772
2025	44,061	36,758	7,303
2026	45,625	37,791	7,833
2027	47,145	38,781	8,364
2028	48,633	39,739	8,894
2029	50,076	40,651	9,425
2030	50,535	40,580	9,955
2031	51,617	41,131	10,486
2032	52,716	41,700	11,016
2033	53,860	42,314	11,547
2034	55,031	43,373	11,658
2035	55,731	43,962	11,769
2036	57,065	45,185	11,880
2037	58,350	46,358	11,991
2038	59,591	47,489	12,103
2039	60,790	48,576	12,214
2040	61,936	49,611	12,325
2041	63,023	50,586	12,436
2042	64,051	51,503	12,547
2043	65,015	52,357	12,658
2044	65,918	53,149	12,770
2045	66,752	53,872	12,881
2046	67,396	54,404	12,992
2047	67,957	54,854	13,103
2048	68,435	55,221	13,214
2049	68,833	55,508	13,325
2050	69,152	55,715	13,436
2051	69,356	55,809	13,548
2052	69,486	55,827	13,659
2053	69,517	55,747	13,770

Projected Water Use



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New Potable Water Projects	4,787
Groundwater Optimization	3,000
Agriculatural Conversion	3,216
Total New Water	**47,141**
Total Volume Required for 20-Year Growth	**42,746**

Land Use Ordinances

Title 10 Adoption in 2022

- Residential: Lawn area limited to 8% of lot size (≤1,500–2,000 sq. ft.); Lawn prohibited in park strips; no turf on slopes >15% or in strips < 8 ft; native plants and efficient irrigation required; water feature limited to 50 gallon capacity
- Non-Residential: Lawn only permitted in active recreation areas; no turf on slopes; trees must be water-conserving species; mandatory separate metering and WaterSense smart controllers.

General: Prohibition of non-functional turf; seasonal limits on misting systems; mandatory secondary system use where available.

Water Conservation

BASE RATE +		$1.58 per 1,000 GAL.	$2.08 per 1,000 GAL.	$2.38 per 1,000 GAL.	$2.68 per 1,000 GAL.	$3.23 per 1,000 GAL.	$3.88 per 1,000 GAL.	$4.63 per 1,000 GAL.
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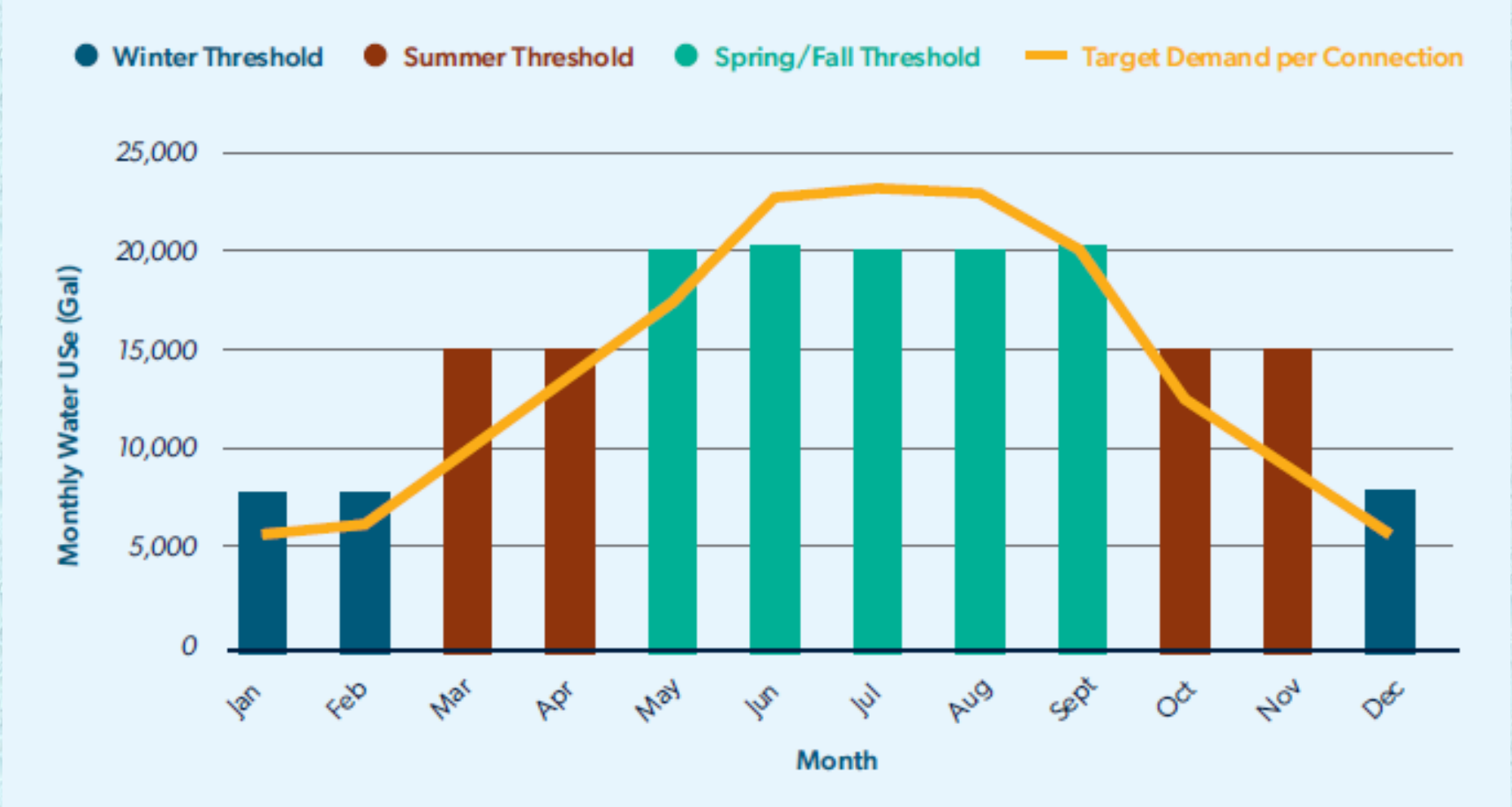
4"	$649.74	Up to 200,000 gal.	200,001 – 400,000 gal.	400,001 – 600,000 gal.	600,001 – 800,000 gal.	800,001 – 1,000,000 gal.	1,000,001 – 1,200,000 gal.	1,200,001 gal +
6"	$1,461.92	Up to 300,000 gal.	300,001 – 600,000 gal.	600,001 – 900,000 gal.	900,001 – 1,200,000 gal.	1,200,001 – 1,500,000 gal.	1,500,001 – 1,800,000 gal.	1,800,001 gal. +

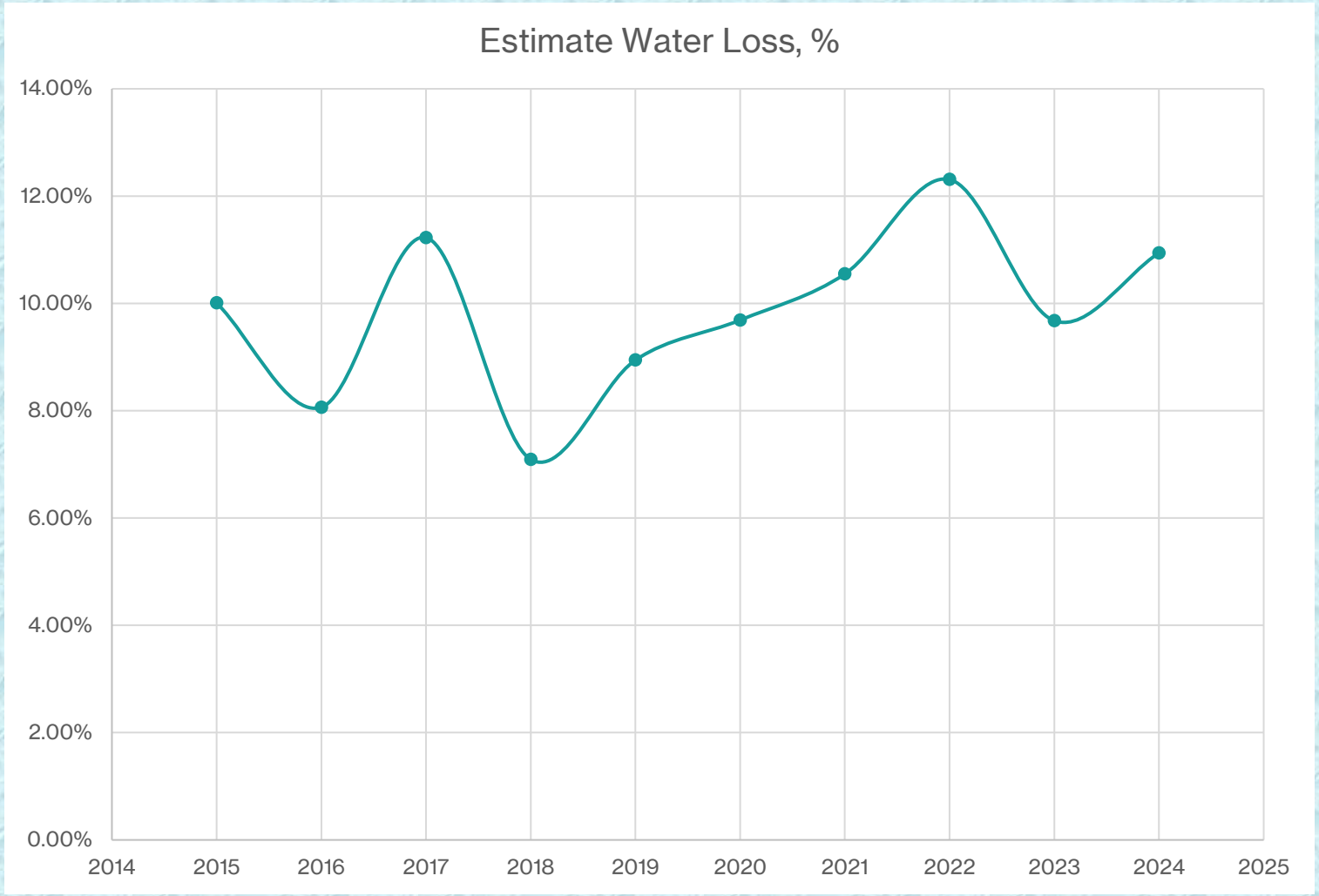
Water Conservation



<u>Additional Fee:</u>
Allowed 36,000 gallons per month

- Home 2022 or older $1.00 per 1,000 gallons over
- Home 2022 or newer $10.00 per 1,000 gallons over

Water Conservation



Water Loss:

Last 10 years: 9.85%

Goal 8%

Goals and Objectives

Goal 1. Reduce indoor water use

a. Ensure every new home has the required hot water recirculation systems by performing and recording inspections during the building process.
b. Continue to promote indoor water conservation efforts and incentives, like the high efficiency toilet rebate program.

Goal 2. Reduce outdoor water use

a. Residential and Commercial Uses
    i. Continue to support WCWCD with grass rebate and smart irrigation controller programs
    ii. Continue to add secondary water systems
    iii. Ensure all water meters in the city are equipped with AMI metering endpoints
    iv. Continue to enforce waterwise ordinance requirements are met with all commercial users through documented inspections
b. City Facilities
    i. Convert all city facilities to secondary water
    ii. Implement a Net Zero landscaping program, where for every square foot of turfgrass added to new park facilities, an equal amount of turfgrass is removed from non-functional landscaped areas throughout the City.

Goal 3. Increase educational activities

a. Educate public on best xeriscape practices
b. Continue to support the WCWCD Desert Garden conservation programs

Goal 4. Reduce and eliminate wasteful water practices

a. Reduce water loss to 8% annual water loss
    i. Institute and follow a pipe replacement program
    ii. Explore and implement new technologies for active leak detection

Goals and Objectives

Goal 1 – Reduce Indoor Use:

- Enforce hot-water recirculation system requirements
- Promote efficiency rebates (e.g., high-efficiency toilets)

Goal 2 – Reduce Outdoor Use:

- Support WCWCD rebate programs
- Extend secondary irrigation system coverage
- Install AMI metering citywide
- Enforce waterwise ordinance requirements
- Convert city facilities to secondary water
- Implement “Net Zero Landscaping” (replace new turf with equivalent turf removal elsewhere)

Goal 3 – Increase Education:

- Expand public outreach on xeriscaping and support WCWCD desert garden programs

Goal 4 – Reduce Wasteful Practices:

- Cut system water loss to 8%
- Implement a proactive pipe replacement and leak detection programs

Recommendation

Staff recommends approval of this amendment to the General Plan to add the Water Use and Preservation Element

St.George
Community Development

ITEM 6

Zoning Regulation Amendment

PLANNING COMMISSION AGENDA REPORT: 11/18/2025

AMENDMENT TO STANDARD SPECIFICATIONS
Section 4 Construction Standards
(2025-ZRA-014)

Amendment to Section 4 Construction Standards

REQUEST:
Consider a request to amend Standard Specification Section 4 Construction Standards to address an overall update to Section 4 including, revisions to Table 4.3 (Minimum Roadway Structural Requirements) for Major Collector roadways and larger, Roadbase gradation allowances for acceptance limits and suspension limits, revisions to Table 4.6 (Master Grading Bands) to meet target tolerances for aggregate gradation, removal of the Chip Seal and Slurry Seal sections and an update to the Standard Drawing 170 - Trench Backfill and Repair Detail in section 4 of City Standards and Specifications. The applicant is Engineering Division representing the City of St. George (Case No. 2025-ZRA-014)

BACKGROUND:
The last revision to Section 4 Construction Standards was June 2000. The Construction Standards are intended to guide the design and installation of general construction within the city have been identified by staff as inadequately addressing the current city standards, resulting in interpretive challenges and inconsistencies in regulatory application. This creates difficulties in the design and construction process.

City staff met with Geotechnical Engineers to update Section 4 of the City Standards. The changes to the standards and specifications are in line with industry standards and current regulations.

This request is to amend the St. George Standard Specifications Section 4 – Construction Standards to modify the design and construction of projects and provide clarification and consistency. This update includes the following:

- A revision to Table 4.3 (Minimum Roadway Structural Requirements) specifying the minimum pavement thickness for Major Collector and larger roadways. The City will pay for any upsizing of asphalt pavement thickness above the minimum required per project specific geotechnical investigations.
- Clarify roadbase gradation acceptance and suspension limits to meet the minimum acceptable CBR. If the material is unacceptable,

it must be removed and replace at the contractor's expense. The geotechnical firm shall notify the City, the source will be removed from the City's Approved Supplier List, and the supplier may not furnish roadbase for city projects until quality control results are demonstrated and the city re-approves the source.

- Require aggregate gradations for Table 4.6 (Master Grading Bands) meet the specified target tolerance, with gradations analyzed by weight, percent-passing basis; the project's target grading curve must lie within the selected aggregate grade in Table 4.6, and the field gradations may not deviate from the target by more than the allowed tolerance.

Proposed Changes:
The proposed revisions are shown in Exhibit A.
The proposed additions are in red and underlined, and the deletions are in red with a ~~strikethrough~~.

RECOMMENDATION:
Staff recommends approval of the amendment to Standard Specifications Section 4 Construction Standards.

ALTERNATIVES:
1. Recommend approval as presented.
2. Recommend approval with changes.
3. Recommend denial.
4. Continue the proposed zoning regulation amendment to a specific date.

POSSIBLE MOTION:
The Planning Commission recommends approval of the amendment to City Standard Specifications, Section 4 – Construction Standards based on the proposed amendments.

FINDINGS:
1. It is in the best interest of the city to review and update city zoning regulations periodically as needed.
2. The proposed revisions will allow more flexibility to address the existing topography within the city and the ability to develop property.

EXHIBIT A
Standard
Specifications
Section 4

SECTION 4
CONSTRUCTION STANDARDS

4.1 INTRODUCTION. This section sets forth the requirements for earthwork, pipeline construction, roadway construction, ~~chip seals, slurry seals,~~ concrete work ~~and~~, restoration of surface improvements, utilities, and other similar projects.

4.2 SURVEY REQUIREMENTS. Prior to commencing the work, all construction shall have appropriate construction staking in conformance with the approved drawings unless otherwise approved by the City ~~Engineer.~~ The staking shall have all necessary information including, but not limited to, stationing, cut or fill data, off-set distance and invert elevations. The information shall be placed on the face of stakes in a legible manner using weatherproof marking materials and shall be in accordance with general surveying practice. All construction staking shall be under the direction of the Engineer responsible for the project.

When a water main design has a profile with grades, a grade line will be staked at the designated grades prior to installation of any pipe. A laser may be used in lieu of a grade line. All sewer lines and storm drains will require that a grade line be set and checked prior to installation of any pipe.

4.3 EARTHWORK. This subsection defines the requirements for excavation and backfill ~~for structures~~, preparation of embankments and fills, ~~and~~ subgrade preparation for pavement, and other underground and surface improvements.

4.3.1 MATERIALS. Earthwork materials shall conform to the following:

4.3.1.1 EXCAVATION. All structures shall be founded on prepared original soil or engineered fill. Unauthorized excavation below the specified structure subgrade shall be replaced with concrete, untreated base course, or approved engineering fill thoroughly compacted to a minimum of ninety-five percent (95%) of maximum dry density. Subgrade soil for all concrete structures, regardless of type or location, shall be firm and thoroughly compacted to a minimum of ninety-five percent (95%) of maximum dry density for granular soils or ninety percent (90%) of maximum dry density for silty/clay (fine-grained) soils.

4.3.1.2 SUBSOIL REINFORCEMENT. Coarse gravel, crushed stone, or a geotextile may be used for subsoil reinforcement when approved by the ~~City Engineer.~~city. Coarse gravel or crushed stone shall be applied in six (6) inch layers, each layer being embedded in the subsoil by thorough tamping. Approved geotextile shall be installed in accordance with manufacturers recommendations. All excess soil shall be removed.

~~The finished elevation of any subsoil shall not be above the specified sub- grade elevation.~~

4.3.1.3 BACKFILL. Backfill shall be placed to the lines and grades shown on the approved drawings, or as directed by the ~~City's Representative.~~city. Prior to backfilling any construction work, the excavation shall be cleaned of all forms, trash and debris, and such

material shall be removed from the site. Backfill material shall be approved and consist of excavated material or clean imported materials such as sand, gravel, or other suitable material.

Backfill shall be placed in ~~layers compatible with the equipment and~~loose lift not exceeding ~~six (6)~~eight inches ~~in compacted thickness.~~(8"). Each ~~layer~~lift shall be compacted to a minimum density of ninety-five percent (95%) of maximum dry density for granular soils or ninety percent (90%) of maximum dry density for silty/clay (fine-grained) soils.

4.3.2. CONSTRUCTION METHODS. The methods employed in performing the work shall be the responsibility of the Contractor. These methods shall include, but are not limited to, the following:

4.3.2.1 CONSTRUCTION OF EMBANKMENTS. Unsuitable materials that occur in the foundations for embankments shall be removed by clearing, stripping and/or grubbing. When required by the ~~City Engineer~~city, the embankment and the materials used shall be approved by a Geotechnical Engineer. All materials in embankments shall be placed, moistened, and compacted as outlined in the following paragraphs.

When the material needed for embankment exceeds the amount of material available from excavation, sufficient additional materials shall be provided by the ~~Contractor.~~Owner. All materials used for embankment construction shall be free from deleterious materials and rocks larger than three inches in diameter and all other material unsuitable for construction of embankments. Rocks larger than three inches (3") may be used when recommended by the Geotechnical Engineer and approved by the ~~City Engineer~~city.

~~Grading of completed embankments shall bring the surfaces to a smooth, uniform condition with final grades being within 0.1 foot of the design grade.~~ Cut and fill slopes shall be a 2 horizontal to 1 vertical ~~maximum~~ (2h:1v~~).~~) or flatter. Construction of slopes steeper than 2h:1v or fills in excess of ~~five~~eight feet~~,~~ (8'), or when placement is on a slope of greater than 5h:1v, shall be reviewed ~~and~~, recommended, and approved by the Engineer.

4.3.2.2 COMPACTION OF EARTH MATERIALS. The fill material shall be deposited in horizontal layers having a thickness of not more than eight ~~(8)~~ inches (8") and then compacted to the density as herein specified. Moisture content during compaction operations shall be within two percent (2%) of optimum for granular soils and shall be two to five percent above (2~~% %~~%-5~~)~~%) optimum for fine-grained soils unless otherwise directed by the Geotechnical Engineer. The moisture content shall be uniform throughout the layers.

If the moisture content is greater than specified for compaction, the compaction operations shall be delayed until such time as the material has dried to the specified moisture content. When the material has been conditioned as herein specified, the backfill or embankment shall be compacted as directed below.

Under roadways, curb and gutter, sidewalks and driveways, and extending one foot (1')

beyond the proposed construction (or to a distance equal to the depth of the embankment material, whichever is greater), the embankment material shall be compacted to a density equal to not less than ninety-five percent (95%) for granular soils and ninety (90%) percent for fine-grained soils. Other fills and embankments not noted above shall be compacted to ninety (90) percent (90%) maximum dry density. When compaction cannot be met with native or imported materials, a sand/cement slurry (flowable fill) mix (no gravel) may be used in lieu of compacted materials for backfill which is above the six to eight (6-8) inch zone above the pipe, as approved by the city.

Exposed natural soils within construction areas, beneath walkways, slabs and pavement shall be scarified to a depth of twelve (12)six inches (6") or greater as approved by the Geotechnical Engineer, moisture conditioned, and compacted to the specified density. Where rock or other acceptable material is exposed, scarification may not be necessary.

Foundations for structures shall be uniform throughout and shall not be placed partially on undisturbed soil or compacted fill and partially on cemented deposits or rock.

Foundation soils should not be allowed to become saturated during construction.

4.3.2.3 SUBGRADE PREPARATION. As a minimum, the original soils under roadways, curb and gutter, sidewalks, and driveways shall be scarified to a depth of one footsix inches (6") or greater as approved by the Geotechnical Engineer prior to compaction operations. All scarified soils shall be compacted to the equivalent of ninety-five percent (95%) of maximum dry density for granular soils or ninety percent (90%) of maximum dry density for fine grain soils. Additional overexcavation and recompaction of original soils due to poor subgrade conditions may be required. Subgrades shall be shaped and graded to the design grade. Drainage shall be maintained at all times. Subgrades shall be stabilized and compacted as directed. When springs or underground water is encountered during construction the Engineer and the City's Representativecity shall be notified immediately. Work shall not proceed until an acceptable mitigation plan is approved. Ground water discovered during construction shall not be ignored!.

The subgrade preparation requirements listed above are considered to be the minimum. When required, the subgrade shall be overexcavated and the material removed from the site. Select borrow material may be imported, placed and compacted as directed by the City's Representativecity.

To demonstrate the stability and compaction of the subgrade, the Contractor may be required toshall proof-roll the subgrade prior to placing any base gravel. The subgrade shall be proof-rolled with at least one pass coverage with a roller with pneumatic tires or other acceptablemoderate weighted rubber tire construction equipment of at least ten ton capacity.. All proof-rolling shall be accomplished in the presence of the City's Representative. Ground contact pressure for all tires shall be eighty five to ninety (85-90) psi unless otherwise recommended.city. When the proof-rolling shows an area to be unstable, itthe contractor shall contact the geotechnical engineer for stability recommendations. It shall be brought to

satisfactory stability by additional compaction, reworking, or removal of unsuitable material and replacement with acceptable material.

4.3.2.4 CONSTRUCTION OF NON-STRUCTURAL FILLS. Fills shall be placed to the lines and grades shown on the approved drawings and shall include all areas not specifically designated for support of structures, roads, utilities, easements, drainage ways, etc. (such as landscape areas, open space areas, etc.). Fill material shall generally be compacted to a minimum of ninety percent (90%) of maximum density and shall consist of material that can be compacted to prevent settlement such as soil, rocks, blocks, crushed stone, broken concrete, etc. Fill material shall not include broken asphalt, concrete chunks, crushed stone (unless geotechnical engineer determines a maximum size for these materials.), toxic or hazardous materials waste sludge, deleterious materials such as muck, ash, sod, grass, trash, tree stumps, lumber, dead animals, etc.

4.3.3 QUALITY CONTROL. All earthwork shall be performed in accordance with these standards and shall be tested and accepted as follows:

4.3.3.1 TESTING. Minimum testing of earthwork shall be as follows:

A. Soil Classification - One per material source. Soil classifications shall be in accordance with AASHTO M-145. For determination of granular soils or fine grained soils use ASTM D-2487 (Unified Soil Classification System). The sieve analysis shall be according to ASTM C-136 and C-117.

B. Soil Proctor - One determination for each significant change in soil type as necessary to provide required compaction testing. Tests shall be performed using method ASTM D-1557 ~~method A or D~~ (modified proctor). Earth fill moisture/density determination - One test per five hundred (500) cubic yards of fill density placed in an embankment. Tests shall be determination - ASTM D-1556 or D-2922 and D-3017.

C. Subgrade moisture/density determination - One test per seven hundred fifty (750) square density yards of surface area. Tests shall be ASTM D-~~determination~~ 1556 or D-2922 and D-3017. Additional moisture density determinations may be made when required by the ~~City's Representative~~city.

4.3.3.2 ACCEPTANCE. Any earthwork determined not to be in compliance with these standards shall be removed and replaced or reworked until compliance is obtained. Costs for the rework or testing the rework shall be paid for by the Contractor.

4.3.4 SPECIAL REQUIREMENTS. The requirements outlined in this section are only a minimum. When a geotechnical investigation is required, the recommendations of the geotechnical investigation report shall be followed unless said recommendations are less than minimum standards.

All development projects shall submit a final soils engineering and engineering geology report in

accordance with ~~Uniform~~the International Building Code~~, 1994 Edition~~ 2021, Appendix Chapter 33, or as subsequently modified.

~~4.4 PIPELINE CONSTRUCTION.~~

4.4 ROCKERY AND SEGMENTAL BLOCK RETAINING WALLS. This subsection defines the requirements for this section, based on the Rockery and Segmental Block Retaining Wall Ordinance, Title 10, Ch 18A.

4.4.1 SITE PREPARATION. As a minimum, subgrade preparation within the limits of the wall construction shall be performed in accordance with the St. George City Standard Specifications 4.3.2.3. Additional subgrade preparation such as over excavation and recompaction may be required in the geotechnical report. Groundwater discovered during construction shall not be ignored and shall be addressed by the Geotechnical Engineer prior to continuing construction of the wall.

4.4.2 MONITORING. The phases of rockery and segmental block wall construction, including site preparation, shall be monitored in accordance with the inspection frequency schedule specified on the construction drawings prepared by the geotechnical engineer. The geotechnical engineer employed by the Owner/Contractor shall verify that the nature and quality of the materials being used are appropriate and that the construction is in accordance with the engineered design. The geotechnical engineer shall verify to the City in writing that the materials and construction of the rockery/segmental block wall as-built is in accordance with the engineered design after construction is complete.

4.4.3 BACKFILL. Backfill materials shall consist of quality fill materials meeting the requirements specified by the geotechnical engineer and the geotechnical recommendations. Backfill shall be placed in uniform lifts per the geotechnical recommendations.

4.4.4 BACKFILL COMPACTION AND TESTING. Compaction shall be in accordance with the geotechnical recommendations. Compaction within three feet (3') of the back of the facing units shall be accomplished with walk-behind compactors. No heavy equipment shall be operated within three feet (3') of the back of the rocks/blocks. Density tests to verify compaction shall be taken at random locations. At least two (2) tests per one hundred feet (100') of wall length per eighteen inches (18") of backfill shall be taken. In critical locations, the geotechnical engineer may request additional testing.

4.4.5 GEOGRID REINFORCEMENT. Mechanically stabilized earth (MSE) retaining walls shall be reinforced with geogrid as specified by the geotechnical engineer. Geogrid design embedment length shall be measured from the back of the rock or segmental block facing units. Geogrid shall be positively connected to the block facing units. No substitutions of geogrid reinforcement products shall be allowed unless specifically approved by the geotechnical engineer. Gravity segmental block retaining walls generally do not require geogrid reinforcement in their design.

4.4.6 ROCK SELECTION AND PLACEMENT. The rock source shall be preapproved by the geotechnical engineer. The contractor shall have sufficient space and stockpile material available to select from among a number of rocks for each space in the rockery wall to be filled. Rock shall be of a generally cubical, tabular or rectangular shape. Rounded rocks shall not be used. Internal void spaces in the facing shall be kept to a minimum. Prior to being placed, rocks shall be approved by the geotechnical engineer. Base keyway rocks shall have a minimum width extending back into the wall of at least one third (1/3) the exposed height of the wall tier. Rocks shall be placed to

decrease in size with increasing wall height. Cap rocks shall have a minimum width of two feet (2') extending back into the wall.

Rocks shall be placed to bear on good flat-to-flat surfaces. The long dimension of the rocks shall extend back toward the cut/fill face. Except for basal rocks, rocks shall bear on at least two (2) or more other rocks. The base rocks shall be embedded at least one foot (1') to provide a keyway into unyielding soil competent subgrade soils. Additional embedment may be required by the geotechnical engineer.

4.4.7 SEGMENTAL BLOCK RETAINING WALL UNITS. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete.

It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and have a minimum net average twenty-eight (28) days compressive strength of 4,000 psi. The concrete shall have adequate freeze/thaw protection and meet the requirements of ASTM C 1372. Higher strengths may be required by the geotechnical engineer based on site conditions.

All units shall be: (a) obtained from the same manufacturer, (b) sound, and (c) free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the construction. Any cracks or chips observed during construction shall fall within the guidelines outlined in ASTM C 1372.

Except for base blocks, each block unit shall bear on at least two (2) blocks. The base blocks shall be embedded at least one foot (1') to provide a keyway into unyielding soil competent subgrade soils. Additional embedment may be required by the geotechnical engineer.

Segmental block units shall match the color as approved by City, surface finish, and dimension for height, width, depth, and batter as shown on the drawings.

If pins or clips are used to interconnect block units, they shall consist of a non-degrading polymer or galvanized steel and be made for the express use with the block units supplied.

Any cap adhesives shall meet the requirements of the block unit manufacturer.

4.4.8 WALL DRAINAGE. Wall drainage behind the retaining walls shall include a free draining gravel layer and filter fabric with a drainpipe daylighting to a proper outlet. If the engineering can substantiate proper filtering between the retained soils and the drain rock, then the filter fabric may be omitted. If the retained soils or backfill is free draining as substantiated by backfill material type for general conditions in the area, then drainage material may be omitted from the design.

4.4.9 SURFACE DRAINAGE. Surface drainage shall be directed away from the rockery/block wall face to a positive and permanent discharge away and beyond the retaining walls. The surrounding site shall be graded such that water cannot flow over the top of the retaining walls. If drainage cannot be directed away from the wall, additional precautions should be taken.

4.4.10 BATTER. The batter (steepness) of a rock wall face shall not exceed one horizontal to

four vertical (1h:4v). The batter steepness of a segmented block wall face shall not exceed 1h:10v unless approved steeper by the geotechnical engineer.

Batter requirements for segmental block retaining wall shall be noted on the design drawings from the geotechnical engineer. The steepness of the wall face shall not exceed the block Manufacturer's design recommendations.

4.4.11 SLOPES. Slopes above and below rockery and segmental block retaining walls shall not exceed two horizontal to one vertical (2:1); shall be shown on the drawings, and shall be included in the stability analysis and the design considerations. (Ord. 2019-10-002, 10-10-2019)

4.4.12 STRUCTURAL ANALYSIS. Structural analysis of rockery retaining walls should be in general accordance with the current Federal Highway Administration (FHWA) Guidelines for Rockery Walls for both static and seismic forces with minimum factors of**:**

	Static	**Seismic**
Sliding	1.5	1.1
Overturning	2.0	1.5
Bearing	2.5	1.5
Global	1.5	1.1

Structural analysis of stacked segmental block retaining walls should be in general accordance with the current National Concrete Masonry Association (NCMA) Design Manual for both static and seismic forces with minimum factors of:

	Static	Seismic
Sliding	1.5	1.1
Overturning	2.0	1.1
Bearing	3.0	1.5
Global	1.5	1.1

The following analysis provisions shall apply:

1. The maximum unit weight of the rocks and blocks used in the design of a wall system shall be specific to the construction material used.

2. The maximum coefficient of friction between rocks or blocks in a wall system shall be specific to the construction material used.

3. Surcharge loading conditions with a horizontal distance equal to the height of the upper most wall shall be taken into consideration in the analysis. The distance shall be measured from the exposed face of the upper most wall.

4. Specifications shall be provided to clearly define acceptance criteria for rock or block materials. (Ord. 2019-10-002, 10-10-2019).

5. Retaining wall shall be designed assuming wet soil conditions.

The geotechnical engineer shall provide design details specific to the location and conditions with a professional stamp and signature. The geotechnical engineer shall provide upon request a printout of the input and output files with factors of safety within the applicable design standard used as follows:

1. Design calculations ensuring stability against overturning, base sliding, excessive foundation settlement, bearing capacity, internal shear, and global stability.

2. Calculations shall include analysis under static and seismic loads.

3. Factors of safety results shall be presented to the nearest hundredth.

4. Seismic loads shall be based on the Peak Ground Acceleration (PGA) as determined from probabilistic analysis for the maximum credible earthquake, with spectral acceleration factored for site conditions in accordance with the current International Building Code.

5. Upon request, a cross-sectional view of each analysis shall be provided, and the printout of the input and output files in an appendix.

6. The geotechnical engineer shall include wall drainage details, if applicable.

7. The geotechnical engineer shall acknowledge that the site is suitable for the retaining wall.

8. The geotechnical engineer shall specify an inspection frequency schedule on the drawings.

Rock and block material shall meet the minimum requirements of the St. George City Standard Specifications section 4.4.10 and 4.4.11 unless other materials are specifically preapproved by the geotechnical engineer. (Ord. 2019-10-002, 10-10-2019)

4.4.13 INSPECTIONS. Construction of rockery and segmental block retaining walls shall be observed by a qualified geotechnical engineer employed by the owner/contractor and shall include all phases of construction. Testing shall be at the frequency specified by the geotechnical engineer,

Upon completion of the wall, the geotechnical engineer shall submit a final compliance report to the authority having jurisdiction. The report shall include a summary of testing and observations per the Pre-Wall Geotechnical Data Sheet provided as part of the construction permit. The report shall provide a professional opinion as to the compliance with the design recommendations and acceptance of the construction. All pertinent compaction testing results and photos shall be included with the final report**. (Ord. 2019-10-002, 10-10-2019)**

4.5 PIPELINE CONSTRUCTION. This subsection covers the requirements for materials, trenching, placing, backfilling, cleaning, testing and other miscellaneous requirements for underground pipeline construction and associated work. This section incorporates the requirements of the American Water Works Association (AWWA) Standards and the Manufacturer's Recommended Installation Procedures, whichever is more stringent.

4.~~4~~5.1 MATERIALS. This subsection specifies the acceptable materials for pipeline construction for use in sanitary sewers, underground culverts, storm drains, water pipes, and appurtenant construction. All materials shall be new and conform to the requirements for class, brand, size and material as specified herein. All materials shall be stored and handled in accordance with ~~manufacturer's~~manufacturers recommendations.

4.~~4~~5.1.1 SEWER PIPE AND FITTINGS. Only those pipe materials listed below may be used in the construction of sanitary sewer line unless otherwise approved in writing by the ~~City Engineer~~city.

A. POLYVINYL CHLORIDE (PVC) PLASTIC SEWER PIPE. This specification covers rigid polyvinyl chloride (PVC) pipe and fittings. PVC pipe and fittings from four (4) inches to fifteen (15) inches in diameter shall meet or exceed all of the requirements of ASTM D-3034 with a minimum wall thickness to diameter ratio of SDR-35. PVC pipe and fittings from eighteen ~~(18)~~ inches (18") to twenty-seven ~~(27)~~ inches (27") in diameter shall meet or exceed the requirements of ASTM F-679.

Each pipe shall be stamped by the manufacturer indicating compliance with the requirements of the appropriate specification. Any pipe not so stamped shall be rejected.

All pipe and fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. All PVC pipe and fittings shall be made from clean, virgin, Type 1, Grade 1, Polyvinyl Chloride conforming to ASTM D-1784.

All pipe joints shall be bell and spigot type with flexible elastomeric seals in accordance with ASTM F-477. Pipe and fittings shall be assembled with a non-toxic lubricant. Pipes of four ~~(4)~~ inch (4") and six ~~(6)~~ inch (6") diameter may be the solvent weld type, in accordance with ASTM F-656 for primer and ASTM D-2564 for glue. Pipe shall have the following minimum SDR-35 dimensions.

Nominal Pipe Size (Inches)	Outside Diameter (Inches)	Minimum Wall Thickness (Inches)
4	4.215	0.125
6	6.275	0.180
8	8.400	0.240
10	10.500	0.300
12	12.500	0.360

Spigot ends shall have a fifteen (15) degree tapered end with a memory mark around the diameter of the pipe to indicate proper insertion depth. Fittings shall be of the same material as the pipe, and shall not have a wall thickness less than that of the pipe furnished.

B.——A.B.S. COMPOSITE AND SOLID WALL SEWER PIPE. This specification covers Acrylonitrile-Butadiene-Styurine (ABS) gravity sewer pipe.

All ABS composite sewer pipe shall conform to the latest revision of ASTM Specification D-2680. The ABS material used shall be a virgin rigid plastic conforming to ASTM Specification D-1788 for rigid ABS plastics. The other component shall be Portland Cement, Perlite concrete or other inert filler material exhibiting the same degree of performance.

All solid wall ABS pipe shall conform to ASTM Specifications D-2751. Solid wall pipe used for laterals shall have a minimum wall thickness to diameter ratio of SDR-35. Fittings not described by these standards shall be shop fabricated or molded from materials listed in paragraphs 4 and 5 of ASTM D-2680 and shall be of equivalent quality to those described.

All field joints shall be chemically welded. Primer, then cement, shall be applied liberally to the outside of the spigot end and the inside of the coupling immediately prior to stabbing the pipe together. The pipe spigot end shall be supplied with home marks to assure proper jointing.

4.5.1.2 STORM DRAIN PIPE. Pipe listed under Sections 4.5.1.1 A. "Sewer Pipes" of these standards, as well as the following pipes, may be used in the construction of storm drain lines and culverts.

A. CORRUGATED POLYETHYLENE PIPE. Corrugated polyethylene pipe shall be high density polyethylene corrugated exterior with a smooth interior wall. Eight to ten inch (8”- 10”) diameter shall meet the requirements of AASHTO M-252 and have a smooth interior liner. Twelve to thirty-six inch (12”- 36”) diameters shall conform to AASHTO M-294 Type S. Forty-two to forty-eight inch (42”- 48”) diameter shall conform to AASHTO MP-6 type. Materials shall conform to ASTM D-3350. All pipe joints and fittings shall be water tight and conform to AASHTO M-353 or M-294, and shall be approved by the city.

B. ~~C.~~ **NON-REINFORCED CONCRETE PIPE.** Non-reinforced concrete ~~sewer~~ pipe may be used up to and including twenty-four ~~(24)~~ inch (24”) size, unless otherwise designated by the City Engineer or these specifications. Appropriate design justification shall be submitted by the Engineer to the City for review and approval prior to use. Pipe shall be extra strength and manufactured to comply with the requirements set forth in ASTM Designation C-14, Class 3 unless otherwise approved by the City Engineer. Type V cement shall be used unless otherwise approved. Joints shall be of the bell and spigot-type with rubber gasket design, and with joints and gaskets conforming to the requirements of ASTM Designation C-443. Pipe joints shall be so designed to provide for self-centering, and when assembled the gasket shall compress to form a water-tight seal. The gasket shall be confined in a groove on the spigot so that pipe movement or hydrostatic pressure will not displace the gasket.

~~D.~~ **C. REINFORCED CONCRETE PIPE.** Reinforced concrete pipe may be used for all appropriate applications. For pipe greater than twenty-four inches (24”) in diameter, and where any non-reinforced concrete pipe installation does not provide a cover of at least three feet over the top of the pipe, reinforced concrete pipe shall be used. Reinforced concrete pipe shall comply with the requirements of ASTM C-76 (Class II - V) unless otherwise approved by the City Engineer. Type V cement shall be used unless otherwise approved. Joints shall be of the bell and spigot design with rubber gasket type joints, with an alternate option of tongue and groove joints for storm drain lines when approved by the ~~City Engineer~~city.

~~4.4.1.2 STORM DRAIN PIPE. Pipe listed under Sections 4.4.1.1 A. C. and D. "Sewer Pipes" of these standards, as well as the following pipes, may be used in the construction of storm drain lines and culverts.~~

~~A. **CORRUGATED POLYETHYLENE PIPE.** Corrugated polyethylene pipe shall be high density polyethylene corrugated exterior with a smooth interior wall. Eight to ten (8-10) inch diameter shall meet the requirements of AASHTO M-252 and have a smooth interior liner. Twelve to thirty six (12-36) inch diameters shall conform to AASHTO M-294 Type S. Forty two to forty eight (42-48) inch diameter shall conform to AASHTO MP-6 type. Materials shall conform to ASTM D-3350. All pipe joints and fittings shall be water tight and conform to AASHTO M-353 or M-294, and shall be approved by the City’s Representative.~~

~~B. CORRUGATED ALUMINUM PIPE: Corrugated aluminum alloy pipe shall conform to AASHTO designation M-196. Any aluminum alloy to be in contact with concrete shall first be spray or brush coated to a minimum thickness of 0.05 inch with an asphalt- fiber compound conforming to the requirements of Section 702 of the State of Utah Standard Specifications for Road and Bridge Construction. The aluminum alloy shall be thoroughly cleaned, including the removal of oil and grease, and shall be dry prior to treatment. Pipe installation and appurtenances shall conform to UDOT Standard Specifications, 1992.~~
~~C. CORRUGATED STEEL PIPE. Use of corrugated steel pipe shall require pre-approval from the City Engineer and shall be on a case-by-case basis.~~

~~Corrugated steel pipe shall be in conformance with AASHTO M-36 and other applicable AASHTO standards as required. Smooth flow spiral rib pipe shall generally be used in storm drain applications while other applications may require annular or helical corrugations.~~

~~Pipes shall be fabricated with a continuous lock seam or ultra high- frequency resistance welded seams.~~

~~(1) COATINGS. All pipe shall have an aluminized coating, both sides, in accordance with AASHTO M-274 specifications unless otherwise approved. The pipe shall be fabricated from steel coils that have been hot-dipped coated in a bath of commercially pure aluminum. This coating shall be uniform throughout on both sides of the sheet and be metallurgically bonded between the metals.~~

~~When a polymer coating is approved for use, such coating shall be a minimum of 10 mils in thickness and shall be a two-sided coating and shall conform to AASHTO M-245~~

~~When a galvanized coating is approved for use, such coating shall be hot dipped in accordance with AASHTO M-245. The coating shall be on both sides.~~

~~Other coatings and linings may be approved.~~

~~(2) JOINTS. All joints shall have the same base metal and coating as the pipe being joined. Joints shall provide circumferential and longitudinal strength to preserve the pipe alignment, to prevent separation of the pipe, to prevent infiltration of fill material and to provide water tight joints. O-ring gaskets or other acceptable material shall be used.~~

~~(3) FITTINGS AND ACCESSORIES. All fittings, bolts and accessories shall meet applicable specifications of the pipe being used. Use accessories and gaskets recommended by the manufacturer.~~

~~(**4**) INSTALLATION. Installation shall be in accordance with the manufacturer's recommendations and these specifications.~~

~~NOTE: Use of this pipe may require significant testing and evaluation to determine compatibility with the ground and the intended installation. Soil Ph, resistibility and other necessary determinations should be made to ensure compatibility.~~

~~4.4.~~**5.1.3** ~~__~~**SEWER MANHOLES.** This subsection covers the requirements for

the materials used in sanitary sewer and storm water manholes. Manholes shall be water tight and be furnished complete with cast iron rings and covers as follows:

A. **CONCRETE BASES.** Manhole bases shall be either pre-cast or ~~cast in place.~~ Precast manhole bases shall conform to ASTM C-478. Concrete for cast in place bases shall be in accordance with Section 4.~~8~~7.1 of these specifications. Type V cement shall be used for precast and cast in place bases.

Where sewer lines pass through or enter manholes, the invert channels shall be smooth and semi-circular in cross-section. Changes of direction of flow within the manholes shall be made with a smooth curve with the longest radius possible. The depth of the channel in the manhole base shall be the full diameter of the sewer pipe being used at that manhole. The floor of the manhole outside the flow channels shall be smooth and slope toward the channel in accordance with standard drawings and not less than one-half ~~(1/2)~~ inch (½") per foot nor more than one ~~(1)~~ inch (1") per foot.

B. **WALL AND CONE SECTIONS.** All manholes shall be constructed of ~~either forty eight (48) inch or~~ sixty (60) inch or larger inside diameter pre~~-~~-cast, sectional, reinforced concrete manholes. Both ~~cylindrical~~cylin-dri-cal and taper sections shall conform to the requirements of ASTM ~~Designation~~Designa-tion C-478 for precast Reinforced Concrete Manhole Sections. ~~All~~ Manholes shall have ladders in accordance with the standard drawings.

Throat length of manholes shall be ~~adjustable~~adjust-able by use of appropriate diameter manhole sections and grade ring sections. The use of a "whirly-gig, Pro-Ring, or approved equal shall be used if throat section is not perpendicular to road grade. All throat sections shall be installed per manufactures specifications. Biodegradable shims shall not be allowed. The maximum height of the throat section shall be eighteen ~~(18)~~ inches~~. The taper section shall be a maximum of three (3) feet in height, shall be of eccentric conical design, and shall taper uniformly from forty eight (48) or sixty (60) inches to thirty (30) inches inside diameter. The cone shall be set on the manhole sections so all ladder rungs are aligned~~ (18) regardless of angles or grade.

When manhole depths are less than four ~~(4)~~ feet (4') manhole cones shall not be used. The manhole shall consist of a cylindrical manhole section with a precast flat manhole top in accordance with ASTM C-478.

Sixty inch (60~~) inch~~") inside diameter sewer manholes shall be required for all sewers greater than twelve ~~(12)~~ inches (12") in diameter or deeper than twelve feet~~,~~ (12'), or

where three (3) or more eight ~~(8)~~ inch or greater lines converge in the manhole.

The shaft section of the manhole shall be furnished in section lengths of one (1), two (2), three (3), and four (4) feet as required. The least number of sections should be used.

Manholes larger than sixty (60) inch inside diameter may be required when designated by the ~~City Engineer~~city.

All joint surfaces of pre-~~-~~cast sections and the face of the manhole base shall be thoroughly cleaned prior to setting the sections. Joints shall be sealed with a minimum one inch (1") thick flexible joint sealant which shall conform to the requirements of ASTM C-923.

~~Joints shall be sealed with a minimum one (1) inch thick flexible joint sealant which shall conform to the requirements of ASTM C- 923.~~

~~C.~~All joints including any grade rings where the joint has not protruded to the interval of the manhole shall be filled with grout prior to final acceptance.

C. WATER-TIGHTNESS. ~~–~~ All manholes shall be water tight. Any cracks or imperfections shall be satisfactorily repaired. Materials and methods used shall be subject to approval of the ~~City's Representative~~city.

D. IRON CASTINGS. All iron castings shall conform to the requirements of ASTM A-48 (Class 30) for grey iron castings. Frames and covers shall have a minimum combined weight of four hundred (400) pounds. All castings shall be designed to carry a minimum HS-20 traffic loading.

The cover and ring seat shall be machined so that the entire area of the seat will be in contact with the cover, in any position of the cover on the seat. Frames and covers shall be so constructed and machined that the parts are interchangeable. The tops of the cover and frames shall be flush, and the clearance between the frame and cover shall be one-eighth (1/8) of an inch all around. The top surface of each cover shall be cast with a studded pattern including the word "Sewer" for sanitary application and "Storm" for storm drain applications. Letters and studs shall be raised three-eighth (3/8) inch. Each cover shall be provided with not less than twelve (12) ventilating holes of three quarter (3/4) inch diameter each.

All manhole frames shall be carefully set to the finished grade or as directed by the ~~City's Representative.~~city. When set in roadways, walkways or other travelways, the finished manhole cover, grade, and slope shall be adjusted to match that of the traveled surface.

Manhole frames shall be set in place on the manhole throat and shall be sealed with an approved flexible joint sealant which shall conform to the requirements of ASTM C-923. Frames or covers loosened from the manhole throat shall be reset and any frames, covers or throat sections damaged or broken shall be replaced prior to acceptance by the ~~City's Representative~~city.

~~E. MANHOLE STEPS. Manhole steps shall be constructed in accordance with ASTM C-478 and the standard drawings.~~

~~Manhole steps shall be installed at intervals no closer than twelve (12) inches and at evenly spaced intervals not to exceed eighteen (18) inches between steps. Steps shall be firmly installed into the concrete wall and taper sections of all manholes to a minimum depth of three and three-eighth (3 3/8) inches, as shown in the drawings. Each step shall be solidly anchored to the wall so it will not pull out or break under repeated use. Steps shall be aligned vertically to form a continuous ladder from top to bottom.~~

4.~~4~~5.1.4~~.~~ WATER PIPE AND FITTINGS. The materials used for pipe and fittings shall all be new and conform to the requirements for class, brand, size and material as specified.

A copy of the manufacturer's installation recommendation for each type of pipe shall be provided for each construction job and shall be available on the jobsite at all times. These recommendations shall be followed during construction unless instructed otherwise by the ~~City's Representative.~~city. All pipe materials are as outlined below.

A~~,~~. GENERAL PIPE REQUIREMENTS. Pipe materials shall conform to the following requirements.

SIZE	TYPE
3/4" to 1"	Copper Type K
1 ½" - 2"	~~Black or~~ Blue Poly (HDPE) Copper Tube Size
Over 2"	Ductile Iron Class 51 with poly jacket sock or~~-~~ PVC C-900, Class 150 (sand bedded) see note #1 below ~~Ultra-Blue PVC (mo) Pressure Pipe C-909PC150~~.

Note:

~~1.~~ 1. High density polyethylene pipe may be used upon approval of the Water Department.

~~2.~~ 2. For pipes greater than 12 inches, material type will be determined by the Water Department. When the pipe is to be installed in a rocky area, the pipe material will be ductile iron.

3. All pipe shall conform to the current AWWA standards for each class of pipe listed above.

B. **CONNECTING WATER METERS.** Only authorized employees of the Water Department shall be allowed to connect or disconnect water meters. All boxes set in concrete shall be flanged to prevent settlement.

C. **DUCTILE IRON PIPE.** All ductile iron pipe shall be Class 51 conforming to the latest edition of AWWA Specifications C-151 (ANSI A21.51).

C.1 **JOINTS.** Ductile Iron Pipe shall be either Mechanical Joints, Rubber Gasket Slip-on Joints, Flanged Joints, or a combination of the above as specified on the plans. Pipe shall also conform to all current AWWA standards.

C.2 **POLYETHYLENE WRAPPING.** ~~A polyethylene wrap~~ Polyethylene wraps (sleeve) shall be required on all ductile iron pipe. Wrap shall be v-bio® type. The polyethylene wrap tubing shall be cut to provide for a minimum of one foot of lap over both the adjoining pipes. The ends of the tubing shall be wrapped using three circumferential turns of ~~plastic adhesive~~approved duct tape. The loose wrap on the barrel shall be pulled snugly around the barrel of the pipe and the excess folded over at the top. This fold shall be held in place by means of ~~six~~ twelve-inch ~~-~~long strips of ~~plastic~~ tape placed at intervals of three feet along the pipe barrel. High Performance 8 mil or greater tape or approved equal.

Bends, reducers, offsets and restraint gland locations shall be wrapped in the same manner as the pipe. Valves shall be wrapped by bringing the tube wrap on the adjacent pipe over the bells of the valve and sealing with adhesive tape. The valve bodies shall then be wrapped with flat sheets passed under the valve bottom and brought up around the body to the stem and fastened with the tape.

D. ~~ULTRA BLUE. All ultra blue~~ **PVC** ~~(mo) pressure pipe shall meet the latest AWWA Standards C-909.~~

~~E. PVC~~ **PIPE.** All PVC Pipe used shall meet the latest AWWA standards C-900 and C-905.

E. **HDPE** pipe shall meet the latest AWWA standards C-901 and C-906.

1. installation operator cert, data logger, minimum experience

F. **COPPER PIPE.** Where service lines are ~~two (2~~one (1) inch or less in diameter, type K copper pipe ~~may~~shall be ~~allowed with prior approval of the City Water Department.~~used. Pipe which has outside dimensions greater than ~~two (2)~~1 ½" inches in diameter shall not be copper. All copper pipe shall conform to the current AWWA standards.

G. **PIPE FITTINGS**. ~~(Two~~ (4 inches through 30 inches) flanged and mechanical joint fittings shall be ductile iron class 250, and shall be produced in accordance with ANSI/AWWA C-110/A 21.10 and ANSI/AWWA C-111/A21.11 and shall conform to details and dimensions published therein. Fittings are cement lined and seal coated in accordance with ANSI/AWWA C-104/A21.04. The fittings will be manufactured by Tyler or approved equal.

Connections of 6 inch and greater into existing piping shall be done with a cut-in tee. Size on size taps are not allowed. Hot taps may be allowed on a case by case basis as follows. For large tappings (6 inch and greater) tapped into PVC or ductile iron pipe, the following tapping sleeves are approved for pressures less than 125 psi:

Romac Style fts 419, fts 420
Power Seal (5 bolt), model 3480
Romac 305 Stainless Steel Service Saddle

For pressures greater than 125 psi, a mechanical joint sleeve type will be required. The following are approved for use.

Mueller H-615
5-149-DI
Clow F-5205
Power Seal Model 3490
Romac SST-III with ductile flange rated at 200 psi
Ford FTSS

For larger diameter pipe:

FTS-425 Class D
For HDPE - Romac SST-H

H. **TAPPING MATERIAL SPECIFICATION.** For small tappings (three quarter (3/4) inch through two (2) inch) tapped into cast iron, steel, PVC, or ductile iron pipe, the following materials shall be required:

H.1 **SADDLE CASTINGS.** Large saddle tappings shall be stainless

steel or bronze single/double strap.

H.2 STAINLESS STEEL STRAP. The stainless steel strap shall consist of a two (2) inch wide strap and shall come complete with sufficient stainless steel or bronze bolts, nuts and washers (with five-eighths [5/8] inch N.C. Teflon coated roll threads) to properly clamp the strap to the pipe. M.I.G. welds shall be ~~pasivated~~passivated for resistance to corrosion.

H.3 GASKETS. Gaskets shall be made from virgin SBR compounded for water services

H.4 HDPE saddles shall have spring washers

I. REPAIR CLAMPS. All repair clamps shall be stainless steel and be equal to the following approved brands:

Romac SS1-552
Power Seal 3121AS, 3122 AS

For HDPE
Romac Style SS1-H, SS2-H

J. VALVES AND BOXES. Unless otherwise specified by the Water Department, all valves, ten (10) inches and smaller, shall be of a resilient-seat-gate-valve type, and all valves over ten (10) inches shall be butterfly valves~~; except for a ten (10) inch "hot tap".~~.

J.1 GATE AND BUTTERFLY VALVES. Valves shall conform to the latest revision of AWWA valve standards. All valves shall be Mueller, Kennedy, Clow, or Pratt. Exceptions to this will require the ~~City Water Department Engineer's~~city's approval.

All valves, ten (10) inches and less, installed next to a fitting must be flange x mechanical joint (MJ) and installed with the flange end connecting to the tee, cross, or fitting and megaluged to the line unless otherwise approved by the ~~Water Department.~~city. Valves greater than twelve inches shall have flange x flange with an MJ adaptor in order to flange to tee, cross, or fitting and shall be megaluged to line.

All six and eight inch valves shall have a ~~16~~12"x 16"x 4" slab of concrete placed under them for support. Valves ten inches and greater shall have a 20"x 20"x 4" concrete slab placed under them for support. All support slabs shall be tied to the valves.

All setter shut off valves shall be provided with bronze handles.

J.2 VALVE BOXES. All valves shall be provided with a cast iron valve box of the extension sleeve type ~~or a screw type adjustable~~, and the height shall be adjusted to bring the top of the valve box flush with the finished surface. Extension sleeve shall be drilled or slotted below the lid seat, and the marking wire shall be threaded through. Slot or drill shall be a minimum of ½" dimension. The valve box shall sawcut to proper length, and not be less than five inches in diameter and shall have a minimum wall thickness of .375 inch. The box shall be provided with a suitable base and cover. The word "WATER" shall be cast on the cover. Cover shall be Bingham & Taylor, 22 pound weight.. Valve boxes intended for irrigation main line valves shall be triangle in shape and the word "IRRIGATION" shall be cast on the cover.

Valve boxes shall be installed plumb and properly positioned to center operating nut and allow access of the operating wrench. To ensure that the box is not displaced during backfill operations, the backfill shall be hand mechanically tamped for a distance of five feet each way along the trench. All valve boxes shall include a concrete collar in accordance with the standard drawings with flow indication arrows~~.~~ and pipe size. The letter size shall be 4"-6" in height, and 1/4" deep stamped into the "wet" collar. The valve operating nut SHALL be at a depth not to exceed 48". If the operating nut is deeper than 48" a operating extension SHALL be required. See standard drawing detail #304

K. WATER SERVICE LATERALS. The material used for water service connections shall comply with the following requirements.

K.1 SERVICE PIPE. Service pipe shall be copper or polyethylene. Note: When polyethylene pipe is used, only ~~Instatite~~locking compression fittings shall be used.

K.2 CORPORATION STOPS. Corporation stops shall be as manufactured by the Mueller Company, or Ford or approval equal, and shall conform to the several designations shown below for the various sizes.

	WATER SERVICE CONNECTION SIZE			
	3/4"	1"	1-1/2"	2"
MUELLER CO.	H-1500	H-1500	H-1510	H-1501
FORD	F600	F600	F6125	F6125

All services shall have a ~~flare or~~locking compression type joint for the service pipe and shall be threaded on the inlet end with an AWWA corporation stop thread.

K.3~~—~~ ~~_~~METER SETTER YOKES. Meter setters or meter yokes shall have a built-in backflow prevention device and shall have a corrosion-resistant bronze body, dual acetyl plastic valves with natural rubber gaskets that are independently acting and capable of giving two levels of protection; stainless steel springs; a resilient O-ring end-tap seal; and full port inlet angle ball valve with brass handle. All internal parts shall be accessible without removing the valve from the line. Meters shall be installed by Water Department personnel only.

K.4~~—~~ ~~_~~METER BOX AND LID.~~—~~ ~~_~~The meter boxes shall be high density polyethylene (HDPE) "Brooks" design or equal. Size shall be as follows unless otherwise approved by ~~City's Representative.~~the city.

PIPE SIZE	METER BOX SIZE
3/4"	17" x 11 3/4"~~—~~ ~~_~~ #1419-18
1"	25" x 16"~~——~~ ~~___~~ #1324-18
1 ½" - 2"	32" x 19"~~——~~ ~~___~~ #1730-18

The meter box lids shall have a hinged opening for meter reading. Lid marking shall be approved by the Water Department. A concrete collar shall be installed around the meter box in accordance with standard drawings. All meter boxes shall be placed behind sidewalks in accordance with standard drawings unless otherwise directed by ~~City's Representative~~the city.

Any meter box covered, or damaged, during construction operations shall be uncovered, replaced, and raised to finish grade by the Contractor. In areas without sidewalks, meter boxes shall be flush, or one inch above the finish grade.

K.5 SERVICE CONNECTIONS. At all points designated by the Water Department, service connections shall be installed and shall extend from the property line to the building, unless otherwise directed by the Water Department.

Individual water services shall be one inch for dual services and three quarter (3/4) inch for a single service from the water main to the meter setter for normal domestic service. When directed by the Water Department, the water service shall be one and one half (1 1/2) or two inches in diameter. Services shall have a minimum of three (3) feet of cover and be constructed as shown in the standard drawings. For service laterals two inches in diameter and smaller, service saddles shall not be closer than twelve inches (12) from the end of the main, nor closer than eighteen (18) inches to any other service saddle or pipe joint.

A mechanical joint type tapping sleeve shall be used on all “hot taps” where the line pressure is greater than one hundred twenty five (125) psi,. The approved mechanical joint sleeves and type shall be as shown in the standard drawings.

L. MARKING WIRE. 12 Gauge type UP Marking wire shall be installed on all waterline installations unless otherwise approved by the Water Department. Marking wire shall conform to the following:

L.1 Marking wire shall be spliced together with ~~“grease” nuts~~a deep silicone wire splice kit, or equal. Prior to installation of the wire nut, a minimum amount of wire shall be bared and twisted together with pliers to assure good contact.

L.2 Marking wire should be taped and pulled tight along the top of the pipe to ensure against breakage.

L.3 Marking wire shall extend up to all hydrants and valves. At valve clusters marking wire shall be run to all valves. The wire should be ~~pig tailed, not~~ looped.

L.4 Marking wire shall extend out of the valve box four (4) to six (6) inches.

L.5 It is the Contractor's responsibility to guarantee and show that the marking wire performs satisfactorily for its intended use. It is recommended that the contractor test the performance of the wire prior to installation of surface improvements.

L.6 After all ~~the~~ boxes are raised and prior to placing concrete collars, the Contractor shall notify the Water Department to perform the final acceptance testing.

M. **FIRE HYDRANTS.** Fire hydrants shall be a three-nozzle, five and one-half inch (5½) diameter ~~Mueller, Modern Centurion, Model A-423~~; Kennedy, Model K-81A; American Flow Control Waterous 51/4" Pacer Model WB-67-250; or approved equal, with foot valve and six (6) inch mechanical joint connection. Fire hydrants shall conform to the latest edition of AWWA C-502, "Dry Barrel Fire Hydrants." All hydrants shall be designed for a working pressure of two hundred (200) psi and a hydrostatic pressure of three hundred fifty (350) psi. Hydrants shall be furnished with a paint finish above the ground line identical in color to the existing hydrant paint (red).

Hydrants shall be installed with a shut-off valve at the mainline. If the hydrant lateral is greater than two hundred (200) feet long, a second valve shall be installed at a location determined by the Water Department.

After the hydrant is installed and accepted, it will be the responsibility of the Water Department to maintain the hydrant. Where applicable, the customer/property owner will allow the Water Department access for said maintenance.

Dead-end mains shall not be installed without prior approval of the Water Department. If installed, they shall not exceed six hundred (600) feet in length. Hydrants shall be located at the end of dead-end mains for flushing purposes as well as for fire protection.

Washout valves, in lieu of fire hydrants, are not allowed without prior approval of the Water Department.

Hydrants shall be of a flanged joint type or mechanical joint inlet. All hydrants shall be so designed as to allow the flanges at sidewalk level to separate without material damage to the main barrel section when struck by a large object, such as a vehicle. Hydrant extensions are not allowed for "new" construction and shall have a minimum bury depth of three feet. Upon such damage, the main gate valve must remain closed to avoid flooding or washout. New fire hydrants shall have "greaseable" operating stem, oil filled stems are not acceptable. Hydrants with a nominal five ~~-~~inch valve opening shall be furnished with two nominal two and one half (2½) inch National Standard Thread Hose Nozzles and one nominal four and one half (4½) inch National Standard Thread Pumper Nozzle. All nozzles shall be furnished with a cap and gasket with attaching chain. All hydrants shall open ~~counter clockwise~~counterclockwise with a pentagon operating nut conforming in size to the specifications of the Water Department.

Fire hydrants shall be set to provide at least the minimum pipe cover for the branch supply line. Nozzles shall be at least eighteen (18) inches above finish grade. Each hydrant shall be set on a concrete foundation at least eighteen (18) inches square and four (4) inches thick. ~~Each hydrant shall be blocked against the end of the trench with concrete.~~ Hydrant drainage shall be provided by installing gravel or crushed rock (~~-~~3/4" ~~to 2"~~minus washed gravel) around the hydrant, and below the top of the hydrant supply line. One third (1/3) cubic yard of ~~one and one half (1½)~~three quarter (3/4) inch gravel shall be placed around the drain holes just above the hydrant valve casing~~.~~, and a mechanical barrier to stop fines infiltration. All hydrants shall stand plumb~~.~~ and the breakaway flange shall be 4"- 6" above collar or as approved by city. Collar shall match finish grade, dishing of concrete collar is not allowed. Collar shall extend to top back curb at -2%, with flared splash pad. Minimum width behind hydrant shall be 30", flare at 6":1' to TBC. Hydrant extensions shall not be used on newly constructed hydrants. The hydrant pumper nozzles shall face the street and be perpendicular to the curb line. The hose nozzle shall be parallel to the street. Hydrants shall be located inside the street utility easements or as otherwise directed by the Water Department.

N. ~~FLOWABLE BACKFILL. Flowable backfill material for water main trenches shall be sand slurry with in-place relative density greater than ninety five percent (95%).~~

~~O.~~ **PRESSURE REDUCING VALVES**. Pressure reducing valve installation will be constructed as per the detail shown in the standard drawings. The valves will be as manufactured by Singer and approved by the ~~Water and Power Engineer~~city.

~~P.~~ **O. MEGALUG SYSTEM.** A megalug retainer gland system shall be used on all mechanical joints and shall meet UNI-B-13 for PVC and be UL/FM approved through twelve (12) inch diameter for both ductile iron and PVC pipe.

A megalug retainer gland system shall be used on all mechanical joints and shall meet Uni-B-13 for PVC and be UL/FM approved through twelve (12) inch diameter for both ductile iron and PVC pipe. The restraint mechanism shall consist of individually activated gripping surfaces to maximize restraint capability. Twist-off nuts, sized the same as the tee-head bolts, shall be used to ensure proper activating of restraining devices. The gland shall be manufactured of ductile iron conforming to ASTM A-536-80. The retainer-gland shall have a pressure rating equal to that of the pipe on which it is used (through fourteen inches) with a minimum safety factor of 2:1. Gland shall be Megalug by EBAA Iron, Inc. or approved equal. The type and model of retainer and amount for each connector is shown on standard drawings.

As an alternate to the megalug system, Ford Uniflange Series 1400 retainer glands and Series 1300 and 1390 joint restraints will be used. For PVC, Ford Uniflange Service 1500 retainer gland will be used. These materials listed are approved for use on the St. George City Water System.
~~George City Water System.~~

Thrust blocks shall only be placed to accommodate connection to existing facilities and only when deemed necessary by the engineer and agreed to by the city.

4.~~4~~5.2 CONSTRUCTION METHODS. This subsection covers the requirements for trenching, placing, and back filling of all underground pipelines (sewer, water, storm drains, etc.). The methods employed in performing the work shall be the responsibility of the Contractor. The Contractor shall make such changes in the methods used as are necessary to install an acceptable finished product. The methods shall include, but are not limited to the following:

4.~~4~~5.2.1 CONTROL OF GROUND WATER. All trenches shall be kept free from water during excavation, fine grading, pipe laying, jointing, and embedding operations. Where the trench bottom is mucky or otherwise unstable because of the presence of ground water, and in cases where the static ground water elevation is above the bottom of any trench or bell hole excavation, such ground water shall be lowered and controlled to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress. Surface water shall be prevented from entering the trenches.

Dewatering for pipeline construction shall commence when groundwater is first encountered and shall continue until such time as water can be allowed to rise. Requirements of section 4.3.2.2 shall be complied with when groundwater is encountered. Dewatering shall be conducted such that no pipelines are placed in water nor shall water be allowed to rise over the pipe until the pipeline has been pressure tested and any concrete or mortar has achieved final set. Water shall not be allowed to rise in pipeline trenches or drained excavations until pipelines are backfilled or restrained to prevent flotation.

4.~~4~~5.2.2 EXCAVATION FOR PIPELINES. Trench excavation shall include all operations necessary for excavation of all materials of whatever nature in relation to pipeline installation. All excavation, including the manner of support and provisions for access to trenches, shall comply with all current regulations as determined by OSHA. Trenches shall be excavated to the lines and grade shown on the drawings, and to a depth to provide the minimum required cover of three (3) feet over the pipe unless otherwise approved by the ~~Water Department.~~city. Pipe installation shall be in accordance with the pipe manufacturer's recommendations. The bottom two feet of the trench should have vertical walls. All finish grading necessary for preparation of the trench bottom shall be made manually. Over-excavating shall not be allowed without re-compaction of backfill in accordance with these standards.

Excavation for trenches in rock shall extend to a depth of at least four inches below the bottom of the pipe. Bedding material as outlined in Table 4.1 shall be placed and mechanically compacted to ninety-five percent (95%) of maximum dry density in maximum six inch lifts to provide a smooth, well compacted and stable foundation for the pipe or appurtenant works.

Trench bottoms shall be hand-shaped as specified and the maximum width of the trench, measured at the top of the pipe, shall be as narrow as possible, but ~~not wider than fifteen (15)~~at least twelve inches (12") on each side of the pipe.

If gravel is to be used as a backfill material, it must be installed with an approved filter fabric to prevent fine material from migrating into the gravel. Use of gravel as backfill material must be approved by the city on a case by case basis.

Where unstable earth, mud or muck is encountered in the excavation at the grade of the pipe, the unsuitable material shall be removed to a minimum of twelve inches below grade and the subsequent hole shall be backfilled with crushed rock or gravel (as called out in Table 4.1 under "foundation material") to provide a stable subgrade. The gravel material shall be deposited over the entire trench width. The maximum layer thickness shall be six inches. Each layer shall be compacted by tamping, rolling, vibrating, spading, slicing, rodding or by a combination of one or more of these methods. In addition, the material shall be graded to produce a uniform and continuous support for the entire length of the installed pipe.

Should the Contractor elect to install the pipe by boring, or jacking, approval must first be obtained from the ~~City's Representative.~~city. The Contractor shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavation, and all pumping, ditching, or other approved measures for the removal or exclusion of water, including, but not limited to, storm water and waste water reaching the worksite from any source so as to prevent damage to the work or adjoining property.

The maximum amount of open trench permitted in any one location shall be five hundred (500) feet, or the length necessary to accommodate the amount of pipe installed in a single day, unless otherwise approved by the ~~City's Representative.~~city. Open trenches shall not be allowed to stay open without proper safety precautions and barricading. Trenches should not be left open over night.

In the event "foundation material" is used in backfill, or replacement of over excavated material, the Contractor shall construct dams within the drain rock bedding material at maximum intervals of six hundred (600) feet. The dams shall be constructed to the top of the pipe or the level of groundwater, whichever is greater, with Class "B" Portland Cement Concrete or other approved material and shall have a minimum thickness of six inches.

TABLE 4.1

BACKFILL MATERIAL			
SIEVE SIZE	FOUNDATION MATERIAL (Angular/Crushed)	*PIPE BEDDING/ PIPE ZONE & INITIAL BACKFILL MATERIAL*	FINAL BACKFILL MATERIAL (above the initial Backfill)
	PERCENTAGE PASSING		
~~12~~ 3"	100	- -	Native material which is well mixed or processed/crushed to be well mixed and contains no sod, vegetation, rocks larger than ~~12~~6" diameter, asphalt or concrete chunks, etc. **Expansive Soils (Liquid Limit >35 and Plastic Index > 15 percent), and Gypsiferous Soils (Solubility > 6% by dry weight) are not suitable for final backfill material
~~6"~~	~~—~~	~~—~~	~~90 – 100~~
~~3"~~ ¾ "	~~100~~	~~80 –~~ 100	
~~2"~~ ½ "		90 - 100	~~—~~
~~1"~~	~~70 – 90~~	~~100~~	~~50 – 100~~
½" ~~#4~~	~~51 – 75~~	~~90~~ 50 - 100	~~30 – 100~~
~~#4~~	~~31 – 65~~	~~50 – 80~~	~~25 – 80~~

#16	16 - 40	30 - 42	16 - 50
#200	2 - 12	9 0 - 25	10 - 50

* 3/4" or 1" clean crushed gravel may be used in lieu of the above table on a case by case basis and must be approved by the City for each project. Upon prior written approval from the City, select excavated on-site soils may be utilized as bedding material.

** Particular site-specific conditions may exist where these normally unsuitable materials may be used as final backfill when specifically recommended by the project Geotechnical Engineer, and upon written approval from the City.

4.45.2.3 SHEETING, BRACING, AND SHORING OF EXCAVATIONS. All excavations shall be sheeted, braced, and shored as required to protect the workers and existing utilities and improvements from sliding, sloughing, settling or other movement of the trench walls while the work is in progress. All such sheeting, bracing and shoring shall comply with theOSHA requirements of the Utah State Industrial Commission. All damage resulting from lack of adequate sheeting, bracing and shoring shall be the sole responsibility of the Contractor, and the Contractor shall effect all necessary repairs or reconstruction resulting from such damage.

4.4.2.4 BLASTING. Blasting shall not be allowed except by written permit from the Fire Chief. If the permit is granted, the Contractor shall comply with all laws, ordinances, and applicable safety code requirements and regulations relative to the handling, storage, and use of explosives and protection of life and property.

In addition to the above, all requirements contained in Section 2.9, Use of Explosives, shall be followed.

4.**4.5.2.4 BLASTING.** See Standard Specifications Section 4.4

4.5.2.5 PIPE LAYING AND BEDDING. Pipe will be carefully inspected in the field by the Contractor and the City's Representativecity before and after laying. If any cause for rejection is discovered in a pipe before or after it has been laid, it shall be removed and replaced by the Contractor.

When connections are to be made to any existing pipe, conduit, or other appurtenances,

the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose the existing improvement before laying any pipe or conduit. The ~~City's Representative~~city shall be given the opportunity to inspect the existing pipe or conduit before the connection is made. Adjustments in line or grade of the connecting pipe which may be necessary to accomplish the intent of the plans will be made at this time.

Pipe shall be laid up grade with the socket bell, or collar ends of the pipe up grade unless otherwise authorized by the ~~City's Representative~~city~~.~~

In general cases, the pipe will be laid in one direction only.

Pipe shall be laid true to line and grade, with uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the bell or collar, which shall not bear upon the subgrade or bedding. Any pipe which is not true to alignment or shows any settlement after laying, shall be removed and re-laid to the proper grade and alignment.

A. **REQUIREMENTS FOR LINE AND GRADE.** All sewer and drainage pipe shall be installed to the defined line and grade within the following limits.

A.1 Variance from established grade shall be not greater than one tenth (1/10) of a foot between manholes. ~~Variance from established line shall be not more than one half foot between manholes.~~ Any variances approved shall not impact the system design capacity and shall be approved by the ~~City's Representative~~city. Any variations shall not result in a level or reverse slope installation.

A.2 The invert elevations of each manhole and box at the inlet and outlet and distance between manholes and/or boxes shall be accurately verified by use of surveying instruments prior to pouring the floor.

A.3 On main lines, invert elevations of each manhole inlet and outlet and the distance measurements between manholes shall be verified by use of surveying instruments prior to installing precast manhole bases. For service laterals, grades may be verified by use of a ~~carpenter's~~digital level or surveying instrument.

A.4 All sewer and drainage pipe systems shall be visually inspected for defects, displacement, proper workmanship, alignment and general compliance.

B. **INSTALLATION OF PIPE.** ~~A groove shall be excavated along the bottom of the trench to receive the pipe.~~ Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom. ~~Large rocks (over six inches in least~~

~~dimension)~~ Rocks near the trench bottom shall be removed and ~~the hole refilled~~replaced with approved backfill ~~in accordance with Table 4.1~~.

Water pipe shall not be deflected at the joint more than a maximum of ~~three percent (3%), or three~~one degrees, per hundred (100) feet, or as per the manufacturer's recommendation.

Sewer and drain pipe shall be laid up grade. All pipe installation shall proceed with joints closely and accurately fitted. Gaskets shall be fitted properly in place and care shall be taken in joining the pipes to avoid twisting the gaskets. Joints shall be clean and dry and a joint lubricant, as recommended by the pipe supplier, shall be applied uniformly to the mating joint surfaces to facilitate easy and positive joint closures. If adjustments to the position of a pipe length are required after being laid, the pipe shall be removed and rejoined as a new pipe. When pipe laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material. In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

C. SETTING OF BENDS, TEES, CROSSES AND REDUCERS. Bends, tees, crosses, and reducers shall be lowered into the trench, inspected, cleaned and joined to the pipe.

Concrete thrust blocks shall not be used as a restraining system for waterline mains or laterals without prior approval of Water Department. ~~Reaction~~ Joint restraints or, when permitted by the ~~City's~~

~~Representative~~city, thrust blocking, shall be applied at bends and tees, and at points of reduction or at fittings where changes in pipe diameter occur.

The design of concrete thrust blocking shall be as shown in the standard drawings or as directed by the Water Department. The material used for thrust blocking shall be Class C concrete Blocking shall be placed between solid ground and the fitting to be anchored. The area of bearing on the fitting and on the ground shall in each instance be that required in the standard drawings or by the ~~City's Representative.~~city. Unless otherwise directed by the ~~City's Representative~~city, the blocking shall be placed so that the pipe and fitting joints will be easily accessible for repair. Restraining joints (megalug or equal) shall also be used to prevent movement wherever thrust blocks are required.

If a megalug retainer system cannot be used, a concrete thrust block system can be substituted, if approved by the Water Department, on a case by case basis.

~~D.~~ **D. PLUGGING OF DEAD-ENDS.** Standard plugs shall be inserted into the bells of all dead-end fittings. Spigot ends of fittings and plain ends of pipe shall be capped. When directed by the ~~City's Representative~~city, a concrete reaction or thrust block shall be provided at all plugged outlet fittings in the sizes indicated on the

standard drawings or as directed by the ~~City's Representative.~~city. The plugs and caps shall also be tied to the pipe with restraining joints. The number and size of rods shall be as specified.

~~E.~~ **E. SERVICE LINES.** All service lines shall be installed in accordance with the details shown on the standard drawings.

~~F.~~ **F. PIPE TO BE KEPT CLEAN.** All dirt and foreign matter shall be removed from the interior of the pipe before lowering into position in the trench. Pipe shall be kept clean by means approved by the ~~City's Representative~~city during and after laying.

~~G.~~ **G. JOINTING PIPE SECTIONS.** The sealing surface of the pipe, the bell to be joined, and the elastomeric gaskets shall be cleaned immediately prior to assembly, and assembly shall be made as recommended by the manufacturer. When pipe laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and the bedding restored. No pipe shall be laid when the trench or weather conditions are unsuitable for proper installations as determined by the ~~City's Representative~~city.

~~H.~~ **H. CUTTING PIPE.** The pipe shall be cut in a neat manner without damage so as to produce a smooth end at right angles to the axis of the pipe. ~~Existing transit~~The minimum length of PVC type pipe shall be 3 feet. Pipe lengths shorter than 3 feet shall be ductile iron. Existing transite AC pipe shall not be cut and should be removed and replaced with ductile or PVC pipe.

~~I.~~ **I. END PREPARATION.** Pipe ends shall be cut square, deburred and beveled in accordance with the pipe manufacturer's recommendations.

~~J.~~ **J. PUSH-ON JOINTS.** The push-on joint shall be a single elastomeric gasketed joint which shall be assembled by positioning the elastomeric gasket in the annular groove of the bell and inserting the spigot end of the pipe into the bell. The spigot end of the pipe shall compress the gasket radially to form a positive seal. The gasket and annular groove shall be designed, sized and shaped so that the gasket will resist displacement. Care shall be taken so that only the correct elastomeric gasket, compatible with the annular groove of the bell, is used. Insertion of the elastomeric gasket in the annular groove of the bell must be in accordance with the manufacturer's recommendations.

~~K.~~ **K. MECHANICAL JOINTS.** The mechanical joint shall be a bolted joint of the stuffing box type, and installation recommendations from the manufacturer shall be followed. Each joint shall consist of:

K.1 A bell provided with an exterior gland having bolt holes or slots and a socket with an annular recess for the sealing gasket and the spigot end of the pipe. On all slotted holes the bolts will be supplied with square shoulders.

K.2 A sealing gasket.

K.3 A follower gland with bolt holes matching those in the fitting.

K.4 Tee bolts and hexagonal nuts of cor-ten metal.

~~L.~~ **L. PIPE BEDDING.** Pipe shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded in accordance with the bedding details in the standard drawings and as recommended by the manufacturer.

Pipe bedding materials shall be deposited and compacted in layers not to exceed six (6) inches in compacted thickness. Deposition and compaction of bedding materials shall be completed simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors to the satisfaction of the ~~City's Representative.~~city. All bedding materials shall be placed in the trench with hand tools, or other approved methods in such a manner that the bedding materials will be scattered alongside the pipe and not dropped into the trench in compact masses. Bedding materials shall conform to the requirements of Table 4.1 of these standards and shall be free from roots, sod, vegetation or other deleterious material.

In the event trench materials are not satisfactory for pipe bedding, imported bedding will be required. Imported bedding material shall be graded in accordance with Table 4.1, under "bedding material".

See Trench Backfill and Repair Detail City Standards Drawing 170.

~~M.~~ **M. METER BOXES.** All meter boxes shall be located behind the sidewalk. All meters will be provided with concrete collars. Any meter box damaged or covered during the construction operations shall be replaced and/or uncovered and raised to finish grade by the Contractor as determined by the ~~City Representative.~~city.

4.~~4~~5.2.6 BACKFILLING AND COMPACTION. Backfill shall include filling of all trenches to the original ground surface or final grading elevation as shown on the drawings, or otherwise directed by the ~~City's Representative.~~city. Backfill shall be carefully placed around and over pipes and shall not be permitted to fall directly on a pipe from such a height, or in such a manner as to cause damage. Backfill material shall be as required by Table 4.1 or as approved by the ~~City's Representative~~city and shall not contain any wood, grass, roots, broken concrete, frozen soil, asphalt chunks, trash or debris of any kind that may

cause unequal settlement or improper consolidation.

The backfill in all utility trenches under proposed or existing roadways, curb and gutter, sidewalks and driveways shall be compacted to the equivalent of ninety five percent (95~~%)~~%), of maximum dry density within 2% of optimum moisture content for granular soils or ninety percent (90%) of maximum dry density between 2% and 4% above optimum moisture content for silty/clay soils. ~~In shoulders and other street right-of-way areas,~~ Utilities that extend outside of the ~~in-place density~~roadway section within the municipal utility easement shall be ~~a minimum of ninety percent (90%) of the maximum dry density~~compacted to the percentages .

A.~~——~~ INITIAL BACKFILL PROCEDURE. (Pipe Zone) Backfill of selected material, which shall conform to the requirements of Table 4.1, shall be placed carefully in eight inch non-compacted horizontal layers and compacted to a depth of twelve inches over the top of the pipe. During compaction of the initial backfill, special care shall be taken so as to not move the pipe, either vertically or horizontally. All backfill operations shall be performed in such a manner so as to avoid any damage to the pipe, valves, laterals, etc. In the event such damage or displacement occurs, such damaged or displaced pipe shall be removed and replaced with undamaged pipe on proper grade and alignment.

B.~~——~~ FINAL BACKFILL PROCEDURE. The backfill above a point twelve (12) inches above the top of the pipe shall be filled in horizontal layers twelve (12) inches thick or less with materials free from roots, vegetation or other deleterious material, or rocks, ~~-~~stones or boulders larger than six inches in the greatest dimension. The material shall be mechanically compacted with appropriate vibrating compaction equipment. ~~Wherever, in the opinion of the City Engineer, surface settlement is not critical compaction may be reduced to a minimum of ninety percent (90%) of maximum dry density and the backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation.~~

C.~~——~~ MECHANICAL COMPACTION OF BACKFILL. The backfill shall be thoroughly compacted by mechanical compaction.

Structural and trench backfill shall be deposited in horizontal layers and compacted by the following method in such manner that the compacted material will be homogeneous and free from lenses, pockets, streaks, and other imperfections.

The materials shall be deposited in horizontal layers across the length or width of the excavation of not more than ~~six inches compacted thickness.~~twelve inches (12”) loose lifts depending on the type of equipment used. The excavation and placing operations shall be such that the materials when compacted will be blended sufficiently to secure the best degree of compaction, impermeability and stability.

Prior to and during compaction operations, all backfill material shall have the required

moisture content and shall be uniform throughout each layer.

If the moisture content is not optimum for compaction, the compaction operations shall be delayed until such time that the material has been brought to the required moisture content. ~~When the material has been properly conditioned, it shall be compacted by using appropriate mechanical compaction equipment as indicated below or as otherwise approved by the City's Representative.~~

~~C.1 Vibrating rollers shall consist of a self-propelled roller with a vibrating steel drum of at least one ton capacity. The roller shall have an effective rolling width of at least twenty four (24) inches and shall deliver a compaction force of at least seven hundred (700) pounds per square inch when vibrating.~~

~~C.2 Pneumatic rollers shall consist of a self- propelled roller with pneumatic tires arranged in a manner so as to provide a satisfactory compacting unit. The roller shall have an effective rolling width of at least thirty (30) inches and shall give a compaction force of at least five hundred (500) pounds per inch of width of tread when fully loaded. The tires shall be uniformly inflated.~~

~~C.3 Vibrating plates shall consist of a pneumatic vibrating plate attached to the boom of a backhoe and capable of compacting an area of at least three square feet. The plate and backhoe combination shall together be capable of exerting a compactive force of at least one thousand (1,000) pounds per square inch.~~

~~C.4 Hand compactors shall be used when hand- compacted methods are specified or required because the location of the area to be compacted does not permit the use of self-propelled mechanical compactors. Vibrating plates, "pogo-stick" tampers or other approved hand-compacting equipment shall be used.~~

~~C.5 Jetting and flooding or other water consolidation methods are not permitted.~~

~~D.~~ ~~FLOWABLE BACKFILLING.~~**D. Controlled Low Strength Material (CLSM).**
For trenches under pavement, sidewalk, curb and gutter, and in all existing city streets, ~~flowable backfill~~CLSM may be used (unless otherwise directed by the ~~City's Representative~~city) for backfill and shall be in conformance with the standards for "~~Flowable Fill~~CLSM" as described below. ~~Flowable fill~~ CLSM shall not be used as backfill for water main trenches without prior approval of the ~~City's Representative. Flowable fill~~city. CLSM shall be discharged from the ready mix truck by reasonable means into the trench to be filled. The fill shall be brought to an elevation equal to the bottom of the road base and shall be finished level to provide a uniform surface. ~~Flowable~~ CLSM fill shall not take the place of roadbase~~-~~ or asphalt in the roadway section.

When surface restoration cannot take place promptly in existing ~~City~~city streets or in other areas where safety is a concern, the flowable fill may be extended to the bottom of the surface course and a temporary driving surface installed. When the permanent surface is installed the temporary surface and flowable fill shall be removed to the

level of the bottom of the roadbase and the roadway structure properly restored in accordance with these standards.

~~Flowable fill:~~

Controlled Low Strength Material (CLSM):

D.1 Portland Cement - Type II or V.

D.2 Fly Ash - ASTM C-618, Class F, except loss on ignition shall not exceed three percent (3%) maximum, and shall come from a source approved by the City Engineer.

D.3 The coarse and fine aggregate for flowable fill shall be natural material and consisting of mineral aggregate particles meeting the following requirements.

Sieve Size	Percent Passing
3/4	100
200	0-10

D.4 Mix Design - shall meet the following:

Minimum compressive strength (28 days)	50 PSI
Maximum compressive strength (28 days)	150 PSI
Maximum fly ash per cubic yard	100 lb
Minimum cement per cubic yard	50 lb.
Minimum slump	6 in.
Maximum slump	10 in.

4.~~4~~5.2.7 TRENCHES ON HIGHWAYS AND STREETS. No work of any kind shall be performed in any public right-of-way without first obtaining an encroachment permit. Wherever any trenches will be in, or must cross any State road or any ~~City~~city road, alley or drainage way, the Contractor, or other responsible party, shall obtain any and all encroachment permits as are required for these crossings and shall become familiar with and abide by the rules and regulations of the Utah Department of Transportation and the ~~City~~city of St. George.

All Contractors or responsible parties excavating or encroaching over or under any public right-of-way including roads, drainage way, easements or other public property shall first obtain an encroachment permit in compliance with the applicable local ordinances prior to excavating.

All asphalt cuts shall be made with a diamond or carbide-tipped masonry or asphalt cutting saw unless otherwise approved by the ~~City's representative~~city. No scarifier-tooth cuts, back-

hoe or bucket rips will be allowed.

All backfilled trenches in roadways shall be patched with hot-mix asphalt within five days of initial excavation, unless otherwise directed by the ~~City's Representative.~~city. All backfill shall be in accordance with these standards.

All concrete or asphalt surfaces damaged or cut in trenching operations or other work within the right-of-way shall be restored to an "as-good or better condition" in accordance with the provisions outlined in Section 4.7 of these standards.

During the entire trenching, backfilling and patching operations, the Contractor shall be required to observe all safety and traffic control procedures as outlined in these standards.

The Developer and/or Contractor shall be responsible for maintenance of the trench, patch, and related work for a period of twelve (12) months from date of completion.

~~A single asphalt patch shall be contisubgra~~

No more than ~~four~~one hundred ~~(400)~~ feet (100') of trench shall be left unfilled at any time in one continuous run, unless otherwise approved by the ~~City's Representative~~city.

All streets and roads shall be kept free from dust and shall be open to through traffic. Approval to close the street must be obtained by the Contractor from the ~~City Engineer or his designated representative.~~city. At least one-half (1/2) the width of any street or road shall be temporarily restored for use before excavation is commenced on the remaining portion of the street or road.

All excavation, backfilling and temporary resurfacing on any portion of any street or road shall be completed in one working day so that trenches are not left open or uncovered over night.

All requirements governing work within a right-of-way as contained in Section 2.5 (Barricades and Warning Signs - Work Area Protection) of these standards shall be adhered to.

All utility installations, i.e., gas, power, phone, cable T.V. and associated utilities, shall conform to the applicable test requirements contained within these standards for earthwork, compaction, base course, bituminous surface course, concrete and other materials.

For new water main connections requiring joint restraints on an existing pipe, a single contiguous asphalt patch shall be installed along the entire length of the existing water main where new joint restraints have been installed. Asphalt patching between new or existing parallel utility trenches that are less than three feet (3') apart (edge of trench to edge of trench) shall be a contiguous patch. See Standard Drawing 170.

4.~~4~~5.2.8 CLEANING OF SANITARY SEWER LINES. When sewer lines have been placed and the trench backfilled, the sewer lines shall be thoroughly cleaned, flushed, and tested prior to acceptance by the ~~City's Representative.~~city. No debris shall be permitted to enter any sewer lines in service. All debris shall be removed from the ~~sewerline~~sewer line and manholes. Methods of cleaning are subject to approval by the ~~City's Representative.~~city.

4.~~4~~5.2.9 CLEANING AND DISINFECTION OF WATER SYSTEMS. After being tested and prior to being placed in service, all lines shall be disinfected by chlorination. Prior to chlorination the entire line shall be flushed to ensure that all dirt or foreign objects have been removed from the line. Sufficient chlorine shall be added to ensure a residual of twenty- five (25) parts per million in the water after twenty-four (24) hours standing in the pipe. Chlorine calcium hypochlorite dry chlorinating chemical solution may be used for this purpose. Methods of application shall be approved by the Water Department. Following chlorination, all treated water shall be drained and the pipeline thoroughly flushed with clean water.

All lines being disinfected shall be flushed after the specified twenty-four (24) hour contact period. Such flushing shall be continued until the water is free from excess chlorine. All lines being disinfected including hydrant laterals, branch lines, and dead-end mains shall be flushed. After final flushing the chlorine residual shall be tested by the Water Department. It is the contractor's responsibility to coordinate this test. The discharge of flushed water shall not cause erosion or damage to streets or other property. Procedures for discharge will be subject to the review and approval of the ~~City's Representative~~city and Water Department.

4.~~4~~5.2.10 SPECIAL REQUIREMENTS.

~~A.~~ A. **CONNECTIONS TO EXISTING FACILITIES - DRY TAPS.** All connections to existing facilities shall be approved by the City Water Department. The Contractor shall make the approved connections to existing facilities as shown on the drawings. Dry connections to existing facilities shall be made only at locations shown on the drawings and shall be made at such times which will cause the least inconvenience to the water user(s). Dry connections shall be planned to minimize the duration of any shut down. The Contractor shall notify the Water Department at least two business days prior to beginning any connections to the existing facilities. When a connection to an existing water main is made, approximately four ounces of high test calcium hypochlorite (HTH) shall be placed in the pipe at each point where the existing main is cut. All new pipe and fittings at such connections shall be swabbed internally with an approved chlorine solution. All connections shall be made in the presence of the Water Department ~~representative.~~.

Valves shall not be operated without a Water Department ~~representative~~ present. Existing facilities shall not be shut down for connections to new facilities without prior Water Department approval. In no case shall an existing pipeline be shut down for a total of more than twenty four (24) hours (a maximum of three (3~~) ,~~), eight-hour periods).

The actual work plan and schedule for making a connection to an existing facility which requires an existing pipeline to be shut down, shall be submitted to the Water Department and shall be approved before the Contractor will be allowed to proceed. The Contractor shall notify, by a method approved by the Water Department, all affected Water Department customers at least twenty four hours prior to shut down. Valves at connections to all existing facilities shall be operated by the Contractor, but only in the presence of the Water Department ~~representative.~~ If the water will be shut off for an extended period of time, the Water Department may require the Contractor to supply water for the Water Department's customers.

~~B.~~ B. **CONNECTION TO EXISTING FACILITIES - WET TAPS** (Steel and Steel Composite Mains). The Contractor shall furnish and install, at his sole cost and expense, all tapping fittings and valves for all wet taps on existing ~~City~~city water pipelines. The Contractor shall notify the Water Department a minimum of two (2)

business days prior to the time the wet tap is required. No wet taps shall be made without prior approval.

Prior to tapping the main, the tapping valve and fittings shall be properly installed and pressure tested and approved by the Water Department. All wet taps to existing ~~City~~city water pipelines shall be made by the ~~City~~city Water Department at the sole expense of the Contractor requesting the work. The Contractor shall also provide all necessary equipment, labor and appurtenances necessary to complete the job. The wet tap materials shall be obtained from a source pre-approved by the Water Department.

4.45.3 QUALITY CONTROL. All underground pipelines shall be installed in accordance with these standards and tested as outlined below. These are minimum requirements and additional testing may be required. to verify compaction.

4.45.3.1 TRENCH BACKFILL MOISTURE/DENSITY TESTING. Minimum testing of trench backfill shall be as follows:

Soil Proctor - One determination for each significant change in soil type as necessary to provide required compaction testing. Tests shall be method ASTM D-1557 Method A or D (modified proctor).

Trench backfill moisture/
Soil Classification (Gradation & Atterberg Limits) - One determination for each source and soil type of materials used for bedding, pipe zone, initial backfill, and final backfill.

Trench Backfill Determination

A set of in-place density determination - Testscompaction tests includes the pipe zone and every two feet (2') of fill above the pipe zone are required for trench backfill for every
two hundred (200) lineal feet of trench or portion thereof and all service laterals, valve locations and manholes. Tests shall be run at the following trench elevations: linear feet. One (1) test per each valve location, three (3) tests per each manhole and three (3) tests per each catch basin. For water, power, and gas crossings, one (1) test per each crossing. See Table 4. Roadway Frequency Requirement Testing

One test at top of pipe zone.

One test per two (2) feet of depth measured from the bottom of the subgrade to the top of the pipe zone. Tests shall be evenly spaced vertically through the trench with one (1) test at top of trench (bottom of subgrade).

For sewer laterals two (2) complete sets of tests per each lateral.

In a public right-of-way and municipal utility easements, natural gas and power may install one foot of moisture conditioned sand material (plus or minus 2% optimum moisture content with a thoroughly mixed material) above the pipe with one foot of native material above that and a compaction test will be taken at the top of native material, and additional test will be taken at subgrade. Both tests within the public right-of-way shall meet ninety-five percent (95%) compaction. Within the municipal utility easement (MUE) the same test shall be taken as listed above but with a ninety percent (90%) compaction test. For all power switch gears and vaults in-place

density/compaction shall be taken at subgrade and achieve a minimum ninety-five percent (95%) compaction.

Additional testing may be required by the ~~City's Representative~~city or ~~soils testing laboratory~~geotechnical engineer to verify compaction.

Tests shall be according to ASTM D-1556 or D-2922 and D-3017.

Moisture/density determinations shall be made in accordance with Section 3 of these standards. Proctors for all trench backfill compaction shall be determined using ASTM D-1557 modified proctor method.

4.~~4~~5.3.2 SANITARY AND STORM SEWER LINE TESTING AND ACCEPTANCE. This subsection specifies requirements for the testing and acceptance of all sewer systems. Prior to testing, all sewer lines shall be cleaned. On main lines, invert elevations of the inlet/outlet of each manhole and the distance measurements between manholes shall be verified with surveying practices prior to installation of manhole floor. For service laterals, grades shall be verified by a carpenter's level or surveying instruments. All sewer trench compaction testing shall be completed and approved prior to performing air and deflection tests. The sewer lines, service laterals and manholes shall be tested for leakage and alignment in the presence of the ~~City's Representative~~city as follows.

~~A.~~ **A. DISPLACEMENT TEST.** The displacement test shall be conducted by the Contractor in accordance with the following procedure.

A light shall be flashed between manholes or, if the manholes have not as yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipe shows broken, misaligned or displaced pipe, or other defects, the defects identified by the ~~City's Representative~~city shall be remedied by the Contractor. After cleaning and inspection have been completed, the line shall be tested for leakage.

~~After cleaning and inspection have been completed, the line shall be tested for leakage.~~

~~B.~~ **B. AIR TESTING.** The air test shall be performed on all sanitary sewer and other storm sewer lines as directed by the ~~City's Representative.~~city. This test applies to all types of pipe. When concrete pipe is used, it shall be pre-wetted prior to testing.

The reach of pipe to be tested shall be isolated by completely plugging all outlets in the section under test. Careful attention shall be given to blocking all plugs. Prior to installing the lower and upper plugs, any concrete pipe and manholes used shall be wetted to minimize any loss of air through the pipe or manhole walls as a result of permeability in the dry condition. One of the plugs used at the manhole must be equipped to control the air entry rate and to prevent the pressure from exceeding five

p.s.i.g. which shall be done by means of a blow-off valve set to operate at five p.s.i.g.

After the plugs are installed (and any concrete pipe has been wetted) the air shall be allowed to slowly fill the pipe until a constant pressure of four p.s.i.g. is maintained for at least two minutes. During the two-minute stabilization period, all plugs and exposed fittings shall be checked with a soap solution. If a leak is found, the air shall be bled off, the leak repaired and a new two minute stabilization period begun. When the temperature of the air has reached equilibrium with that of the pipe wall, the air pressure shall be brought to four p.s.i.g. and the supply shall then be disconnected. When the pressure gauge reaches three and one-half p.s.i.g., a stop watch shall be started. The watch shall then be stopped when the pressure reaches two and one-half p.s.i.g. The time shown on the watch for a loss of one p.s.i.g. at an average pressure of three p.s.i.g. is used to calculate the rate of air loss. The pipeline may be considered to have passed the air test successfully if the loss of air is not greater than a rate of 0.0030 cubic feet per minute per square foot of internal pipe surface. The following table shows the allowable time for the pressure to drop from three and one-half to two and one-half p.s.i.g. for respective pipe diameters.

Pipe Diameter	Time Min. — Sec.	Pipe Diameter	Time Min. — Sec.
6-inch	3 — 0	18-inch	8 — 30
8-inch	3 — 45	20-inch	9 — 30
10-inch	4 — 45	21-inch	10 — 0
12-inch	5 — 45	24-inch	11 — 15
14-inch	6 — 30	27-inch	12 — 45
15-inch	7 —	30-inch	14 — 0
16-inch	0	36-inch	17 — 0
	7 — 30		

~~C.~~ **C. EXFILTRATION TEST.** In lieu of the standard air test, the Contractor may make an exfiltration test in accordance with the following procedure:

The test section shall be plugged at both ends and the pipe subjected to a hydrostatic pressure produced by a head of water at a depth of three feet above the invert of the sewer at the upper manhole under test. In areas where ground water exists, the head of water shall be three feet above the existing water table.

For concrete pipe, the three foot head of water shall be maintained for a period of one hour to obtain full absorption of the pipe body and thereafter for a further period of one hour for the actual leakage test. For all other types of pipe, the three foot head of water shall be maintained for a period of one hour only. During the one hour test period the measured maximum allowable rate of exfiltration for any section of sewer, including service stubs, shall be as listed below.

Sewer Main Diameter (inches)	Maximum Drop in Head in a 4-ft. Diameter Manhole (Non-taper sect.) per 100 ft. of sewer pipe	Maximum Allowable Leakage (Exfiltration) (Gallons/Hour/100 ft.)
6	0.1563 inch	1.2
8	0.2031 inch	1.6
10	0.2500 inch	2.0
12	0.3125 inch	2.4
15	0.3594 inch	2.8
18	0.4063 inch	3.2
21	0.4531 inch	3.6
24 or larger	0.5156 inch	4.0

When measurements indicate an exfiltration greater than the maximum allowable leakage, additional measurements shall be taken and continued until all leaks are located and the necessary repairs and corrective work have reduced the leakage in the section being tested below the maximum allowable by these standards.

For purposes of the exfiltration test, the line between adjoining manholes will be considered a section and will be tested as such.

The Contractor shall furnish the plugs and other material and labor for placing the plugs in the sewer and shall assist the ~~City's Representative~~city in making all measurements required. The introduction of any substance into the testing water with the intent of sealing leaks will not be permitted.

When the results of the air test or the exfiltration test is not satisfactory, repairs or pipe replacement shall be required until the ~~City's Representative~~city is satisfied that the leakage requirements have been met. All repair methods and materials used shall be approved and accepted by the ~~City's Representative~~city.

~~D.~~ **D. PVC DEFLECTION TEST.** All PVC sewer pipe shall be tested for deflection with a mandrel. The mandrel shall be a rigid device sized to pass through a pipe having five percent (5%) or less deflection. These allowances shall include deformations due to all causes (wall thickness variations, shipping, production, backfill, heat, etc.). The mandrel device shall be cylindrical in shape and shall comply with the manufacturer's recommendations.

The mandrel shall be hand pulled through all sewer lines. Any sections of sewer not passing the mandrel shall be uncovered and repaired by the Contractor. The Contractor shall re-round or replace the sewer to the satisfaction of the ~~City's Representative.~~city. All repaired sections shall be re-tested as noted above.

Deflection tests shall be conducted only after the final trench backfill is placed to final grade and compacted.

~~E.~~ **E. INSPECTION AND FLUSHING.** Prior to final acceptance of each section of sanitary and storm sewer lines, all lines shall be flushed by the Contractor. All dirt and debris shall be prevented from entering the existing sewer system by means of water-tight plugs or other suitable methods.

Upon completion of the project, the ~~City's Representative~~city will carefully inspect all sewers and appurtenances. Any unsatisfactory work shall be removed and replaced in a proper manner. The invert of the sewer lines and manholes shall be left smooth, clean, and free from any obstructions throughout the entire line. All manhole rings and covers shall be adjusted to finished grade, concrete collars installed and all sanitary sewer laterals shall be properly extended, capped and

marked prior to acceptance of the sewer system.

~~F.~~ **F. MANHOLE LEAKAGE TEST.** Sewer manholes located in areas of ground water or probable flooding or if their water tightness is suspect, as determined by the ~~City's Representative~~city, shall be tested for leakage prior to acceptance. The contractor shall perform all testing. Allowable leakage shall be one gallon per hour per manhole. At least two manholes shall be tested, and based on these tests and visual inspection of all manholes, additional tests may be required for other manholes. Any manhole which tests unsatisfactorily shall be repaired and retested until satisfactory results are obtained.

4.~~4~~5.3.3 WATER SYSTEM TESTING AND ACCEPTANCE. The Contractor shall test all water mains prior to final acceptance. Testing shall be done in the presence of the City Water Department ~~Representative.~~ When existing facilities must be included in the test and are determined to be faulty and not capable of holding test pressures, the existing facilities must be repaired prior to testing. When concrete thrust blocks are used, they shall be in place at least five days prior to initial filling of the line. (If high early strength concrete is used, three days will be required.

A. PRESSURE TEST. After the pipe has been laid, including fittings, valves, corporation stops, services, and hydrants, and the line has been backfilled in accordance with these standards, each valved section, unless otherwise directed by the Water Department, shall be subjected to a hydrostatic pressure test of not less than two hundred pounds per square inch. The duration of each such test shall be two hours. Water added to maintain the pressure shall not exceed 0.3 gallons per inch diameter per one thousand ~~lineal~~linear feet of pipe being tested during the two hour test period.

Each valved section of pipe shall be slowly filled with water, and the specified test pressure measured at the lowest point of elevation. The pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, gauges, and all necessary apparatus for the test must be furnished by the Contractor. Gauges and measuring devices must be approved by the City Water Department and the necessary pipe taps shall be made as directed. Before applying the specified test pressure, all air shall be expelled from the pipe by a method approved by the Water Department.

Any cracked or defective pipes, fittings, valves, or hydrants discovered in the pressure test shall be removed and replaced with new materials in accordance with the standard specifications. The test shall be repeated until the water main passes the pressure test and is accepted by the City's Water Department or ~~City's Representative~~the city.

B. OPERATIONAL INSPECTION. At the completion of the project and in the

presence of the ~~City's Representative~~city, the Contractor shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve

~~B.~~ boxes are centered and valves are operational; that all hydrants operate and drain properly and that water is available at all meter boxes.

~~C.~~ **C. TEST RESULTS AND CERTIFICATES OF COMPLIANCE.** Test results shall be submitted for pressure and operational testing in accordance with current City Water Department requirements. Certificates of compliance from material suppliers may be required, at the option of the ~~City's Representative~~city, for any materials not specifically covered herein.

4.5.3.4 ROADWAY TESTING FREQUENCY REQUIREMENTS. The Roadway Testing Frequency Requirement Table below includes all roadway frequency requirement for subgrade, pavement and concrete .

TABLE 4.2
SUBGRADE AND PAVEMENT/CONCRETE REQUIREMENTS
St. ~~4.5~~ **George City Minimum Testing Requirements**

Subgrade Requirements

Location	Minimum Requirements	Frequency
Roadway Subgrade	95% for granular soils, 90% for fine grained soilsand +/- 2% per D-1557	1 test per 750 square yards
Roadway/Embankment/Backfill	95% for granular soils, 90% for fine grained soilsand +/- 2% per D-1557	Embankments: 1 test per 250 linear feet of roadway
Under Curb and Gutter	95% and +/- 2% per D-1557	1 test per 400 feet of linear roadway
Under Sidewalks and Driveways	95% and +/- 2% per D-1557	1 test per 500 feet of linear sidewalk and 1 per entrance (commercial)
Utility Trenches under Roadway, Curb and Gutter, or Sidewalk*	95% and +/- 2% per D-1557	1 test per 200 linear feet and 2 vertical feet (additionally 1 test per crossing)
Sewer and Water Laterals*	95% and +/- 2% per D-1557	2 tests per sewer lateral , 1 test per water lateral
Sewer Manhole and Storm Drain Box/Curb Inlet*	95% and +/- 2% per D-1557	3 tests per sewer/storm drain manhole, 1 tests per storm drain box/curb inlet
Water Valves*	95% and +/- 2% per D-1557	1 test per valve/valve cluster

Untreated Base Course and Subbase Requirements

Location & Test Type	Minimum Requirements	Frequency
Roadway (Compaction)	95% and +/- 2% per D-1557	1 test per 200 linear foot of roadway
Roadway (Gradation)	Job-Mix Target	1 test per 500 linear foot
Curb and Gutter (Compaction)	95% and +/- 2% per D-1557	1 test per 300 linear feet
Curb and Gutter (Gradation)	Job-Mix Target	1 sample per 750 lineal feet
Sidewalk/Trail (Compaction)	95% and +/- 2% per D-1557	1 test per 300 linear feet
Sidewalk/Trail (Gradation)	Job-Mix Traget	1 sample per 750 linear feet

Bituminous Surface Course Requirements (Asphalt)**

Location and Test Type	Minimum Requirements	Frequency
Roadway (Compaction)	96% Average, no test below 92% Marshall 92% Average, no test below 90% Rice	1 test per 7,000 square feet
Roadway (Extraction)	Job-Mix Target	1 Rice test per 500 tons
Roadway (Extraction)	Job-Mix Target	1 Marshall test per 1 day's production

**Temperature observation required during winter months (December 1 through February 15)

Concrete Testing Requirements (Curb, Gutter and Sidewalk)

Test Type	Requirements	Frequency
Compressive Strength	4,000 psi at 28 days	1 set (4 cylinders) per 50 cubic yards
Air Entrainment	4-6% by volume	Until 2 consecutive tests pass
Slump	4-inch maximum 1 1/2-inch maximum for machine placement	Until 2 consecutive tests pass
Temperature	90° F. Maximum concrete temperature 60° F. Minimum concrete temperature	At least once per load

4.6 ROADWAY CONSTRUCTION. This subsection covers roadway construction including subgrade, subbase, roadbase, recycled aggregate materials (RAM), prime coat, tack coat, plant mix bituminous surfaces (dense and open graded), construction staking and other related work.

4.6.1 ~~4.5.1~~ GENERAL REQUIREMENTS. The Contractor shall furnish all labor, material, equipment, tools, transportation, traffic control and supplies required to complete the work in accordance with the approved plans and these specifications. The approved plans do not ~~purport~~intend to show all the details of the work. The plans are intended to illustrate the character and extent of work required and therefore, they may be, if necessary, supplemented or revised as the work progresses. The Contractor shall keep the most current set of approved plans available on the job site at all times.

The Contractor shall arrange the work and shall place and dispose of the materials being used so as not to interfere with the public during the course of the project. The Contractor shall join the new work with that of existing in an acceptable manner and shall perform all work in proper sequence.

The Contractor shall provide and maintain or have provided for, all necessary work zone traffic control in accordance with the requirements of Section 2.5 of these specifications. The Contractor shall also maintain the job site and all adjoining private and public areas in a clean, safe manner. This maintenance shall constitute continuous and effective work prosecuted day-by-day, with proper equipment and adequate work forces to keep all areas related to and adjoining the job site in a condition satisfactory to the ~~City's Representative.~~city. If, at any time, the Contractor fails to comply with these provisions the ~~City's Representative~~city will immediately notify the Contractor of such non-compliance. If the Contractor fails to remedy the unsatisfactory maintenance within twenty-four (24) hours after receipt of such notice, the ~~City's Representative~~city may immediately proceed to cause correction(s) to the job site and adjoining areas. The entire~~-~~ cost of this corrective maintenance will be billed to the Contractor and shall be paid in full prior to the ~~City's~~city acceptance of the work.

If a condition develops due to a lack of maintenance by the Contractor that is dangerous to public safety, the Contractor shall proceed to immediately remedy the condition with whatever means are available. The entire cost of~~–~~ the corrective remedy will be the Contractor's responsibility

~~4.5.2~~

4.6.2 CONSTRUCTION STAKING. Construction stakes shall be furnished and set, establishing lines and grades for roadway excavation including, but not limited to all cut and fill slopes finished subgrade, finished subbase and finished roadbase grades for streets, curb & gutter, cross-gutters, sidewalks, drive approaches, any contiguous structures and utilities (to help prevent conflicts of location). In development related projects the Developer and his Engineer shall be responsible for all surveying and the accuracy thereof.

The line and grade stakes shall be, whenever possible, off-set from the construction area a minimum of five feet~~,~~ and shall show the stationing (corresponding with the approved plans), off-set distance, required cut or fill to the finished grade, flow line, and TBC as indicated on the approved plans. ~~-~~Grade stakes with hubs set to the finished grade of the subgrade shall be painted appropriately. Stakes with hubs set to the finished grade of the subbase or roadbase shall be painted appropriately. Plastic "whiskers" may be used in connection with painted hubs. All stakes and grades shall be set by appropriate methods under the direction of the professional engineer whose seal is on the approved plans. The Contractor constructing the facilities should be provided with copies of the cut sheets generated during construction staking. Cut sheets shall include roadway stationing, reference elevations, grade elevations, etc.

The line and grade stakes and cut sheets along with the most current set of approved plans shall constitute the field control by which the work shall be executed.

The Contractor shall be responsible for preserving property markers, corner survey markers, construction survey stakes and marks for the duration of their usefulness.

If any construction survey stakes or markers are lost or disturbed and need to be replaced, such replacement shall be done at no expense to the ~~City~~city. At no time shall a permanent monument be removed without prior authorization by the ~~City Engineer~~city. When construction work encounters such monuments, the City Surveyor should be contacted immediately.

~~4.5.3 GRADE CONTROL SYSTEMS. Non-contact grade control systems may be used to establish the roadway elevations of subgrade, subbase and roadbase on public streets providing the following conditions are met.~~

~~4.5.3.1 The system shall be equipped with a "self diagnostic" function that continuously monitors all system functions and shuts the system down if an error in the system occurs. It shall also be equipped with a "thermistor" to electronically compensate for differences in air and ground temperature with a minimum operating range not less than zero to 160 degrees F. (-18 to 71 degrees C.).~~

~~4.5.3.2 The system shall meet the following minimum specifications:~~

~~Blade Slope Sensor Resolution~~	~~0.01% slope~~
~~Main Fall Sensor Resolution~~	~~0.01% slope~~
~~Rotation Sensor Resolution~~	~~0.1 degree~~
~~Tractor Grade Controller Accuracy~~	~~"0.015 foot (4.5 mm)~~
~~Cross Slope Resolution~~	~~0.1% slope or 0.01 foot/10 foot (3 mm in 3 m)~~
~~Cross Slope System Accuracy~~	~~0.02 foot/10 feet (6 mm in 3m)~~

~~4.5.3.3 A system meeting the above requirement must be properly installed on a "tight"* properly maintained motor grader.~~

~~*Meeting the equipment manufacturer's service specification tolerances for all controlling surfaces and connecting points that effect the ability of that specific type of equipment to provide proper grade control.~~

~~With all the above conditions met the system will be permitted to be used, providing a preset grade and line for curb & gutter, edge of pavement or curb grade line has been established by the Engineer.~~

~~The City's Representative has the right to prohibit the use of such equipment, if in his opinion the equipment has not been properly maintained or is not being properly operated.~~

~~4.5.4~~

4.6.3 GEOTECHNICAL INVESTIGATION. A geotechnical investigation shall be conducted under the direction and control of a Geotechnical Engineer experienced in flexible pavement design. The investigation shall include a thorough exploration and sampling program of the subgrade to determine the nature and engineering properties of the on-site soils within the roadway construction areas. The minimum sampling and testing requirements shall be as outlined in Section 3.2.5 and where otherwise outlined in these specifications.

The structural details shown on the plans and/or Standard Drawings, and Table 4.2 are minimum requirements. The actual structural section for each roadway shall be designed by accepted engineering design methods for flexible pavement (i.e., AASHTO, UDOT, Caltrans). Required subgrade soil properties shall be obtained from an on-site geotechnical investigation. Required traffic ~~-~~design traffic information is provided in Table 4.2. When, in the opinion of the ~~City Engineer~~city the traffic information listed is inappropriate for the street under consideration the Traffic Index will be adjusted accordingly.

4.6.4 ~~4.5.5~~ **ROADWAY SUBGRADE.** This subsection shall govern the preparation of natural, filled or excavated material prior to placement of subbase. The preparation of subgrade shall extend a minimum of one foot beyond the proposed

construction limits. This includes roadways, curbs & gutters, drive approaches, sidewalks or any other roadway structures.

4.6.4.1 ~~4.5.5.1~~ **PREPARATION.** The subgrade soils shall be prepared by scarifying and processing to a minimum depth of one foot unless otherwise recommended by the geotechnical firm approved by the ~~City representative~~city.

Unsuitable material found below the processing depth such as saturated soils from groundwater, expansive soils, soluble soils, deleterious and/or organic materials shall be addressed by a Geotechnical Engineer who shall provide a written recommendation to the ~~City's Representative~~city for approval prior to performing any work in the areas being addressed.

TABLE 4.3: MINIMUM ROADWAY STRUCTURAL REQUIREMENTS

	Roadway Class	Design ESALs (Million)	Travel Lanes	Min. CBR	Asphalt (in.)	Road Base (in.)
Residential-Local	I	≤0.150	2	10	3	6
Residential-Standard	II	0.150-0.400	2	10	3	8
Residential-Collector	II	0.400-0.700	2	10	3	8
Major Collector	II	0.700-2.2	2	10	3	8
Minor Arterial	III	2.2-7.0	4	10	3.5	10
Arterial Major	III	7.0-9.5	4	10	4	10
Commercial-Local	III	7.0-9.5		10	4	10
Industrial-Local	III	9.5-22		10	5	12

Notes:

1. For Major Collector and larger Roadways, a structural pavement design based on a project-specific traffic study shall be submitted to the City for review and approval by the project geotechnical engineer. Pavement designs should be based on AASHTO 98 or UDOT Pavement Design Methods. For new roadway construction, the minimum design life shall be 25 years.
2. Where the CBR value of the subgrade soil is < than 10, sub-base materials, or additional road base materials, or geogrid are required in the structural pavement section as recommended by the project geotechnical engineer.
3. Where collapsible soils (>3 percent) are identified in the initial geotechnical investigation or during construction, the subgrade soil shall be over-excavated and recompacted to a minimum of 1½ feet or deeper as directed by the project geotechnical engineer.
4. Where expansive soils (Liquid Limit > 35 and Plastic Index > 15 percent) are identified in the initial geotechnical investigation, or during construction, the subgrade soil shall be over-excavated to a minimum of 4 feet or deeper and replaced with approved embankment fill materials as directed by the project geotechnical engineer.
5. City will pay cost difference between Table and specified pavement thickness per geotechnical investigation.

4.6.4.1

~~**TABLE 4.2**~~

~~**Minimum Roadway Structural Requirements**~~

Classification	Traffic Index	(3)(4) Roadway Minimum Asphalt Pavement (inches)	(4) Required Roadway Road Base (inches)	(5) Required Roadway Sub-base (inches)	Sidewalk Minimum Concrete Thickness (inches)	Sidewalk Minimum Road Base Thickness (inches)	Driveway Minimum Concrete Thickness (inches) (5)	Driveway Minimum Road Base Thickness "residential" (inches) (6)
Residential Local (7)	5	2.5 (1)	6	varies	4	4	6	6
Residential Standard (7)	5	2.5 (1)	6	varies	4	4	6	6
Residential Collector (7)	5.5	3	6	varies	4	4	6	6
Major Collector (8)	6	3	6	varies	4	4	6	8
Minor Arterial (8)	7	3.5	7	varies	4	4	8	8
Major Arterial (8)	8	4	8	varies	4	4	8	8
Commercial Local (9)	10	4	8	varies	4	4	8 (2)	8
Industrial Local (9)	10	5	12	varies	4	4	9 (2)	8

(1) Asphalt pavements containing more than 1% gypsum (CaSO4+2H2 calcium sulfate, dehydrate) shall be a minimum of 3" thick; consisting of 2" of 3/4" dense-graded asphalt base course containing no more than 2% gypsum and 1" of 1/2" dense-graded asphalt wearing course with less than 1% gypsum. This road classification does not require a prime coat unless otherwise specifically designated by the City Representative.
(2) #4 rebar to be placed three inches above the bottom of concrete spaced 12 inches on center each way.
(3) All wearing courses shall have less than 1% gypsum content.
(4) Thickness may vary based upon structural section design by a registered professional engineer experienced in flexible pavement design. Minimum values are shown.
(5) Roadway sb-base is required. The thickness varies based upon the structural section designed by the engineer.
(6) Thickness' shown here do not apply outside the public right of way or behind the back of sidewalk unless otherwise designated.

4.5.5.1 **(continued)** Uniform pervious soils that allow the immediate penetration of water to a depth of one foot, will not require scarifying and processing unless a condition previously stated requires it. When scarifying and processing are not required, the moisture content of the top one foot of the subgrade material shall be brought to not less than two percent (2%) of optimum by the addition of water on the surface, and the material shall be

compacted by approved equipment to the specified compaction requirements.

When scarifying and processing, the roadbed shall be loosened to a depth of at least one foot, then alternate blading, moistening and rolling will be required to provide a smooth, even and uniformly compacted course true to cross-section and grade. ~~-~~Moisture content at the time of processing and testing shall be not less than two percent (2%) of optimum. All rocks larger than six inches in diameter shall be removed.

4.6.4.2 ~~4.5.5.2~~ **TOLERANCES.** When subbase material is placed on the subgrade the subgrade tolerance shall not vary more than 0.10-foot from the specified grade and cross-section. However, when roadbase or recycled aggregate materials (RAM) placed on the subgrade the subgrade tolerances shall not vary more than 0.05-foot from the specified grade and cross-section.

4.6.5 ~~4.5.6~~ **SUBBASE - CLASS I AND CLASS II.** All gravel pits supplying aggregate shall be UDOT approved pits. Subbase for all roadways and associated areas shall consist of select materials, either natural or crushed. Aggregate wear shall be less than fifty percent (50%) when tested by AASHTO T-96. The material passing the 40 (4.75 mm) sieve shall be non-plastic per AASHTO T-90. The subbase shall contain no more than three percent (3%) gypsum or any other deleterious or organic materials by weight. The test for gypsum shall follow ~~City~~city of St. George Chemical Quantitative Analysis of Gypsum in Aggregates, Test Procedure S-3171-96 or AASHTO T267 and dividing the total combined water percentage by a factor of 20.93 to determine the purity of gypsum.

Prior to delivering any subbase to any site the supplier shall submit, in writing, a job-mix gradation to the ~~City Engineer~~city for approval. The job-mix gradation shall have definite single values for the percentage of aggregate passing each specified sieve based on the dry weight of the aggregate. Dry weight values shall fall within the band limits shown in Table 4.3.

Annual job-mix gradations shall be submitted in writing to the ~~City Engineer~~city for approval prior to January 31 each calendar year or upon selection of new aggregate sources. Any revisions to the approved job mix gradations shall fall within the requirements listed above.

If a supplier does not have an approved job-mix gradation that is current for the aggregate source or calendar year, the “Ideal Gradation” in Table 4.3 will apply.

The subbase mixture placed on projects during one day's operation shall come from a single source. Intermixing from more than one source will not be permitted.

Subbase material shall be deposited and spread in uniform lifts not to exceed eight inches compacted thickness for Class I and six inches compacted thickness for Class II without segregation of size. Each layer shall be compacted for the full width and depth by mechanical means of compaction. When mixing, moistening and placing subbase the moisture content shall be not less than two percent (2%) below optimum. However, caution shall be used to avoid over watering to a state of instability. Alternate blading and rolling will be required to provide a smooth, evenly moistened and uniformly compacted course true to cross-section and grade. Locations inaccessible to rolling shall be compacted with mechanically operated hand tampers. The subbase shall be compacted to not less than ninety-five (95%) percent maximum dry density as determined by ASTM D1557-78 orD1557or AASHTO T-180 Method D. Subbase tolerances when compacted shall not vary more than 0.05-foot from the specified grade and cross-section.

Table 4.34

SUBBASE AGGREGATE GRADATION

PERCENTAGE OF TOTAL AGGREGATE PASSING					
SIEVE SIZE		CLASS I BAND LIMITS	IDEAL GRADATION	CLASS II BAND LIMITS	IDEAL GRADATION
METRIC	AMERICAN STANDARD				
152.4 mm	6"	100	100	- -	- -
76.20 mm	3"	90 – 100	95	100	100
50.80 mm	2"	80 – 100	90	90 - 100	95
25.0 mm	1"	70 – 90	80	70 - 90	80
12.5 mm	½"	51 – 75	63	51 - 75	63
4.75 mm	#4	31 – 65	48	31 - 65	48
1.18 mm	#16	16 – 40	28	16 - 40	28
.075 mm	#200	2 – 12	7	2 - 12	7

4.5.7. UNTREATED ROADBASE - ONE INCH AND THREE-QUARTER INCH. All gravel pits supplying aggregate shall be UDOT approved pits. Roadbase for all roadways and associated areas shall consist of select materials, natural and/or crushed. Coarse aggregate shall be all material retained on the #4 (4.75

~~mm) sieve, and shall be crushed stone, crushed gravel, or crushed slag with a minimum of forty percent (40%) fractured faces per FLH designation T-506-94.~~

~~Fine aggregate may be a natural, or manufactured, product and shall pass through a #4 (4.75 mm) sieve. All aggregates shall be clean, hard, tough, durable and sound containing no more than two percent (2%) gypsum and be free from other deleterious and/or organic materials and harmful adherent coatings. The test for gypsum shall follow City of St. George Chemical Quantitative Analysis of Gypsum in Aggregates, Test Procedure S-3171-96.~~

~~Aggregate wear shall be less than fifty percent (50%) when tested by AASHTO T-96 and the material passing the #40 (.0425 mm) sieve shall be non-plastic per AASHTO T-90. The dry-rodded unit weight shall be at least seventy five pounds per cubic foot (1200 kg/m3) per AASHTO T-19.~~

4.6.6. UNTREATED ROADBASE

Prior to delivering any roadbase to any site, the supplier shall submit, in writing, a physical property test report of the material meeting Table 4.4 and a job-mix gradation and a standard aggregate gradation plot to the ~~City Engineer~~city for approval. The job-mix gradation shall have definite single values for the percentage of aggregate passing each specified sieve based on the dry weight of the aggregate. Dry weight values shall fall within the band limits shown in Table 4.45**,** and provide a uniform curve when plotted on a standard aggregate gradation chart. The ~~City Engineer~~city has the right to request modification to the job-mix gradation to provide an acceptable curve. The accepted job mix will ~~-~~then become the target gradation for the aggregate source for the calendar year.

Annual job-mix gradations shall be submitted in writing to the ~~City Engineer~~city for approval prior to January 31 each calendar year, or upon selection of new aggregate sources. Any revisions to the approved job-mix gradation shall fall within the requirements listed ~~above~~in Table 4.5.

~~If a supplier does not have an approved job-mix gradation that is current for the aggregate source, or calendar year, the "Ideal Gradation" in Table 4.4 will apply.~~The roadbase placed on a project during one day's operation shall come from a single source. Intermixing from more than one source will not be permitted.

Material shall be crushed rock, gravel, sand, or other high quality mineral particle, or combination that is free of organic matter, free of chemical or petroleum contamination, and meets the following physical properties.

Table 4.5
Untreated Roadbase Physical Properties

Physical Property	ASTMs	Aggregate Class
		A
Coarse aggregate		

Angularity (2 fractured faces), min., percent	D5821	50
Wear (toughness or hardness), max., percent	C131	50
Fine aggregate		
Liquid Limit, max.	D4318	25
Plastic Index, max.	D4318	6
Sand Equivalent, min., percent	D2419	22
Blended aggregate		
Dry Rodded Unit Weight, min., percent	C29	75
CBR, min., percent	D1883	70
Percent of Gypsum, Max	S3176 or AASHTO T267	2.0

NOTES
(a) Faces: Retained on No. 4 sieve.
(b) Wear: Retained on No. 12 sieve after 500 revolutions.
(c) Liquid limit and plastic index: Passing No. 40 sieve.
(d) Sand equivalent (clay content or cleanliness): Passing No. 4 sieve.
(e) CBR: Use a surcharge of 10 pounds measured at 0.20 inch penetration at 95 percent relative to a modified proctor density. A reduction in aggregate class may be accepted providing any costs for difference in excavation, backfill, and alternate design for CBR does not increase Concrete Price.
(f) AASHTO equivalents may be substituted for the listed ASTM's. Please reference AASHTO re:source equivalencies.
(g) Modify AASHTO T267 by dividing the total combined water percentage by a factor of 20.93 to determine the purity of gypsum

Gradations shall be analyzed according to ASTM C136 on a dry weight and percent passing basis. Target Grading Curve must lie within the selected aggregate grade in Table 4.5. Field gradation shall not vary from target by more than the target tolerance.

Table 4.6 – Master Grading Bands

Sieve	Aggregate Grade			Target Tolerance
	Grade 1-1/2	Grade 1	Grade 3/4	
1-1/2"	100	–	–	
1 "	–	100	–	±11%
3/4 "	70 – 85	–	100	±11%
1/2 "	–	79 – 91	–	±11%
3/8 "	55 – 75	–	78 – 92	±10%
No. 4	40 – 65	49 – 61	55 – 67	±9%
No. 16	25 – 40	27 – 35	28 – 38	±7%
No. 200	7 – 11	7 – 11	7 – 11	±2.9%

NOTES
(a) It is assumed fine and coarse aggregate have same bulk specific gravity.
(b) Target tolerance for 3/4 sieve in Grade 3/4, and 1" sieve in Grade 1 is not applicable.
(c) Percentage of fines passing No. 200 sieve determined by washing, ASTM C117.

The roadbase placed on a project during one day's operation shall come from a single source. Intermixing from more than one source will not be permitted.

Roadbase shall be placed in layers compatible with the equipment and not exceeding eight ~~(8)~~ inches (8") in non-compacted thickness. Where the required thickness is more than eight inches (8") the roadbase shall be spread and compacted in two or more layers of approximately equal thickness. However, if vibratory compaction equipment of a type approved by the ~~City's Representative~~city is used, and the requirements for density and moisture content are complied with, the noncompacted thickness of any one layer may be increased to ten ~~(10)~~ inches~~.~~ (10"). Each layer shall be compacted for the full width and depth by mechanical means. When mixing, moistening and placing roadbase the moisture content shall be not less than two percent (2%) below optimum. Care shall be used to avoid overwatering. Alternate blading and rolling will be required to provide a smooth, evenly moistened and uniformly compacted course true to cross-section and grade. Locations inaccessible to rolling shall be compacted with mechanically operated hand tampers. The roadbase shall be compacted to not less than ninety-five percent (95%) maximum dry density as determined by ASTM D-~~1557- 78 or~~1557or AASHTO T-180~~ method D~~. Roadbase tolerances when compacted shall meet or exceed the required minimum thickness and shall not vary more than 0.02 foot from the specified grade and cross-section at the time the asphalt pavement is placed.

When the roadbase surface is used to convey traffic~~,~~ or is left unpaved for an extended period of time, the contractor shall preserve the integrity and grade and an asphalt prime coat meeting the requirements in Section 4.~~5.8~~6.7 shall be applied. When asphalt prime is not used, the contractor shall maintain the roadbase moisture, structural integrity and finish, to the finished tolerances of this subsection.

~~Table~~ 4.~~4~~
~~ROADBASE AGGREGATE GRADATION~~

~~PERCENTAGE OF TOTAL AGGREGATE~~				
~~Sieve Size~~	~~1 inch/~~			

Metric	American Standard	25mm Band Limits	Ideal Gradation	3/4 Inch/ 19mm Band Limits	Ideal Gradation
25mm	1"	100	100	–	–
19mm	3/4"	–	–	100	100
12.5mm	½"	79-91	85	–	–
9.5mm	3/8"	–	–	78-92	85
4.75mm	#4	49-61	55	55-67	61
1.18mm	#16	27-35	31	28-38	33
.075mm	#200	7-11	9	7-11	9

4.5.86.7**PRIME COAT.** Prime coastcoat is required for all roadway work unless otherwise approved by the City Engineer.city. This work shall consist of preparing and treating an existing aggregate base with bituminous material and blotter material, if required, in accordance with these specifications and in conformity with the lines shown on the plans or established by the City's Representative.city. The type and grade of bituminous material shall be MC-70 liquid asphalt, unless otherwise approved by the City's Representativecity.

The Contractor shall provide equipment for heating and applying the bituminous material. The asphalt distributor shall be so designed, equipped, maintained and operated that bituminous material will be applied uniformly on variable widths of surface at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard with uniform pressure and an allowable variation from any specified rate not to exceed 0.02 gallon per square yard. Distributor equipment shall include a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

Bituminous material shall not be applied on a wet surface that has free standing water, or when the atmospheric and surface temperature is less than 50^0 F. (10^0C.) or when weather conditions, in the opinion of the City's Representativecity, would prevent the proper application of the prime coat. The surface upon which the bituminous prime coat will be placed shall conform to the established lines and grades, shall be smooth and uniform and shall be compacted to the required density with the optimum moisture content at plus, or minus, two percent (2%).

If, for any reason, the required density and/or moisture deteriorates between the time the gravel course was compacted and the time the prime coat is placed, the surface shall be recompacted and/or moisture conditioned to the required density and moisture content.

Bituminous material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform, continuous spread. When traffic is maintained, not more than one-half of the width of the section shall be treated in one application. Traffic will not be allowed on the treated surface until the bituminous material is absorbed and will not adhere to the vehicle tires. Care shall be taken that the application of bituminous material at the junctions of spreads is not in excess of the specified amount. Skipped areas or deficiencies shall be corrected.

Application rate shall be 0.25 gallon per square yard, or as directed by the ~~City's Representative.~~city. At the time of placement the temperature of the liquid asphalt shall be uniform and not less than 120 degrees F. (49 degrees C.) nor more than 180 degrees F. (82 degrees C.).

If the bituminous material fails to penetrate within forty-eight hours, blotter material shall be spread as required to absorb any excess bituminous material. All loose blotter material shall be completely removed from the treated areas prior to placing surfacing material. Prior to placing asphalt concrete, additional prime coat shall be applied as directed by the ~~City's Representative~~city to areas where the prime coat has been damaged, and loose or extraneous material shall be removed.

Sand blotter material shall meet the following requirements. The material may be accepted in the stockpile at the source.

Required Tests	Test Methods
Sieve Analysis	AASHTO T27
Sampling Aggregate	ASTM D 75
Organic Impurities	ASTM C 40

GRADATION REQUIREMENTS
Percentage by Weight

Sieve Sizes	Passing Sieve
½ Inch	100
No. 4	90-100
No. 16	30-75
No. 200	0-12

Liquid asphalt shall not be sprayed upon adjacent pavements, that portion of the traveled way being used by traffic, structures, railings and barriers, markers, adjacent property and improvements, and other roadway improvements or facilities not mentioned herein.

4.~~5.9~~6.8 TACK COAT. This work shall consist of preparing and treating an existing bituminous or concrete surface with asphaltic emulsion in accordance with these specifications and in conformity with the lines shown on the plans or established by the ~~City's Representative.~~city. The type and grade of bituminous material shall be SS-1h asphalt emulsion, unless otherwise directed.

Asphalt emulsion used as a tack coat between courses of plant mix surface, or over an existing surface, shall be prepared for application by using warm water to cut back the emulsion in the quantity of fifty percent (50%) of the emulsion by weight.

Bituminous material shall be applied to the width of the section to be tacked by means of a pressure distributor in a uniform, continuous spread. Care shall be taken that the application of bituminous material at the junctions of spreads is not in excess of the specified amount. Skipped areas or deficiencies shall be corrected.

The Contractor shall provide equipment for heating and applying the bituminous material. The asphalt distributor shall be so designed, equipped, maintained and operated that bituminous material will be applied uniformly on variable widths of surface at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard with uniform pressure and with an allowable variation from any specified rate not to exceed 0.02 gallon per square yard. Distributor equipment shall include a tachometer, pressure gauge(s), accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

Application of tack coat may occur only when the surface and air temperature is 50 degrees F. (10 degrees C.) and rising. The surface shall be clean, dry, free of irregularities and shall be smooth and uniform.

At the time of placement the temperature of the asphaltic emulsion shall be uniform and not less than 75 degrees F. (24 degrees C.) nor more than 130 degrees F. (54 degrees C.). The tack shall be applied at a rate of 0.05 to 0.10 gallon per square yard. The rate of application may be adjusted by the ~~City's Representative~~city.

Liquid asphalt shall not be sprayed upon adjacent pavements, structures, railing, barriers, markers, adjacent property improvements, and other ~~facilities not~~

~~mentioned herein.~~
facilities not mentioned herein.

4.~~5.10~~6.9DENSE-GRADED ASPHALT. This work shall consist of mixing, laying and compacting an asphalt course of one or more layers composed of aggregate, asphalt cement, applicable additives and lime, as required. All materials shall be mixed at a central mixing plant.

4.6.9.1 ~~4.5.10.1~~ **RELATED WORK.** Work related to asphalt concrete pavement shall include surface preparation, prime coat, tack coat, transporting, placement, compaction and finishing of asphalt mixture as required. Work zone traffic control shall be in accordance with the requirements of Section 2.5 of these specifications.

~~4.5.10.2 ASPHALT CEMENT. Viscosity graded asphalt cement shall meet AASHTO designation M-226-80 (1993). Viscosity is to be measured at 140BF (60BC) when used in pavement construction. The asphalt cement shall be homogeneous, free from water, and shall not foam when heated to 347B F (175B C). Sampling and testing of asphalt cements shall be in accordance with the following AASHTO Standard Methods:~~

4.6.9.2 ROAD CLASS: Attribute of a public or private thoroughfare based upon equivalent el loads (ESAL).

Class I: (ESAL < 10^4 per year) Includes maintenance mixes, bike paths, parking lots, residential driveways, light traffic residential streets, light traffic rural farm roads.

Class II: (ESAL between 10^4 and10^6 per year). Includes heavy traffic residential streets, rural farm collector roads, non-industrial parking lots, urban low volume collector streets.

Class III: (ESAL > 10^6 per year). Includes high volume collectors, arterials, industrial parking lots (primary load from 3-axle or greater vehicles), climbing lanes, truck weigh stations.

4.6.9.3 ASPHALT CEMENT. Performance Graded Asphalt Binder (PGAB): See ASTM D6373. Use the following minimum virgin mix binder grades unless otherwise specified.

~~Sampling~~**Table 4.7 – Minimum Virgin Binder Grade**	
~~Viscosity at 140EF (60 E)~~**Road Class**	~~T202~~PGAB

~~Viscosity at 275EF (135EC)~~Class I & II	~~T201~~PG 64-22 (≤ 15% RAP) PG 64-34 (>15% RAP)
~~Penetration~~Class III	~~T49~~PG 70-28 (≤ 15% RAP) PG 64-34 (>15% RAP)
a. ~~Flash Point (COC)~~Blending chart limitations for mixes exceeding 15% RAP must meet -28 for low end PG temperatures. b. Mixes shall not exceed 20% RAP by total weight of aggregate	

~~Solubility in bituminous materials~~	~~T44~~
~~Thin-film oven test~~	~~T179~~
~~Ductility~~	~~T51~~
~~Spot Test~~	~~T102~~
~~Rolling thin film oven test~~	~~T240~~
~~Water~~	~~T55~~

~~The asphalt cements shall conform to the requirements given in Table 4.5.~~

Adjust virgin binder grade to accommodate RAP contents in excess of 15% as identified in Table 2. Do not use grades lower than xx-34. Use M323 Appendix X1 Blending chart to determine acceptable RAP content up to maximum allowed based on virgin binder grade selected or additives incorporated. Submit RAP binder grading and blending charts with mix design.

Use of Virgin Binder Grades exceeding the minimums, i.e. grades with ranges encompass greater temperature ranges than required for virgin binder, is acceptable.

4.6.9.4

TABLE 4.5

Paving Grade Liquid Asphalt Requirements

AC	AC-10	AC-20	AC30
PG	58 - 28	64 - 22	70 - 16
Viscosity: 140° (60°C) poises	1,000 ± 200	2,000 ± 400	3,000 ± 600
Viscosity: 275°F (135°C), Cs-minimum	250	300	350
Penetration: 77°F (25° C), 100g, 5 sec min.	80	60	50
Flash Point: COC, C(F) minimum	219(425)	232(450)	232(450)
Solubility in trichloroethylene: percent minimum	99.0	99.0	99.0
Tests on residue from thin-film oven test:			
Loss on heating: percent - maximum (1)	0.5	0.5	0.5
Viscosity: 140°F (60°C), poises-maximum	4,000	8,000	12,000
Ductility: (77°F (26°C), 5cm per minutes), cm minimum	75	50	40

Spot test (when and as specified (2) with: Standard naphtha solvent	Negative for all grades
Naphtha-Xylene solvent, % Xylene	Negative for all grades
Hepthan-Xylene solvent, % Xylene	Negative for all grades

The use of loss on heating requirement is optional.

The use of the spot test is optional. When it is specified, the City Engineer's Representative shall indicate whether the standard naphtha solvent, the naphtha-xylene solvent, or the heptane xylene solvent will be used in determining compliance with the requirement. If xylene solvent is used the percentage of xylene shall be indicated.

4.5.10.3 **SHIPMENT OF ASPHALT MATERIAL.** Asphalt cement shall be uniform in appearance and consistency and show no foaming when heated to the specified loading temperature. Shipments of asphalt shall not be contaminated with any other type or grade of asphalt material. A bill of lading shall accompany each shipment of material and shall include the following information:

- Type and grade of material.
- Type and amount of additives used, if applicable.
- Destination.
- Consignee's name.

- Date of shipment.
- Truck identification.
- Loading temperature.
- Net weight or net gallons corrected to 60°F (16.6°C).)
- Specific gravity.
- Bill of lading number.
- Manufacturer of asphalt material.

4.5.11 HYDRATED LIME FOR ASPHALT MIXTURE. The physical properties of hydrated lime shall conform to ASTM C-1097, subparagraph d.1; use test method ASTM C-110, paragraph 6.

The water used in saturating the aggregate to be coated shall be potable or water that is clean and free of dirt, silt and other damaging material. The aggregate bulk specific gravity (saturated-surface-dry (SSD)) shall be not less than one and one-half percent (1 ½%) nor more than three percent (3%) using AASHTO T-85 for the course aggregate retained on a No. 4 (4.75 mm) sieve and AASHTO T-84 for the fine aggregate passing the No. 4 (4.75 mm) sieve. Hydrated lime shall be applied at a rate determined during the Marshall Design requirements in Table 4.6, unless otherwise directed by the City Engineer. Two options for coating the aggregate with lime are as follows:

4.5.11.1 Aggregate shall be monitored for SSD by taking a belt cut between the stockpile and the pugmill or drum. The pugmill or drum shall be equipped with metering devices that will introduce the required amount of hydrated lime and water into the mixer to produce an aggregate SSD of one and one-half percent (1½%) to three percent (3%).

4.5.11.2 Use of a lime slurry of one (1) part lime and three (3) parts water by volume may be used, if the plant is equipped with a mixing chamber that can maintain the lime suspension in the slurry. Spraybars for introducing the required quantity of slurry into the mixer shall be equipped with a positive shutoff. If this option is used the aggregate stockpile shall be maintained at two percent (2%) SSD.

Asphalt plants shall provide a positive signal system that automatically closes down the cold feed when the appropriate amount of hydrated lime and water ceases to be introduced into the aggregate. This shall be accomplished by the use of interlocked and synchronized metering devices and feeders. The plant shall be equipped in such a way that the quantity of hydrated lime incorporated into the mix can be readily checked at any time.

~~TABLE 4.6~~

~~MARSHALL DESIGN REQUIREMENTS~~

4.6.10 AGGREGATE

A. Crushed stone, crushed gravel, slag, sand, or combination.

B. Use Table 4.7 to determine suitability of aggregate source.

Table 4.8 – Aggregate Physical Properties

	Standard		**Road Class**	
~~TRAFFIC CATEGORY*~~		~~I~~	**I & II**	**III**
~~ASTM D 1559 (number of blows)~~	**Coarse Aggregate**			
~~TEST PROPERTY~~ Angularity, percent, minimum	~~MIN~~ One Fractured face	~~MAX~~ D5821	~~MIN~~ 90	~~MAX~~ 95
	Two Fractured faces		90	90
Wear (hardness or toughness), percent, maximum		C131	35	35
~~1500~~		~~—~~	~~1200~~	~~—~~
~~8~~		~~16~~	~~10~~	~~18~~
~~3~~ Flats or elongates (3:1 length to width), percent, maximum		~~5~~ D4791	~~3~~ -	~~5~~ - 20
~~VOIDS IN MINERAL AGGREGATE (VMA)~~	**Fine Aggregate**			
Angularity (uncompacted void content), percent, minimum		T304	40	45
Sand equivalent, percent, minimum		D2419	45	60
Plastic limit, maximum		D4318	0	0
Blended Physical Properties				
Dry-rodded Unit Weight, lb/ft^3, minimum		C29	~~FRACTURED FACES RETAINED ON THE NO. 4 (4.75 mm) SIEVE PER FLH DESIGNATION: T 506-94 2.1~~ 75	~~—~~ 75 ~~%~~

Weight Loss (Soundness), percent, maximum	C88	16	16
~~SAND EQUIVALENT PER AASHTO T-176-86 (1993)~~ 4.3.2, 4.3.3Friable particles, percent, maximum	~~5~~ 5C 142	~~—~~2	~~40~~2
Quantitative Analysis of Gypsum, percent, maximum	~~WEAR TEST~~ S-317 1-96 or AASHTO ~~T-96~~ T267	~~—~~2.00	~~30%~~2.00

~~DRY-RODDED UNIT WEIGHT AASHTO T-19~~	~~AM. STD.~~	~~METRIC~~	~~AM. STD.~~	~~METRIC~~
	~~75 pounds per cubic foot~~	~~1200 kg/m³~~	~~75 pounds per cubic foot~~	~~1200 kg/m³~~

~~Shall be used to determine the required amount of hydrated lime in the asphalt. The mix design shall have a tensile strength ratio of 70 percent.~~

NOTES
(a) Coase aggregate is material retained on No. 4 sieve.
(b) Fine aggregate is material passing No. 4 sieve.
(c) Sand equivalent is waived for RAP aggregate but applies to the remainder of the aggregate blend.
(d) Plastic limit, passing No. 40 sieve. Aggregate is non-plastic even when filler material is added to the aggregate.
(e) Weight loss, using sodium sulfate.
(f) Friable particles are clay lumps, shale, wood, mica, coal passing the No. 4 sieve, and other deleterious materials.
(g) Road class as identified in project documents and as defined in Table 4.6
(h) Modify AASHTO T267 by dividing the total combined water percentage by a factor of 20.93 to determine the purity of gypsum

~~Traffic Category I applies to arterial streets or truck routes with a Traffic Index of seven or more. Traffic Category II applies to streets with a Traffic Index of less than seven.~~

~~4.5.12 AGGREGATE. The requirements for crushed rock, rock dust, gravel, stone, slag, and sand are included in this subsection. All aggregate shall be clean, hard, sound, durable and uniform in quality. The quality of soft, friable, thin, elongated, laminated pieces and disintegrated materials will be determined by the supplier's professional Geotechnical Engineer at the time the mix design is submitted, at which time the City's Representative will have the option to approve or reject the material. Organic matter, oil, alkali or other salts shall not exceed two percent (2%) total weight. In the surface course this material may be restricted to less than one percent (1%) by weight.~~

~~4.5.12.1 Aggregate for three-quarter (3/4) inch (19.0 mm) Category I (NR), (see Table 4.7) shall be one hundred percent (100%) crushed material (all manufactured). This is considered a~~

~~non-rutting (NR) mix.~~

~~4.5.12.2 Coarse aggregate for three-quarter (3/4) inch standard (19.0 mm standard) and one-half inch (12.5 mm) Category II (see Table 4.7) shall be retained on the No. 4 (4.75 mm) sieve and shall have no less than seventy-five percent (75%) fractured face material as defined in FLH T 506-94 2.1.~~

~~4.5.12.3 Fine aggregate for other than the three quarter (3/4) inch NR, may be a natural or manufactured product. It shall pass the No. 4 (4.75 mm) sieve. It shall be clean, hard-grained angular, non-plastic, and have no more than two percent (2%) by weight of organic matter or other detrimental substances, including gypsum.~~

~~4.5.12.4 The test for gypsum shall be conducted using City of St. George Chemical Quantitative Analysis of Gypsum in Aggregates, Test Procedure S-3171-96.~~

~~4.5.12.5 Surface courses, or asphalt wearing courses, shall be free from organic materials and contain less than one percent (1%) by weight of soluble minerals, such as gypsum, and phosphate~~

~~TABLE 4.7~~

~~DENSE-GRADED ASPHALT AGGREGATE GRADATION~~

4.6.10.1 ADDITIVES

A. Mineral Filler: ASTM D242.

B. Recycle Agent: ASTM D4552.

C. Anti-strip Agent: Heat stable cement slurry, lime slurry, or chemical liquid as required to meet Tensile Strength Ratio (Lottman)or Hamburg test requirements.

D. RAP: Free of detrimental quantities of deleterious materials.

1. Use RAP Content as requirements of Table 2.
2. Determine RAP binder content by chemical extraction or ignition.

4.6.10.2 MIX DESIGN

A. **Preparation**:

1. Road Class as defined by Section 4.6.9.2.
2. Determine submittal requirements from paragraph 1.4C.

B. **Aggregate Gradation:** See Table 4.8. The Target Gradation Curve for the specified aggregate grade must lie within the Master Grading Band limits. The target grading band limits using the applied deviation in <> are allowed to extend outside of the Master Grading Band limits.

~~PERCENT OF TOTAL AGGREGATE PASSING (DRY WEIGHT)~~ **Table 4.9 - Master Grading Bands - Superpave Mix Design**					
~~TRAFFIC CATEGORY~~**Sieve**	~~I~~ **Gradation Limits of Target Gradation**				
	~~METRIC~~		~~19.0 mm NR~~	~~19.0 mm std.~~	~~12.5mm~~
~~AMERICAN STANDARD~~	~~SP-~~**1/2** ~~inch~~	**SP-3/8**			
	~~SIEVE SIZE~~				
	~~METRIC~~	~~AMERICAN STANDARD~~			
	~~25.0 mm~~	~~1 inch~~	~~---~~	~~---~~	~~---~~
3/4 inch 1/2 inch 3/8 inch No. 4 No. 8 No. 200	100 90.0 – 100 < 90.0 – 28.0 – 58.0 2.0 – 10.0	– 100 90.0 – 100 < 90.0 32.0 – 67.0 2.0 – 10.0			
	~~12.5 mm~~	~~1/2 inch~~	~~74 – 99~~	~~---~~	~~100~~
	~~9.5 mm~~	~~3/8 inch~~	~~69 – 91~~	~~75 – 91~~	~~---~~
	~~4.75 mm~~	~~#4~~	~~49 – 65~~	~~46 – 62~~	~~60 – 80~~
	~~2.36 mm~~	~~#8~~	~~33 – 47~~	~~---~~	~~---~~
	~~1.18 mm~~	~~#16~~	~~21 – 35~~	~~22 – 34~~	~~28 – 42~~
	~~.300 mm~~	~~#50~~	~~6 – 18~~	~~11 – 23~~	~~11 – 23~~

~~#200~~NOTES

(a) Gradation is expressed in percent passing by weight per ASTM C136. Percentage of fines passing No. 200 sieve determined by washing per ASTM C117.

(b) The numerical portion of the grade designator (1/2, 3/8) represents the ***nominal maximum*** sieve size. Comparable ***maximum*** mix designs would be one sieve size larger, i.e. ½" nominal (superpave) maximum is comparable to ¾" maximum (Marshall).

~~4.5.13~~ C. **Design Parameters:** Determined by AI SP-2 and in accordance with Table 4.9.

Table 4.10 - Mix Design Parameters	
Compaction Level (a)	Asphalt Institute SP-2
Road Class I/II	50Nd
Road Class III	75Nd
Design Air Void Target, percent (b)	3.5
Voids in Mineral Aggregate (VMA) relative to nominal sieve size grading and calculated using Gsb(dry), percent, minimum	ASTM D3203
Class II and III: SP-1/2	14.2
Class I: SP-3/8	15.2
RAP specific gravity for calculations	Gsb (dry) by chemical extraction
Dust to Binder Ratio, maximum	1.6
Tensile Strength Ratio (moisture sensitivity), minimum (a,c)	AASHTO T283
Road Class I (e)	80% or HWT
Rutting (Hamburg Rut Test) (a,d)	AASHTO T324
Road Class II	15 mm/10,000 passes
Road Class III	10 mm/20,000 passes

NOTES
(a) Road Class as identified in project documents and as defined in Section 32 01 31.
(b) Design Density Target: ASTM D2041. Percent of maximum theoretical specific gravity.
(c) Tensile Strength Ratio (moisture sensitivity): Use one cycle of Freeze-thaw conditioning. Compact test specimen to seven (7) percent plus or minus one (1) percent air voids. Applicable to Road Class I only.
(d) With testing performed at temperatures representing the specified binder grade in the Hamburg rut test, the average rut depth of two (2) mix design test samples is less than the amount shown for the respective Road Classes.
(e) TSR not required if passing Hamburg Wheel Tracker with Road Class II parameters
(f) For Class I and II Mixes, submit an alternative asphalt content target to produce a mix with a Design Air Voids of less than 2.0% for use on trails, bike paths, and other requested uses. Designate this target as the voidless mix design target.

4.6.11 STORING, MIXING AND SHIPPING OF PLANT MIX BITUMINOUS PAVEMENTS. Hot mix plants may be batch or drier-drum type plants (with not less than four aggregate bins).

4.6.11.1 ~~4.5.13.1~~ **STORAGE.** The various natural and manufactured

aggregates shall be stored separately. The various aggregate sizes shall be placed in bins which allow the material to be properly and evenly fed to the dryer to ensure a uniform flow of properly combined aggregates. When placing materials in storage bins, or when moving them from storage to the feeder, no method will be used which may cause segregation, degradation or the intermingling of different size aggregates. Materials not meeting the gradation requirements shall be reprocessed to comply with the requirements. All scales and meters shall be certified and sealed by the Utah Department of Agriculture, Division of Weights & Measures, annually and when the plant has been moved.

~~4.5.13.2 BATCH PLANT METHOD. The aggregates shall be dried and heated for sufficient time in the dryer so that the moisture content of the aggregate will not be greater than one percent (1%). The dryer shall be equipped with a calibrated thermometer to determine the temperature of the aggregate leaving the dryer. The thermometer shall be accurate to the nearest 10BF (5.5BC), and shall be installed in such a manner that a fluctuation of 10BF (5.5BC) in the aggregate temperature will be indicated within one minute and be clearly read from the operator's platform.~~

~~After drying, the aggregates shall be evenly fed to screens having clear square openings to separate, classify and quantify materials for hot storage bins. The aggregate passing these screens shall be separately stored in individual bins until proportioned into the mixer.~~

~~Each bin shall be provided with an opening to prevent overflow into adjacent bins. All overflow material shall be returned to an appropriate storage area for reprocessing.~~

~~If a substantial change is made in the cold feed to accommodate the demands of a different type of mixture, the hot storage bins shall be emptied and recharged with the correct materials.~~

~~All materials shall be proportioned by weight. The aggregate scales shall be fully automatic, solid-state digital strain-gage transducer with a capacity exceeding one and one-quarter times the total amount of materials to be weighed in one operation. Asphalt binder shall be weighed by a fully automatic scale having a capacity of not more than five hundred pounds (227kg) with one pound (0.45kg) resolution for mixers with a manufacturer's rated capacity of four thousand pounds (1814kg) or less, and a capacity of not more than one thousand pounds (454 kg) with one pound (0.45kg) resolution for mixers with a manufacturer's rated capacity over four thousand pounds (1814kg).~~

~~When bag house fines or mineral filler is used, it shall be proportioned by weight or volume. The method used shall uniformly feed the material within ten percent (10%) of the required amount.~~

~~Utah Department of Agriculture, Division of Weights & Measures, annually and when the plant has been moved.~~

~~4.5.13.2 BATCH PLANT METHOD. The aggregates shall be dried and heated for sufficient time in the dryer so that the moisture content of the aggregate will not be greater than one percent (1%). The dryer shall be equipped with a calibrated thermometer to determine the temperature of the aggregate leaving the dryer. The thermometer shall be accurate to the nearest 10BF (5.5BC), and shall be installed in such a manner that a fluctuation of 10BF (5.5BC) in the aggregate temperature will be indicated within one minute and be clearly read from the operator's platform.~~

~~After drying, the aggregates shall be evenly fed to screens having clear square openings to separate, classify and quantify materials for hot storage bins. The aggregate passing these screens shall be separately stored in individual bins until proportioned into the mixer.~~

~~Each bin shall be provided with an opening to prevent overflow into adjacent bins. All overflow material shall be returned to an appropriate storage area for reprocessing.~~

4.6.11.2 CONSTRUCTION EQUIPMENT

A. Mixing Plant: Capable of meeting ASTM D995 or UDOT Qualified Plant. Provide:

1. Positive means to determine the moisture content of aggregate.

2. Positive means to sample all material components.

3. Sensors to measure the temperature of the mix at discharge.

4. Ability to maintain discharge temperature of mix.

5. Capability of maintaining plus or minus five (5) percent tolerance on component percentages in final mix.

6. Ability to document control efforts.

~~If a substantial change is made in the cold feed to accommodate the demands of a different type of mixture, the hot storage bins shall be emptied and recharged with the correct materials.~~

~~All materials shall be proportioned by weight. The aggregate scales shall be fully automatic, solid-state digital strain-gage transducer with a capacity exceeding one and one-quarter times the total amount of materials to be weighed in one operation. Asphalt binder shall be weighed by a fully automatic scale having a capacity of not more than five hundred pounds (227kg) with one pound (0.45kg) resolution for mixers with a manufacturer's rated capacity of four thousand pounds (1814kg) or less, and a capacity of not more than one thousand pounds (454 kg) with one pound (0.45kg) resolution for mixers with a manufacturer's rated capacity over four thousand pounds (1814kg).~~

~~When bag house fines or mineral filler is used, it shall be proportioned by weight or volume. The method used shall uniformly feed the material within ten percent (10%) of the required amount.~~

4.5.12.6 Mixing shall be done with a twin shaft pug mill-type mixer and shall be operated at the speed recommended by the manufacturer. The paddles shall be of sufficient size and quantity to deliver a uniform mixture.

The weight of the material that may be mixed per batch shall not exceed the manufacturer's rated capacity of the mixer, nor exceed an amount that will permit complete mixing of all the materials. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected by reduction in the volume of materials or by repairs to the mixing equipment before any further production will be allowed.

The entire batch shall be mixed until all the materials are thoroughly blended. The batch mixing time will begin on the charging stroke of the weight hopper dump mechanism and conclude when discharge from the mixer has started. The mixer shall be equipped with a time lock which locks the mixer discharge gate for the mixing period and actuates an indicator light visible from the operator's platform.

The aggregate and liquid asphalt drop time into the mixer shall not exceed ten seconds and the time for mixing materials will not be less than thirty seconds per batch. If the City's Representative determines that the mixture is not thoroughly blended, and all aggregate properly coated with asphalt cement, the mixing time will be increased to produce a homogeneous material.

The weight-box housings and mixer platform shall provide safe and convenient access with properly sized gates and tracks for sampling the discharged materials.

4.5.13.3 DRIER-DRUM METHOD. When a drier-drum is used, aggregate shall be fed directly to the mixer drum at a uniform rate, and monitored for combined aggregate moisture and gradation by taking belt cut samples. A minimum of one moisture content check and gradation test per day and one moisture and gradation test per five hundred tons (551 tonne), or as conditions require, shall be made. The results of these tests shall be kept on logs for review by the City's Representative. Sampling and testing may be performed by the manufacturers properly trained and equipped staff or by an approved testing lab. If sampling is performed by the manufacturer, five percent of the samples shall be split and a testing firm approved by the City shall verify that the test results accurately represent the product being tested by the manufacturer. The sample to be split may be selected at random by the manufacturer's quality control team, or the City's Representative.

If the cold feed material gradation is outside the allowable mean of deviations of the approved mix design as determined in Section 4.5.24, production shall be stopped until the necessary corrections are made. If the moisture content of the cold feed reaches five percent, production shall be stopped until certified by an approved independent materials testing firm under the direction of a Registered Professional Engineer, licensed in the state of Utah. This firm shall then be employed to provide continuous plant quality control and testing, and production may be resumed.

All production shall be prohibited if the cold feed material reaches seven percent moisture, without exception. During lay down operations, if in the opinion of the City's Representative excess moisture is present in the asphalt material, it shall be sampled and tested for moisture under AASHTO T-164-94 Note-6 or ASTM D 2172-93 Note 3. Asphalt found to contain excess moisture shall be removed in its entirety and properly disposed of.

~~The drier-drum shall be equipped with a calibrated thermometer to determine the temperature of the mixed materials leaving the drum. The thermometer shall be accurate to the nearest 10°F (5.5°C), and shall be installed in such a manner that changes of 10°F (5.5°C) in temperature of the mixed material will be shown within one minute and be clearly read from the operators station.~~

~~Asphalt cement shall be measured through a meter under constant pressure with a gage indicating the pressure and temperature at all times. This metering system shall be calibrated and certified for accuracy every six months, or whenever the plant is moved.~~

~~During any day's run, the temperature of asphalt cement shall not vary more than 50°F (10C). If the meter loses pressure the operator's computer shall be equipped to warn the operator or automatically shut down the system.~~

~~The aggregate feeders for each material in the mixture and for the combined aggregates shall be equipped with devices by which the rate of feed can be determined while the plant is in full operation. The combined aggregate shall be weighed on a belt scale. The scale shall be of such accuracy that, when the plant is operating between thirty percent and one hundred percent of belt capacity, the average difference between the indicated weight of the material delivered and the actual weight delivered will not exceed one percent of the actual weight for three two-minute runs. For any of the three individual two-minute runs, the indicated weight of material delivered shall not vary more than two percent from the actual weight delivered.~~

~~The belt scale for the combined aggregate, the other proportioning devices for additives and the asphalt cement proportioning meter shall be interlocked so that the rates of feed will be automatically adjusted to maintain the proper material ratios as designated by the approved mix design. The plant shall not be operated unless this automatic system is operable and in good working condition.~~

~~The asphalt cement meters, additive feeders and aggregate belt scales used for metering the aggregate additives and asphalt cement into the mixer shall be equipped so that the actual quantities of asphalt cement, additives and aggregate introduced into the mixture can be determined.~~

~~Mixing shall be performed for sufficient time, and at a sufficiently high temperature, so that at discharge from the mixer, the sizes of aggregates are uniformly distributed throughout the completed mixture and all particles are thoroughly and uniformly coated with asphalt cement.~~

~~Temperature of the completed mixture at discharge from the drum shall not exceed 325BF (163BC) for all dense-graded mixes using AC-10, AC-20 and AC-30 grades of asphalt cements. Maximum temperatures for open- graded mixes using AC-20 and AC-30 shall not exceed 275BF (135BC). Open-graded mixes using AC-20R shall not exceed 325BF (163BC).~~

~~The mixed material shall be discharged from the drum into a surge silo of not less than forty tons in capacity. The manufacturer shall also provide a means of diverting the flow of material away from the silo, when starting and stopping the plant production, to prevent incompletely or improperly mixed portions of the mixture from entering.~~

~~Paving grade asphalts shall be added to the aggregates, in both batch and drier-drum plants, at a temperature between 285BF (140BC) and 350BF (177BC). The temperature of the aggregates at the time of adding the asphalt cement shall not be less than 265BF (130BC), nor more than 325BF (163BC). A thermometer with a 500BF (260BC) capacity, and accurate to 10BF (5.5BC) will be~~

~~fixed in the asphalt cement feed line or storage tank at a suitable location to view when sampling the asphalt. The manufacturer will provide a suitable sampling outlet in the asphalt cement feed lines connecting the storage tank(s) to the asphalt cement meter. The sampling valve shall consist of a one-half inch (12.7 mm) or three- quarter inch (19 mm) valve constructed in such a manner that a one quart (.95 liter) sample may be withdrawn slowly at any time during plant operations. The sampling valve shall be placed in the least hazardous location that is readily accessible. A drainage receptacle shall be provided for flushing the valve prior to sampling. One gallon (3.8 liters) shall be drawn from the sampler prior to taking the sample.~~

~~4.5.14 ASPHALT CONCRETE SURGE AND STORAGE SILOS. The type of conveying equipment used to deliver the hot-mix asphalt from the discharge chute on the drier-drum mixer or from the hopper under the pugmill may be either a variable or constant speed - bucket elevator, drag slat conveyor or hot material belt conveyor.~~

~~The manner in which the mix exits from the conveyor or elevator and enters the top of the silo, shall be such as to prevent segregation of the completed asphalt mixture. Properly installed, maintained and operated systems such as rotating spreader chutes, batchers and gob hoppers are all acceptable segregation prevention systems. Splitter systems, or a series of baffles, may be used providing they are approved by the City's Representative.~~

~~Silos shall be cylindrical with conical bottoms providing a minimum angle of 55B and maximum angle of 70B. The gate opening in the bottom shall be sized to work with the angle of the cone to prevent center draw down resulting in material segregation.~~

~~Heated or insulated surge silos are not required, however, a heated discharge cone is preferred.~~

~~The asphalt mixture that develops lumps, hardening or chills below 250B (120BC) while the mix heats the silo and discharge cone, shall not be used. All surge silos shall be emptied of mix at the end of each production day.~~

~~Storage silos shall be well insulated and equipped with heated discharge cones and well sealed discharge gates. Dense-graded asphalt may be stored up to forty eight hours in silos with heated cones, and seventy-two hours with heating of the silo vertical walls and cone.~~

~~Storage silos may be used for storage or surge purposes, but under no circumstance may a surge silo be used for storage. Either silo must be equipped with high and low indicator systems.~~

4.6.12 ~~4.5.15~~ **SHIPPING ASPHALT MIXTURES.** Trucks used for hauling mix shall have tight, clean, smooth beds which are treated to prevent the mix from adhering to the bed. Amounts of solution that form visible pools in the truck bed shall be removed prior to loading asphalt mix. Diesel is not permitted as a release agent.

Asphalt mix shall be deposited in a mass into the haul truck or loading hopper from the silo. The gates on the bottom of the silo cone shall open and close quickly. To prevent segregation, it is also necessary for the gates to open completely so that the flow of mix is unrestricted. The mix shall be delivered in evenly divided drops into the length of the truck bed. In no case shall the truck be loaded continuously by the truck driver moving forward under the silo as the mix is being discharged.

Multiple drops of small quantities or dribbling mix into the haul vehicle at the end of the main delivery should be avoided to prevent segregation.

For each batch delivered to site provide a paper or electronic (e-ticket) delivery ticket with the following:

1. Date and project description.
2. Producer and plant.
3. Name of contractor.
4. Serial number of ticket.
5. ~~16~~ Mix identification number or code.
6. Truck number and time dispatched.
7. Weight of mix delivered.

4.6.13 SURFACE PREPARATION FOR ASPHALT OVERLAYS. Prior to placing asphalt overlays, all manholes, utility covers, monuments and other items affected by the paving operations shall be located, referenced and protected. The existing asphalt surface shall be thoroughly cleaned of all deleterious materials and brought to a uniform grade by spot leveling or by the application of a bituminous leveling course to the surface. A bituminous tack coat shall be applied to the existing prepared surface immediately prior to placing the finish asphalt course in accordance with Section 4.~~5.9~~6.8 of these specifications.

4.6.14 ~~4.5.17~~ **ADJUSTMENT OF MANHOLE AND UTILITY COVERS.** Prior to paving
and after roadbase is placed, all manholes and utility covers shall be brought to the base grade. Damaged valve boxes, covers, grade rings, cones, flattops**,** risers, etc. replaced. Manhole cones or flattops that are more than eighteen inches below finish grade shall be raised by using risers etc. under the cone or flattop. Existing roadbase shall not be contaminated with soil or subbase. Backfill material around adjusted manholes and utilities shall comply with roadbase standards meeting Section 4.~~5.7~~6.8 of these specifications, and be compacted to ninety five percent as determined by ASTM D-~~1557-78 or~~1557or AASHTO T-180 Method D. When paving is complete, all manhole and utility covers shall be raised to finished grade, including concrete collars, in accordance with standard requirements.

4.6.15 ~~4.5.18~~ **ASPHALT PAVING EQUIPMENT.** A self-propelled paver with a screed unit that provides a smooth, steady pull on the screed arms shall be used. The screed unit shall strike off, partially compact, and iron the surface of the mat at least twelve feet (3.7 m) wide. The screed unit shall be equipped with automatic controls and heaters and vibrators. The screed plate must be smooth and not excessively worn. All screed extensions shall be ridged, or hydraulically extendable. The screed extensions shall maintain the proper elevation and angle of attack to the main screed at all times and shall also be heated and provide vibration. Augers shall adequately feed all areas of the extended screed.

The automatic screed controls shall be full contact electronic or non-contact ultrasonic grade control systems. These systems shall be adaptable to a floating-beam system a minimum of thirty feet long. The floating-beam shall be equipped with shoes that are allowed to rotate and can be individually displaced by isolated disruptions in the existing surface without changing the height of the whole beam. The automatic grade sensor shall be set at the midpoint of the floating beam.

Ultrasonic grade control systems may be used without the floating beam on all Traffic Category II streets unless otherwise directed. The ultrasonic grade- control system must meet the following conditions in order to be used without the floating beam.

4.6.15.1 ~~4.5.18.1~~ The system shall be equipped with a "self--diagnostic" function that continuously monitors all system functions and shuts the system down if an error in the system occurs. It shall also be equipped with a "reference bail" to electronically compensate for differences in air and ground temperature with a minimum operating range not less than zero to 160 degrees F. (-18 to 71 degrees C.).

4.6.15.2 ~~4.5.18.2~~ The system shall perform to a minimum of the following specifications:

Ultra sonic grade controller:	
On-grade tolerance	±0.01 foot
Resolution	0.001 foot
Operating range	10 in. to 42 in.
Mat thickness control	- 0.01 foot
Slope controller:	
Correction window	- 1.0%
On-grade tolerance	- 0.1%
Resolution	- 0.01%
Operating range	±0.0% to 100%.

The systems meeting the above requirements must be properly installed on a "tight," properly maintained self-propelled paver with a screed unit. A "tight" system shall meet the equipment manufacturer's service specification tolerances for all controlling surfaces and connecting points that affect the ability of that specific type of equipment to provide proper grade control.

The ~~City's Representative~~city has the right to prohibit the use of such equipment if in his opinion the equipment has not been properly maintained or is not being properly operated.

If the automatic grade control becomes inoperative, the Contractor may

finish the day's work using manual controls provided the required grade, thickness and smoothness tolerances are met. Paving shall not continue on the project, or any new project, until the automatic control system has been repaired.

4.6.16 ~~4.5.19~~ **ROLLERS.** Rollers shall be vibratory, steel-wheeled double-drum with a static weight of not less than 10 tons (9.10 tonnes) for breakdown rolling. Pneumatic-tired rollers with a minimum operating weight of two thousand pounds (907 kg) per tire shall be used for intermediate rolling and leveling course compaction. The roller shall be in good condition, and capable of reversing without backlash. The number of rollers shall be sufficient to compact the asphalt mixture before it cools below 175°F (80°C). Finish rolling may be performed with the breakdown roller in the static mode, or with a steel-wheeled roller of sufficient size to remove the roller marks in the finished surface. If a roller breaks down and a back-up roller is not available, paving operations shall stop until adequate rollers are available.

4.6.17 ~~4.5.20~~ **WEATHER AND DATE LIMITATIONS.** Asphalt shall not be placed during the period from December 1st through February 15th unless otherwise the Contractor has submitted a Cold Weather Paving Plan approved by the ~~City Engineer~~city. Paving approved during this time shall conform to winter paving requirements and policies. Minor repairs and patching will be allowed during winter months. Cold Weather Paving Plans must include the following at a minimum:

a. Haul details.
b. Placement details.
c. Compaction aids used in production.
d. Additional equipment and procedures for achieving compaction.
e. Coordination procedure for acceptance testing.

The asphalt mixture shall not be placed upon any wet surface, or when the air and surface temperature of the underlying course is less than specified in Table 4.~~8~~10. The temperature requirements may be modified, but only when so approved and directed by the ~~City Engineer.~~city. Open-graded asphalt mix shall be placed only when the air temperature is 70°F (~~21C~~21°C) and rising, and the surface temperature is a minimum of 60°F (16°C). Air and roadbed temperature shall be measured in the shade. Asphalt mixtures shall not be placed during adverse weather conditions such as rain, wind, hail, etc.

~~TABLE 4.8~~
~~Climate Limitations~~Table 4.11 – Minimum Pavement Temperature in Degrees F.

~~Mat Thickness~~ ~~Wink of 5 mph or Less~~**Air Temperature Deg F**	~~Minimum Air and Surface Temperature~~**Compacted Mat Thickness**					
~~3 inches or greater~~			~~40*~~			~~4*~~
	3/4"	**1"**	**1-1/2"**	~~Greater than 2 inches, but less than 3 inches~~ **2"**	~~45~~ ***3"**	~~7*~~**4"+**
~~45 –~~ 50~~*~~ ~~50 - 59~~ ~~60 - 69~~ ~~70 - 79~~ ~~80 - 89~~ ~~90 +~~	~~10 *~~ ~~– – 285~~ ~~280~~ ~~275~~ ~~270~~	– – 285 280 275 270	– – 285 280 270 265	– 280 275 270 265 260	280 270 265 265 260 250	265 255 250 250 250 250
~~Open graded asphalt mix~~			~~70*~~			~~21*~~

~~4.5.21~~ If a warm mix additive or manufacturing process is used, delivery temperature may be reduced by 15°F, but not below 250°F. This temperature may be reduced further upon the completion of a successful test section using the modification.

4.6.18 SPREADING AND FINISHING. The asphalt mix shall be placed upon an approved surface, by a self-propelled paver meeting the requirements in Section 4.5.18. The travel rate of the paving machine shall be regulated to a speed dependent upon the capacity of the mixing plant and/or trucking service to supply the mixture. The paving machine shall be operated so that material does not accumulate and cool below 250˚F (121˚C) along the sides of the receiving hopper.

Where unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture may be spread, raked with hand tools, and mechanically compacted. For such areas, the mixture shall conform to the required mix design, density, compacted thickness, grade and cross section.

The asphalt mix may be windrowed in front of the self-propelled paver properly equipped to transfer the asphalt mix directly into the hopper, provided that the following conditions and requirements are strictly adhered to.

4.6.18.1 ~~4.5.21.1~~ The windrow is properly sized, thereby insuring the delivery of the correct amount of material to the paving machine at all times.

4.6.18.2 ~~4.5.21.2~~ The asphalt mixture shall be transferred from the windrow to the paving machine in such a manner that the materials in the paver will be a uniform mixture. The base, upon which the windrow was formed, shall not be disturbed. There shall be a minimum amount of asphalt mixture remaining on the base between the pickup device and the paving machine.

4.6.18.3 ~~4.5.21.3~~ The material in the hopper of the paving machine shall meet with the temperature requirements. Asphalt mixture that does not meet the minimum specified temperatures shall not be used, and shall be properly disposed of.

When it is determined by the ~~City Representative~~city that the asphalt course being placed by use of a windrow is inferior to that being placed by direct transfer of the asphalt from the hauling vehicle to the spreading machine, the use of the windrow method shall be discontinued.

The asphalt mixture placed by the use of a paving machine during one day's operation shall come from a single plant manufacturer. Intermixing from more than one source shall not be allowed. Intermixing is defined as when more than one plant is used as a routine supply source to a single operation.

The asphalt mixture shall have a temperature not less than ~~270BF (132BC~~270°F (132°C) nor more than ~~325BF (163BC~~325°F (163°C), at the time the paving machine places the asphalt mixture on grade. Depending on environmental conditions and compaction requirements, the ~~City's Representative~~city may specify more strict temperature requirements.

Asphalt pavement courses of more than three inches in total compacted thickness shall be placed in two or more courses. One course shall not be placed over another course until the compaction requirements have been met and the mat temperature has cooled to ~~160BF (71BC~~160°F (71°C) at mid-depth.

Placing of the asphalt pavement shall be as continuous as possible. Rollers should not pass over the unprotected edge of the freshly laid

asphalt mixture. Transverse joints shall be formed by cutting back on the previous run to expose the full depth and proper grade of that course. A tack coat meeting Section 4.~~5.9~~6.8 of these specifications shall be applied on the contact surface of the prepared transverse joints just before the new asphalt mixture is placed.

Longitudinal joints shall be spaced in such a manner that joints in succeeding courses will be offset at least twelve inches horizontally from joints in any preceding course. Lanes will be evened up each day to minimize cold longitudinal joints and to provide proper transverse joints. Where possible, the top course longitudinal joints shall be placed a minimum of one foot either side of the lane line.

Transverse joints shall be spaced in such a manner that joints in succeeding passes will be a minimum of five feet horizontally from joints in any adjacent pass.

Existing roadway pavements to be widened shall be sawcut far enough into the roadway to provide the proper grade, cross-section and thickness with a straight vertical longitudinal or transverse joint. These joints shall have a tack coat meeting Section 4.~~5.9~~6.8 of these specifications applied on the contact surface immediately prior to paving.

Longitudinal joints on previously compacted passes should have an overlap of new asphalt mixture one to one and one-half inches over the existing mat. Raking should be merely to "bump" the joint, pushing the asphalt mixture off the previous pass and onto the new pass directly over the joint. If the adjacent mat is overlapped too far and too much asphalt mixture is deposited on the existing mat, the excess material shall be pulled away from the new mat rather than being pushed onto the new mat. Excess mix shall never be broadcast across the newly ~~layed~~laid asphalt. The excess mix shall be picked up and recycled.

4.6.19 ~~4.5.22~~ **ROLLING AND COMPACTING.** Compaction equipment shall meet the requirements of Section 4.5.~~19~~16 of these specifications, unless otherwise approved or required by the ~~City's Representative~~city.

A pass shall be one movement of a roller in either direction. A coverage shall be as many passes as are necessary to cover the entire width being paved. Overlap of passes during any coverage, made to ensure compaction without displacement of material shall be in accordance with good rolling practice.

The breakdown rolling shall consist of one or more complete coverages of the

asphalt mat with a vibratory steel-wheeled roller. Initial rolling shall commence at the lowest edge and shall progress toward the highest portion of the asphalt mat. Initial rolling shall not commence on the interior portion of any mat.

The breakdown rolling shall be followed immediately by additional rolling with a pneumatic-tired roller that will provide uniform density throughout the depth of the course being compacted. A minimum of two rollers, one steel-wheeled, and one pneumatic-tired, shall be used. However, the total number of rollers used beyond the minimum of two shall be sufficient to obtain the required compaction while the asphalt mixture is above ~~175BF (80BC~~175°F (80°C).

The final rolling of the asphalt mixture shall be performed by a steel wheel roller of sufficient size to remove all roller marks caused during the compaction of the asphalt mixture. The vibratory roller used for breakdown rolling may be used as the finish roller provided it is operated with the vibratory unit turned off.

The rollers shall be kept in continuous motion while rolling so that all parts of the asphalt mixture will receive as close to equal compaction as possible. The roller speed shall be slow enough at all times to avoid displacement of the pavement. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected immediately by use of rakes and fresh asphalt mixture when required.

To prevent adhesion of the asphalt mixture to the rollers, the wheels/tires, bars, pads and release agent pumps shall be kept properly maintained.

The use of diesel oil on pneumatic-tired rollers shall be kept to a minimum and used only in conjunction with coca pads to prevent the asphalt mixture from adhering until the tires heat enough to prevent mix adherence.

The completed surface shall be thoroughly compacted, smooth and free from ruts, humps, depressions, or irregularities. Any ridges, indentations or other objectionable marks left in the surface of the finished pavement shall be eliminated by rolling or other means. The use of any equipment that leaves ridges, indentations, or other objectionable marks in the asphalt surface shall be discontinued, and acceptable equipment shall be furnished.

Compacting the longitudinal joint shall be performed by placing the roller on the hot uncompacted mat and overlapping the joint by a distance of approximately six inches over the cold compacted mat. For proper compaction, the level of the uncompacted mix at the longitudinal joint must be above the elevation of the compacted mix by an amount equal to one- quarter inch for each one inch of compacted pavement. This ratio is “rule of thumb” and may vary slightly depending on the type of asphalt mix and the supplier. A test strip is advisable.

A good source of information for rolling asphalt is a document by AASHTO, FAA, Federal Highway Administration and the National Asphalt Pavement Association entitled "AC 150/5370-14, Appendix 1, July 31, 1991". The following information is taken from that document.

1. Rolling From The Cold Side - It was common practice in the past to do the initial rolling of the longitudinal joint from the cold (previously placed mat) side of the joint. The major portion of the weight of the roller was supported by the cold, compacted mat. Only six inches or so of the width of the roller hung over the fresh mat, compressing the mix along the joint. The majority of the compactive effort was wasted because the roller essentially was applying its compactive effort to an already-compacted asphalt material.

   During the time that the roller was operating on the cold side of the longitudinal joint, the mix on the hot side of the joint, and the rest of the mix in the course being laid, was cooling. Depending on the environmental conditions and the thickness of the mix being placed, the process of compacting the joint from the cold side often proved to be detrimental to the ability to obtain density on the whole pavement layer.

   The reason often given for rolling the joint from the cold side of the joint was that this compaction method allowed the rollers to "pinch" the joint and obtain a higher degree of density. There is no evidence that this is true.

2. **Rolling From The Hot Side** - The most efficient way to compact the longitudinal joint is to put the roller on the hot mat and overlap the joint by a distance of approximately six inches over the cold mat. This places the majority of the weight of the compaction equipment where it is needed. The mix at the joint is still pushed into the joint area by the roller as long as the elevation of the new mix at the joint is proper. The longitudinal joint can be compacted effectively by keeping the roller on the new mix, instead of on the previously compacted mix. Any type of roller used for the breakdown rolling of the mix can be employed to compact the longitudinal joint as long as the elevation of the mix at the joint is above the level of the cold mat and the mix is still hot.

   Sometimes the first pass of the roller is completed with the edge of the machine about six inches inside of the longitudinal joint. The theory behind this method of compaction is that the mix will be shoved toward the joint by the roller, and better compaction will be obtained. If the mix being placed is stable enough, the roller

should not be able to move the material laterally to any significant degree. If the mix design is proper, this method of compacting the joint does not provide any advantage over moving the first pass of the roller outward one foot (from six inches inside the joint to six inches outside the joint). Rolling the mat by lapping the roller over the adjacent old pavement typically is the more efficient way to provide roller coverage for the whole pavement width.

4.6.20 ~~4.5.23~~ OPEN-GRADED WEARING COURSE.

4.6.20.1 ~~4.5.23.1~~ WEARING COURSE. An open-graded wearing course shall be placed over a dense-graded asphalt course. The dense-graded asphalt shall be true to line and grade, cleaned and tacked.

The following specifications shall be complied with:

Item	Section
Dense-graded asphalt	4.5.10
Tack Coat	4.5.9
Asphalt Cement for (existing road) Overlays	Table 4.~~10~~ 12
Asphalt Cement for New Construction	4.5.10.2
Hydrated Lime	4.5.11
Other related requirements	

Aggregate gradation shall conform to Table 4.~~9~~11 when tested under AASHTO T-30.

The percent passing the No. 200 (.075 mm) sieve will be determined by using AASHTO T-11, test procedures.

That portion of aggregate retained on the No. 4 (4.75 mm) sieve shall have no more than ten percent rounded particles when tested in accordance with UDOT Test Procedure 8-929.

TABLE 4.~~9~~12
Open-Graded Asphalt Gradation

Sieve Size		Ideal Gradation Percent Passing	Ideal Gradation Tolerance
American	Metric		
½ inch	12.5 mm	100	0
3/8 inch	9.5 mm	96	93-100
No. 4	4.75 mm	40	35-45
No. 8	2.36 mm	17	13-21
No. 200	.075 mm	3	1.3 - 4.7

TABLE 4.~~10~~13 Rubberized Liquid Asphalt Requirements			
AC-20R:			
Property	ASTM	Specification	
Viscosity @ 140EF, poise	D-2171	1,600	2,400
Viscosity @ 275EF, cs	D2170	325	
Pen @ 77EF (100 g, 5 sec)	D-5	70	
Flash Point, EF, C.O.C.	D-92	450	
Duct. @ 39.2EF, (5 cm/min)	D-113	50	
Cm		2.0	
Rubber, Weight %	*	110	
Toughness, in-lb	*	75	
Tenacity, in-lb	D-2872		
Rolling Thin-Film Oven Test	**		
Tests on Redsidue:		8.000	
Viscosity @ 140EF, pois	D-2171	25	
Duct. 39.2EF, (5 cm/min)	D-113		
Cm			
*Benson Method of Toughness and Tenacity: Scott Tester, inch-pounds @ 77EF, 20 inches per minute pull. Tension head 7/8-inch diameter			
** TFOT ASTM D-1754 may be used. The Rolling Thin-Film Circulating Oven Test is the preferred method.			

4.6.20.2 ~~4.5.23.2~~ **SUITABILITY OF AGGREGATE.** The following requirements shall be used to determine the suitability of the aggregate during the mix design:

4.6.20.2.1 Wear shall not exceed thirty percent when tested in accordance with AASHTO T-96.

4.6.20.2.2 The weighted loss shall not exceed twelve percent by weight when subjected to five cycles of sodium sulfate tested in accordance with AASHTO T-104.

4.6.20.2.3 Aggregates consisting mainly of carbonate type rocks shall not be used unless approved by UDOT as satisfactory long-term friction values for comparable traffic volumes when tested in accordance with AASHTO T-242 or ASTM E-274-79.

Aggregates shall be separated into two or more sizes and stored separately.

Stockpiling or handling methods that cause segregation, degradation or the combining of materials of different sizes when placing the aggregate in storage or moving it from storage to the cold bins shall not be used. Any segregated or degraded material shall be re-screened.

4.6.20.3 ~~4.5.23.3~~ **MIX DESIGN.** Annual mix designs shall be submitted in writing to the ~~City Engineer~~city for approval two weeks prior to the first job each calendar year, or upon selection of new aggregate sources. Any revisions to the approved mix design shall fall within the requirements listed above. Open-graded wearing courses that do not meet the tolerances shown in Section 4.~~5.24~~6.20 shall be removed and replaced with material meeting the required gradation. The asphalt cement shall be within 0.10 percent of the mix design. At no time shall the asphalt cement content be such that asphalt slicks form on the surface of the roadway.

Based on the mix design, the open-graded wearing course shall have a tensile strength ratio of seventy (70) percent, or greater, in accordance with AASHTO T-283 UDOT modified. Hydrated lime or anti-stripping agent may be added to the asphalt mix to meet the minimum tensile strength of seventy (70) percent.

4.6.20.4 ~~4.5.23.4~~ **MIXING.** The mixing shall be done as specified in Section 4.~~5.13~~6.20. The mineral aggregate will be considered satisfactorily coated with asphalt when all particles are coated. During mixing the viscosity of asphalt shall be maintained between four hundred and nine hundred centistokes. The viscosity of polymer-modified asphalt, when used, shall be maintained between one hundred fifty and three hundred (150-300) centistokes.

If a drier-drum mixing process is used, the temperature of the mixture shall not be less than ~~220BF (104BC~~220°F (104°C), or more than ~~275BF (135BC~~275°F (135°C), when discharged from the mixer. When using a polymer-modified asphalt the temperature of the mixture when discharged from the mixer, shall be maintained between ~~270BF (132BC~~270°F (132°C) and ~~320BF (160BC~~320°F (160°C). Viscosity will be determined in accordance with ASTM T-201.

4.6.20.5 ~~4.5.23.5~~ **SURFACE PLACEMENT.** Tack coat shall be applied in accordance with Section 4.~~5.9~~6.8.

Self-propelled asphalt paving equipment and automatic screed controls meeting the requirements of Section 4.~~5.18~~6.15 shall be used. Rollers

shall meet the requirements of Section 4.~~5.19~~6.16 and shall be a ten ton (9.10 tonne) vibratory operated static or a ten ton (9.10 tonne) static steel ~~wheeled roller for asphalt pavement finishing.~~

wheeled roller for asphalt pavement finishing.

Paving operations should be planned such that all passes will be brought even “transversely” at the end of each working day. Joints between old and new pavements, or between successive days worked shall ensure continuous bond between adjoining work. Construct joints to have the same texture, density, and smoothness as other sections of the bituminous pavement course. Clean contact surface and apply tack coat.

Offset longitudinal joints a minimum of 12 inches in succeeding courses and at least 6 feet transversely to avoid vertical joints through more than one course. In the top course restrict longitudinal joint to 1 foot either side of the lane line. Prevent traffic, including construction traffic, from crossing vertical joint edges.

Excessive rolling shall not be allowed. Wearing course compaction shall be completed prior to the mix temperature drop below 180°F (82°C). When using polymer-modified asphalt, compaction shall be completed prior to the mix temperature dropping below ~~200 (93C).~~ 200°F (93°C).

Asphalt slicks shall be raked immediately. Slick spots that cannot be removed by raking, shall be replaced. All humps or depressions exceeding tolerances shall be corrected. Correction methods shall be approved by the ~~City's Representative.~~ city. All traffic shall be prevented from traveling on the completed wearing course until it has hardened sufficiently and the surface temperature has dropped below 160BF (71BC). The thickness of the compacted wearing course shall not vary more than one-quarter inch (6.35 mm) from the specified thickness. Testing and acceptance shall conform to Section 4.5.24.

4.6.21 ~~4.5.24~~ ACCEPTANCE TESTING REQUIREMENTS AND TOLERANCES. The following subsections list the requirements for testing and acceptance for subbase, roadbase, RAM, dense-graded asphalt, open graded asphalt and asphalt pavement surfaces. Testing documentation shall fully address the requirements of these standards.

4.6.21.1 ~~4.5.24.1~~ SUBBASE. The following will be required for testing and acceptance of subbase:

A. One moisture/density test per seven thousand square feet of roadway, or fraction thereof.

B. One thickness test hole per five thousand square feet.

C. One gradation test per fifteen thousand square feet of roadway, or fraction thereof. The allowable deviations from the approved subbase targets are as follows:

SIEVE SIZE ~~AMERICAN (METRIC)~~	ACCEPTABLE LIMIT ~~ALLOWABLE DEVIATION~~	SUSPENSION LIMIT
2~~" (50.80 mm)~~" to 6~~" (152.4 mm)~~"	± 12.~~1~~%	± 15%
~~½" (12.5 mm)~~1/2" to 1~~" (25.0 mm)~~"	± ~~10.8~~11%	± 15%
3/8~~" (9.5 mm)~~"	± ~~9.8~~10%	± 15%
No. 4 ~~(4.75 mm)~~	± ~~8.8~~9%	± 14%
No. 16 ~~(1.18 mm)~~	± ~~6.9~~7%	± 11%
No. 200 ~~(.075 mm)~~	± ~~2.9~~3.0%	± 4.5%

C.1 ~~C.1~~ One sand equivalent *(SE)* value for every gradation outside the allowable deviation. A CBR ~~or R-~~value shall be performed on twenty~~-~~five percent (25%) of all sand equivalent test results with a minimum of one test required. Where multiple SE tests are run, the CBR ~~or R-~~value shall be determined on those SE ~~tests~~test that exhibit the lowest values.

The ~~Following Are~~following are the Minimum Values for Roadway Subbases.

- The minimum acceptable SE value shall be ~~eighteen.~~twenty-two (22)

~~The minimum acceptable R-value shall be sixty.(1)~~

- The minimum acceptable CBR value shall be ~~8.8.(2)~~70

Note 1: ~~R-value test: AASHTO T-190 or ASTM D-2844 (300 psi exudation pressure) Note 2:~~ CBR Value Test: AASHTO T-193, (3 point)

~~4.5.24.2~~ C.2 If more than two sample gradations from a project exceed the Suspension Limit or fail to meet the minimum acceptable CBR value, the subbase is unacceptable and shall be removed and replaced with acceptable subbase.

4.6.21.2 ROADBASE ~~AND RECYCLED AGGREGATE MATERIALS (RAM).~~

A. One moisture/density test per seven thousand square feet of roadway, or fraction thereof.

B. One thickness test hole per five thousand square feet.

C. One gradation test per fifteen thousand square feet of roadway, or fraction thereof. The allowable deviation from the approved roadbase ~~and RAM~~ targets are as follows:

SIEVE SIZE ~~AMERICAN (METRIC)~~	~~ALLOWABLE DEVIATION~~ACCEPTANCE LIMIT	SUSPENSION LIMIT
~~½" (12.5 mm) to 1" (25.0 mm)~~1/2" TO 1"	± ~~10.8~~11%	± 15%
3/8~~" (9.5 mm)~~"	± ~~9.8~~10%	± 15%
No. 4 ~~(4.75 mm)~~	± ~~8.8~~9%	± 14%
No. 16 ~~(1.18 mm)~~	± ~~6.9~~7%	± 11%
No. 200 ~~(.075 mm)~~	± ~~2.9~~3.0%	± 4.5%

~~C.1 One sand equivalent (SE) value for every gradation outside the allowable deviation. A CBR or R-value shall be performed on twenty five percent of all sand~~

~~equivalent test results with a minimum of one test required. Where multiple SE tests are run, the CBR or R-value shall be determined on those SE tests that exhibit the lowest values.~~

~~The Following Are the Minimum Values for Roadbase and RAM.~~

~~The minimum acceptable SE value shall be twenty-two.~~

~~The minimum acceptable R-value shall be seventy-six.(1)~~

C.1 ~~The~~If roadbase gradations exceed the Suspension Limit or fail to meet the minimum acceptable CBR value, the material shall be considered unacceptable and must be removed and replaced with acceptable roadbase at the Contractor's expense.

The geotechnical firm shall notify the city and the city will remove the roadbase source from the City's Approved Supplier List if any of the following conditions occur:

- A gradation test result exceeds the Suspension limit;
- A CBR value does not meet the minimum acceptable ~~CBR~~ value ~~shall be 14.5.(2)~~;

~~Note 1: R-value test: AASHTO T-190 or ASTM-D 2884 (300 psi exudation pressure) Note 2: CBR Value Test: AASHTO T-193, (3 point)~~

- ~~4.5.24.3~~ Fifty percent (50%) of more of gradation test results on a project exceed the Acceptance Limit; or
- Four (4) or more consecutive gradation test results exceed the Acceptance Limit.

The supplier shall not furnish roadbase for any City projects until a quality control plan has been submitted, acceptable quality control results have been demonstrated, and the city has provided written re-approval of the source.

4.6.21.3 DENSE-GRADED ASPHALT PAVEMENTS ACCEPTANCE.

~~A. One density test per seven thousand square feet of surface area, or fraction thereof.~~

~~B. One core sample per nine thousand square feet, or fraction thereof, unless sufficient inspection has been made by the City's Representative to verify required thickness.~~

~~C. One extraction and gradation test per days work, or one for every five hundred tons or fraction thereof, whichever is greater.~~

~~In the event that the asphalt pavement fails to meet the allowable deviation for extraction or gradation tests, or shows a tendency under traffic loading to rut, tear, or distort, or in the opinion of the City's Representative is "tender" or deficient in appearance, the asphalt pavement shall be cored and tested in accordance with AASHTO T-283-89 or ASTM D 4867-92 including Note 5.~~

~~The asphalt pavement must possess seventy percent of the tensile strength ratio based on the approved Marshall mix design. Asphalt pavement not meeting this requirement shall be removed.~~

~~The maximum allowable deviations from the approved Marshall mix design are:~~

Acceptance testing shall be performed by an Accredited Laboratory. Verify laboratory complies with ASTM D3666 or AASHTO R-18

Submit Acceptance data to the Engineer within 3 working days after completion of each day of paving or prior to the start of the next paving day, whichever is sooner.

The Supplier shall submit daily plant production records to the Engineer within 1 working day after completion of each day of paving and prior to the start of the next paving day.

a. Plant report must include weights of all individual aggregates, bitumens, water and other additives incorporated in mix, including RAP, lime, mineral filler, fiber or other additives.

Observation of CONTRACTOR's field quality control testing does not constitute acceptance.

4.5.21.3.A TESTING PROTOCOL

A. Sub-lot size is 500 tons or part thereof.

B. Sampling Protocol: ASTM D3665 and ASTM D979. Collect at least one (1) random Sample per sub-lot from behind paver and before compaction. For placements with a design thickness of 2 inches or less, samples may be taken at the plant. Any sample collected because of non-uniform appearance shall not be used in determining acceptance for the Lot.

1. Sampling binder, ASTM D140. At owner's request, take 1 qt sample and provide to owner's representative.

C. Testing Protocol (Performed by Owner's Verification Testing Organization):

a. Project Less than 1000 tons – Mix samples will be compacted in the laboratory and tested for:

1) Binder content, ASTM D6307.
2) Aggregate gradation, ASTM D5444.
3) Maximum Specific Gravity (Rice), ASTM D2041

a. Project greater than 1000 tons - Mix samples will be compacted in the laboratory and tested for:

1) Air voids, ASTM D3203.
2) Voids in the mineral aggregate, AI MS 2.
3) Binder content, ASTM D6307.
4) Aggregate gradation, ASTM D5444.
5) Maximum Specific Gravity (Rice), ASTM D2041

D. Reporting: The Owner or the Owner's Verification Testing organization will provide the contractor with acceptance results within 3 working days after completion of each day of paving, or prior to the start of the next paving day, whichever is sooner.

E. Lot Acceptance: A Lot is acceptable if binder content and aggregate gradation test average deviations are within limits the limits below.

Criteria	ALLOWABLE DEVIATION
Asphalt ~~content~~Content	~~+/-~~ ± 0.~~49~~38%
Nominal Sieve ½" (12.5mm) ~~and larger~~or 3/8" (9.5 mm)	~~+/-~~ ± 6.~~3~~0%
~~3/8" (9.5mm)~~	~~+/- 5.9%~~
~~No. 4 (4.75mm)~~	~~+/- 5.7%~~
No. 8 (~~2.36mm~~4.75 mm)	~~+/-~~ ± 4.~~8~~0%
~~No. 16 (1.18mm)~~	~~+/- 4.6%~~
No. 50 ~~(.300mm~~(1.18 mm)	~~+/-~~ ± 3.~~8~~0%
No. 200 (.~~075mm~~075 mm)	~~+/-~~ ± 2.0%

~~2.5.24.4~~ **F. Un-Accepted Lots (Contracts Issued by Someone Other Than The Ultimate Owner of The Pavement)**: Provide recommended corrective measures based on Engineering Analysis, described below, based on durability and serviceability relative to the specified product requirements, including expected performance compared to design life. The ultimate owner of the pavement or a representative of such will review and either approve corrective measures or provide basis for rejection.

G. Un-Accepted Lots (Contracts Issued by The Ultimate Owner of The Pavement): At the Engineer's discretion, a lot that does not meet the criteria in 4.5.21.3 may be accepted given the following corrective action.

Alternative Corrective Action				
Lab Air Voids:	**2.0-5.0%**	**< 2.0%**	**5.0-7.0%**	**>7.0%**
Average Relative Compaction	VMA – Voids > 10.7	VMA – Voids > 10.7	VMA – Voids > 11.7	Or VMA not Met
93.0 – 98.0%	No Action	2	1	3
> 98.0%	2	3	2	3
91.0 – 93.0%	1	2	3	3
<91.0%	3	3	3	3
1: Application of Owner-Approved Surface Treatment 2: Application of minimum 1.5" Overlay 3: Removal and Replacement				

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4.6.21.4 COMPACTION OF DENSE-GRADED ASPHALT PAVEMENT.

Test results must be from a UDOT qualified laboratory using UDOT qualified technicians, or results must be verified and certified (stamped) by a Utah Registered Professional Engineer.

A. Acceptance of compaction of dense graded asphalt pavement shall be as follows:

~~When the average of all density tests is not less than ninety six (96) percent of the maximum laboratory density (Marshall) and when no single test is lower than ninety two (92) percent of the Marshall.~~
~~When the average of all density testing falls between ninety three (93) percent to 95.9% of the Marshall with no test lower than ninety two (92) percent of the Marshall, the asphalt pavement shall be tested to determine the percent of air voids. If the percent of air voids are between three to five (3-5) percent, the asphalt pavement will be considered acceptable. If the percent of air voids are between five to seven (5-7) percent, the asphalt pavement will require a slurry seal per these specifications. When the average of all density testing falls between ninety one (91) percent of the Marshall and 92.9% of the Marshall with no single test below ninety (90) percent of the Marshall, the asphalt pavement shall be overlaid with a minimum of one inch thick asphalt pavement. Prior to the overlay, the existing asphalt next to the curb, gutter, cross gutter, etc. shall be milled one inch below the top edge of the concrete to provide a finished asphalt surface that is flush with or not more than .02 foot above the concrete gutter. Asphalt pavements with an average density less than ninety one percent of the Marshall, or with any single test less than ninety percent of the Marshall, shall be removed and replaced.~~

~~4.5.24.5~~ 1) core density or 2) non-destructive test density, or 3) control strip density with visual observation. Use core density unless specified elsewhere. A Lot is acceptable if density test averages are within the Acceptable Compaction Levels defined in Table 4.13 and no test is below Lowest Test limit. For lots outside of this acceptable level, reference the Alternative Correction Action in 4.5.21.3.A.

Mat Sampling Protocol: Use ASTM D3665 to randomly select in each sub-lot at least one (1) surface test location. Samples are full depth or overlay depth in overlay construction.

1) Projects less than 500 Tons: Use 10 sublots and non-destructive tests. Coring may be used for dispute resolution.

2) Projects between 500 and 1000 Tons: Use 4 equal sublots.

3) Projects between 1000 and 1500 Tons: Use 6 equal sublots

4) Projects greater than 1500 Tons: Use 8 equal sublots.

5) Joint Sampling Protocol: Use ASTM D3665 to randomly select a total of three (3) longitudinal joint test locations for each joint. Samples are full depth or overlay depth in overlay construction.

a. Use 6” diameter cores, centered within 1 inch of center of joint

b. Do not core projects smaller than 250 Tons.

c. Testing Protocol: ASTM D2726 for core density and ASTM D2041 (Rice) for maximum theoretical density.

6) Non-Destructive Density Testing by Electronic Gauge:

a. Lot Size: One (1) day production, with sublots as defined in Article 1.8.E 2 Core Density.

b. Mat Sampling Protocol: Use ASTM D3665 to randomly select in each sub-lot at least two (2) surface test locations.

c. Testing Protocol: ASTM D2950 (nuclear gauge) or AASHTO TP68 (non-nuclear gauge) and ASTM D2041 (Rice) for maximum theoretical density. A non-destructive test is the average of two (2) test results at each test location with a minimum 90 degree offset between test samples using mix correlated gauges. Use minimum 60 second count with Nuclear Gauge.

Table 4.14 – Compaction Acceptable Levels				
Acceptance Parameter	Mat Density, in Percent Relative to ASTM D2041 (a)		Joint Density, in Percent Relative to ASTM D2041 (a) (d)	
	Average	Lowest Test	Average	Lowest Test
Requirement	93.0 to 98.0	90.0 or greater	91.0 to 98.0	89.0 or greater

Notes:
(a) For overlay design thicknesses of less than 2.0", mat density targets are reduced by 1% and no joint density cores are taken.
(b) Difference based on actual sublot mat density and sublot core density values.
(c) Report and calculate all density values to 0.1%.
(d) A paving Joint is defined as a longitudinal seam between two adjacent passes of asphalt placed during the project, and where the initial pass cools below 180 deg F prior to placement of the adjacent pass. Do not take Joint cores where the "Joint" is comprised of existing asphalt or concrete. Use 6" diameter cores for joint density determination.

B. Thickness Acceptance of dense graded asphalt pavement shall be as follows:

1. **Lot Size**: One (1) day production with 1,000 square yard sub-lots or part thereof. Samples are full depth. Overlay construction measured only on overlay portion of core sample. Use one of the following methods for thickness determination:
2. Measurement of Density Cores
   i. A Lot specified to have actual thickness is acceptable if any sub-lot measurement does not exceed deficiency limits for thickness tolerances in Table 4.14
3. Probe of uncooled mix by representative of the city – perform between intermediate and final rolling operations.
   i. A Lot specified to have actual thickness is acceptable if any sub-lot measurement does not exceed deficiency limits for thickness tolerances in Table 4.14
4. Ground Penetrating Radar (not applicable to overlay applications). Perform GPR evaluation by scanning and recording depth for full-width of the pavement at one random location for each sublot. Engineer will mark locations for scans. Measure HMA thickness every 6 inches on the recorded scan. Calculate the average thickness, and the percentage of the thickness below each of the tolerance levels described in Table 4.14. A lot is accepted for thickness based on GPR evaluation when the average thickness of all scans is not more than ¼ inch less than the total thickness specified and no individual scan shows a deficient thickness of more than ⅜ inch for more than 5% of any scan.
5. A Lot is acceptable if average of test deficiencies, applied to the total design thickness, exceeds design thickness or is within the acceptance limits; and no sublot or individual test below the individual test limit. Reference Table 4.14.
6. At the Engineer's discretion, a lot with an average deviation that does not meet acceptable limits and/or has an individual deviation greater than the individual limits may be accepted upon the

completion and review of an Engineering Analysis and other requested actions.

Table 4.15 – Thickness Tolerance	
Acceptance Criteria	**Deficiency Limits, in Inches**
Acceptable	0.00 to 0.25
Individual	0.25 to 0.375
Remediate	Average >0.25 or Individual >0.375

Cores not meeting acceptable limits will be provided to the Contractor for verification of measurements.

Reject mixes in the transport material exceeding the limits identified in the mix design. Use calibrated temperature probes for rejection of mix. Use temperature guns for quick approximate temperature readings only.

Opening a paved surface to traffic does not constitute acceptance. Observation of CONTRACTOR's field quality control testing does not constitute acceptance.

4.6.21.5 OPEN-GRADED ASPHALT WEARING COURSE.

In the event that the extraction or gradation fails to meet the allowable deviation, the remaining sample material shall be remolded and tested in accordance with AASHTO T ~~283-89 or~~283or ASTM D 4867~~-92~~ including Note 5. The open-graded asphalt pavement must possess seventy percent of the tensile strength ratio based on the approved mix design. Open-graded asphalt not meeting this requirement shall be removed and replaced.

The allowable maximum deviations from the approved Marshall mix design shall be as follows:

Asphalt content	+/- 0.46%
~~½"~~½" (12.5 mm)	+/- 6.3%
3/8~~"~~" (9.5 mm)	+/- 5.9%
No. 4 (4.75 mm)	+/- 5.7%
No. 8 (2.36 mm)	+/- 4.8%
No. 200 (.075 mm)	+/- 2.0%

4.6.21.6 ~~4.5.24.6~~ ASPHALT PAVEMENT SURFACES.

The completed surfacing shall be thoroughly compacted, smooth and free from ruts, humps, depressions, rock pockets or slick spots. Any ridges, indentations or other objectionable marks left in the pavement's finished surface shall be corrected prior to acceptance.

The paving contractor shall provide adequate quality control during spreading and finishing procedures to meet or exceed the following longitudinal and transverse profiles:

- Longitudinal deviations shall not exceed ± 0.025 foot in 25 feet when checked by a taut string line.

- Transverse deviations shall not exceed ± 0.01 foot in 10 feet when checked with a ten foot straight edge.

- Longitudinal construction joint deviations shall not exceed ± 0.01 foot when checked with a ten foot straight edge.

- The completed pavement surfaces shall be constructed to the required grades and cross sections. When pavement surfaces contact concrete structures such as drainage structures, curbs & gutters, utility vaults, or manholes, the pavement surfaces shall be flush with or above the concrete structures by not more than 0.02 foot. All deviations exceeding the specified profile tolerances shall be corrected prior to final rolling.

~~4.6 BITUMINOUS SEAL COAT (CHIP SEAL). Bituminous surface treatments (chip seals) shall be applied to the road surface only when required, or approved by the City Engineer. The bituminous surface treatment shall consist of an application of bitumen covered with mineral aggregate and rolled to a smooth surface presenting an even texture. The materials used in the application of the bituminous surface treatment shall be bituminous mineral, and mineral aggregate, as specified below.~~

~~4.6.1 MATERIAL SPECIFICATIONS.~~

~~4.6.1.1 BITUMINOUS MATERIAL. The bituminous material shall be cationic emulsified asphalt with a natural latex rubber material (type LMCRS-2H) and shall conform to the following requirements:~~

~~TEST~~	~~SPECIFICATION~~	~~PARAMETERS~~

~~Viscosity @ 122°F.~~	~~AASHTO T-59~~	~~100-300 sec.~~
~~Sieve~~	~~AASHTO T-59~~	~~0.3% max.~~
~~Settlement, 5 days~~	~~AASHTO T-59~~	~~5% max.~~
~~Demulsibility Storage~~	~~AASHTO T-59~~	~~40% min.~~
~~Stability~~	~~AASHTO T-59~~	~~1% max.~~
~~(1 day test) Ash Content~~	~~ASTM D3723~~	~~0.2% max.~~

Tests on Residue by Drying: Percent Residue Penetration @ 77° F., (100 g., 5 sec.) Ductility @ 77° F., (5 cm./min.) Torsional Recovery	 NV 756 AASHTO T-49 AASHTO T-51 NV 756	 65% min. 40-150 mm. 40 cm. min. 18% min.
Particle Charge	AASHTO T-59	POSITIVE

4.6.1.2 AGGREGATE (CHIPS). Mineral aggregate shall consist of crushed stone or crushed gravel, free from adherent films of clay or dust, and shall be of such nature that a thorough coating of the bituminous material used in the work will not strip off upon contact with water.

The gravel or rock shall have a percent of wear not greater than thirty when tested by the Los Angeles Abrasion Test (AASHTO T-9 ASTM C 131). Chips shall be cubical or pyramidal in shape with at least ninety-five (95) percent fractured faces. The crushed aggregate shall have a weighted percent of loss not exceeding ten percent by weight when subjected to five cycles of sodium sulfate and tested in accordance with AASHTO Designation T-104.

Stripping tests of the mineral aggregate which the Contractor proposes to use shall be furnished to the City's Representative before crushing operations begin. During aggregate crushing, additional stripping tests shall be furnished to the City's Representative upon request. No stripping test shall show a percent stripping greater than ten for LMCRS-2H asphalt. The chip shall be electrically compatible to the asphalt emulsion used.

The crushed aggregate shall conform to the gradation requirements shown in following table.

TABLE 4.11
GRADATION OF AGGREGATE FOR CHIP SEAL COATS

SIEVE SIZE	PERCENT BY WEIGHT PASSING (Ideal)	IDEAL GRADATION TOLERANCE (Percent)
1/2 Inch	100	0
3/8 Inch	95	+/- 5
No. 4	10	+/- 5
No. 8	2	+/- 2
No. 200	0.5	+/- 0.5

~~The initial mineral aggregate used for the production of chips shall be retained on a one-inch sieve prior to being crushed to the gradation specified.~~

~~4.6.2 AGGREGATE QUALITY CONTROL. Prior to delivery to the project site the designated wear test, striping test, sodium sulfate test, fracture face count, and gradation tests shall be performed on the crushed aggregate. Each time a source changes said tests will be repeated.~~

~~All aggregate (chips) shall be tested for compliance with the gradation and fracture face count during the production of the chips. There shall be no less than one test performed for every five hundred tons of material produced or one day's production, whichever is less. One gradation test and fracture face count test shall be defined as the average results of tests taken on three different samples taken at one particular time.~~

~~All material produced shall be stockpiled in designated stockpile site(s).~~

~~When chips are delivered to the project stockpile site there shall be one gradation test conducted for every five hundred tons of material. If the gradation test requirements are not met, the City's Representative may require that the failed material be removed from the stockpile. Chips shall be considered to be out of specification if one test (as defined herein above) fails.~~

~~The City's Representative will not accept any chips which do not meet all the designated specifications. No reduction in pay or other remedial terms will be allowed or negotiated.~~

~~In addition to the random acceptance samples taken at the stockpile, the City's Representative may sample the aggregate from any portion of stockpile which exhibits a non-uniform appearance.~~

~~The Contractor shall take immediate steps to bring the aggregate into specifications when test results show any deviation from the established maximum or minimum values for any sieve as shown in Table 4.11 of these specifications.~~

~~At designated stockpile site(s), the Contractor may be required to "push up" the unloaded aggregate into piles suitable for loading into the delivery dump trucks.~~

~~Extreme care shall be taken so as not to mix any of the crushed aggregate with the underlying material at the stockpile or the crushing site. In the event that there is contamination of the chip seal aggregate with foreign material, as determined by the City's Representative, or by tests conducted, the contaminated section of material shall be immediately removed from the stockpile or crushing area and properly disposed of. All contaminated material removed from the stockpile, or crushing area, shall be replaced with aggregate which meets the requirements of these specifications.~~

~~All testing required by the City's Representative, or by the plans and specifications, shall be performed by an independent testing laboratory. The Contractor shall do everything in his power to ensure that the City's Representative has full access to the testing procedure and shall deliver to the City's Representative any and all results of tests run. The Contractor shall not proceed with subsequent construction until certified copies of appropriate tests are delivered to the City's Representative. Any materials not properly tested shall be subject to rejection and removal.~~

~~4.6.3 EQUIPMENT. Work shall be subject to the approval of the City's Representative, and shall be maintained in satisfactory working conditions at all times.~~

4.6.3.1 ASPHALT DISTRIBUTOR. The asphalt distributor shall be equipped with a calibrated dipstick marked in gallons per inch of length, and an accurate thermometer and speedometer. The distributor shall also be capable of maintaining proper pump pressure to ensure a uniform distribution of liquid asphalt emulsion at all times. The pump shall be able to maintain the correct pump speed, or pressure, without either atomizing the asphalt or distorting the spray fan. However, the pump shall be able to maintain a pressure which shall be sufficient to prevent streaking from a non-uniform discharge of material from the individual nozzles.

The distributor shall be equipped with a rear-mounted spray bar capable of covering widths of six to fifteen feet in a single pass. The distributor tank shall be well insulated and be equipped with one or more heaters capable of bringing the asphalt emulsion to spray application temperature. The tank shall have a full circulating system which shall include the spray bar unit. The truck shall also be equipped with a hand-spray for applying the asphalt emulsion to areas that cannot be reached with the spray bar.

The distributor shall be equipped with a computer which will automatically determine the discharge based on the nozzle size, the truck speeds for various application rates, and the corrections for temperature-viscosity variations.

4.6.3.2 AGGREGATE SPREADER. The spreader shall be a self- propelled Flarity chip spreader, or equal, capable of uniformly spreading aggregate at varying application rates as required. The spreader shall be equipped with a tachometer and/or a speedometer to ensure the maintenance of a uniform spreader speed. The aggregate spreader shall also be equipped with a device and so operated that the coarse particles of the screening shall be deposited on the bituminous binder before the finer particles.

4.6.3.3 ROLLERS. The Contractor shall provide at least two self propelled, smooth-tread, pneumatic tired rollers on the job during the chipping operations. Each roller shall weigh at least ten tons and have staggered (offset) front and rear tires to obtain a uniformly rolled pass. Tire pressure in all tires shall be uniform and inflated to eighty psi. No steel wheel rollers shall be used to roll the chip seal surface treatments. Rolling speed shall not exceed ten miles per hour.

4.6.3.4 DUMP TRUCKS. The Contractor shall provide sufficient ten- wheel dump trucks during the chip sealing operations to ensure that the project can proceed without interruption. FREQUENT STOPS AND STARTS DURING THE CHIP SEAL OPERATION WILL NOT BE PERMITTED.

4.6.3.5 FRONT END LOADERS. The Contractor shall have on hand at least one front end loader to load the aggregate into the dump trucks from the aggregate stockpile(s). The loaders shall have at least a two-and-one- half yard capacity bucket.

4.6.3.6 POWER BROOMS. The Contractor shall provide at least one self-propelled rotary power broom or sweeper at the job site, and shall use said sweeper (supplemented with hand brooms as necessary) as required, to sweep the excess aggregate on the edge of each pass which will be in contact with the next pass so that there will be no build up of aggregate at the seams or joints between passes. The broomed aggregate shall be swept onto the freshly laid course.

4.6.4 BITUMINOUS CHIP SEAL CONSTRUCTION METHODS. The methods employed in installing bituminous chip seal(s) shall include, but are not limited to, the following:

4.6.4.1 SURFACE PREPARATION. All dust, dirt, tracked on clay and foreign material shall be removed from the surfaces to be sealed by sweeping the surface with power brooms, hand

brooms, power blowers, or by flushing it with water or a combination of the above. All patching, crack filling and drainage improvements required by the City's Representative shall be completed prior to the commencement of the surface treatment application. After the cleaning operation has been completed, and prior to the application of the surface treatment, the area to be treated will be inspected by the City's Representative to determine its fitness for receiving the surface treatment.

All sewer manhole lids, water valve covers nd survey monument covers shall be protected from the application of the seal coat by placing building paper over the lids (cut to the exact dimensions of the lids) prior to the application of the seal coat. At the completion of the sealing operations, all protective coverings shall be removed from said survey monument covers, manhole lids and valve covers.

At the edges of all passes which will form longitudinal joints in the surface treatment (chip seal) the edge of the pass shall be swept clean of all chips for a distance of from four to six inches back from the edge prior to the application of the adjacent pass to allow for overlap without chip buildup (humps) in the previous pass. Building paper shall be laid on all cross gutters (concrete waterways) to prevent the chip seal from being applied to said gutters. The Contractor shall place building paper at the beginning of all chip passes. Immediately after the chip application, the building paper shall be removed and destroyed.

4.6.4.2 ASPHALT APPLICATION. Application of the bituminous material shall not be permitted until the loaded aggregate trucks, rollers, and chip- spreader are in place and ready to apply, and roll, the cover aggregate. No surface will be chip sealed until authorization to do so has been obtained from the City's Representative. The asphalt material shall be applied at 0.32 to 0.40 gallons per square yard or as determined by the City's Representative and at a temperature between 125 degrees to 185 degrees Fahrenheit. The exact temperature used to apply the bituminous material shall be determined by the City's Representative.

The bituminous material shall be applied by an asphalt distributor, as described above, so that uniform distribution in the quantities specified is obtained over all points of the surface to be treated. All lightly-coated areas and spots missed by the distributor shall be properly treated with bituminous material applied by hand. No more asphalt shall be applied than can be covered with aggregate in sixty seconds or less. Distances between the distributer and chip-spreader shall be as close as possible, but in no case shall the chip-spreader be greater than fifty feet behind the distributer during the chipping operations.

4.6.4.3 AGGREGATE SPREADING. Immediately following the application of the bituminous material, the aggregate shall be evenly spread over the surface at a uniform quantity of twenty-five to thirty (25-30) pounds per square yard of surface area. Upon commencement of the work, and during it's progress, the individual quantities of bitumen and aggregate may be varied to meet specific field conditions, as directed by the City's Representative. An adequate supply of aggregate shall be available on the job site to permit continual spreading operations. Aggregate shall be damp (not wet) prior to being spread on the surface. The aggregate shall be spread by using a self-propelled spreader machine (Flarity or equal). The aggregate shall be spread evenly by hand on all areas missed by the aggregate spreader. Back-spotting or sprinkling of additional aggregate over the areas having insufficient cover shall be done by hand and shall be continued during the operations whenever necessary.

As the distributor moves forward to spray the asphalt, the aggregate spreader shall start right behind it, spreading the damp chips uniformly and at the specified rate. The asphalt distributor shall travel at the same rate of speed as the chip spreader and in no case shall the two machines

be separated by more than fifty feet during the sealing process. Operating the chip spreader at speeds which cause the chips to roll over after striking the bituminous-covered surface will not be permitted.

Excess aggregate deposited in localized areas shall be immediately removed with square-end shovels, and in areas where application is insufficient, additional aggregate shall be added by hand prior to the time the asphalt "breaks".

4.6.4.4 AGGREGATE COMPACTION. The treated surface shall be rolled with rubber-tired rollers immediately after the distribution of the cover aggregate, and rolling shall continue until the aggregate is properly seated in the binder. Rollers shall proceed in the longitudinal direction, working across the treated surface until the entire width and length of the treated surface has been rolled at least four times. All rolling shall be completed within one hour after the application of the cover aggregate. Rollers and gravel trucks shall not be operated at speeds great enough to kick up chips, and in no case shall rollers be operated above ten miles per hour. In all places not accessible to the rollers, the aggregate shall be adequately compacted with pneumatic type hand tampers. Any aggregate that becomes coated, or mixed with dirt or any other foreign material shall be removed, replaced with clean aggregate over a newly-sprayed surface, and then re-rolled as directed by the City's Representative.

Bituminous material and chips shall not be spread more than one hundred feet ahead of completion of initial rolling operations.

No aggregate will be allowed to be swept into the gutters, onto the sidewalks, or thrown onto private property. The Contractor shall be responsible for the clean up of any and all aggregate swept into these areas.

Prior to placing the second chip seal course on streets designated for double chip seals, the first course shall be thoroughly rolled to set the chips, then no less than 24 hours later the excess chips shall be removed. Upon removal of the excess chips, the second course may be applied.

4.6.4.5 LOOSE AGGREGATE REMOVAL. Upon completion of rolling, traffic will be allowed to use the streets at a speed not to exceed fifteen miles per hour for a period of not less than twenty four hours. After the chips are set in the bituminous binder, but not earlier than the following day, or as directed by City's Representative, loose chips on the surface of the road shall be broomed and removed in such a manner that the aggregate set in the binder will not be displaced. Excessive brooming will not be permitted. At the end of seven days, any excess chips shall be removed in such a manner that the aggregate set in the binder will not be displaced. Excessive rolling or brooming will not be permitted.

4.6.4.6 SANDING. After the surface has been opened to traffic, any excess bituminous material that comes to the surface (bleeds) shall be immediately covered with CLEAN SAND. The Contractor shall be required to have sufficient CLEAN sand (NOT DIRT) on hand or available to immediately sand any bleeding spots when requested by the City's Representative. Sanding shall be accomplished by evenly spreading the sand over the affected area and then hand brooming the sand to a smooth even surface with no bumps, ruts, depressions or irregularities visible.

4.6.4.7 APPEARANCE. The completed chip sealed surface shall present a uniform appearance and shall be thoroughly rolled and compacted and free from ruts, humps, depressions or irregularities due to an uneven distribution of bituminous binder or aggregate. In the event the surface presents an unacceptable appearance, as determined by the City's Representative, the

Contractor shall repair unacceptable areas in accordance with the City Representative's directions.

4.6.4.8 WEATHER LIMITATIONS. Chip seal treatments shall be placed only when the air temperature in the shade is above 75 degrees Fahrenheit. The chip seal shall not be placed when the temperature of the road surface is below 70 degrees Fahrenheit, above 120 degrees Fahrenheit, during rainy weather, when the surface is wet or during other unfavorable weather conditions as determined by the City's Representative.

4.7 ASPHALT EMULSION SEAL COAT (SLURRY SEAL This sub-section covers the requirements for the application of slurry seal coats on existing road surfaces. The slurry seal surface treatment shall consist of a mixture of emulsified asphalt, mineral aggregate, mineral filler, set control additive, and water. The slurry shall be properly proportioned, mixed, and spread evenly on a prepared surface in accordance with these specifications, or as directed by the City's Representative. When cured, the slurry shall have a homogeneous appearance, fill all cracks, adhere firmly to the road surface, and have a skid resistant texture.

4.7.1 MATERIAL SPECIFICATIONS.

4.7.1.1 ASPHALT EMULSION. The asphalt emulsion shall conform to the specifications outlined in Tables 4.12, 4.13 and 4.14. Either cationic or anionic emulsion may be used, whichever is best suited to the aggregate and job conditions to be encountered, as determined by compatibility tests and procedures as specified in the latest edition of the ISSA Technical Bulletin #115.

4.7.1.2 AGGREGATE. The mineral aggregate shall consist of angular sand, or crushed stone, that is free from dirt, organic matter, clay balls, adherent films of clay, dust or other objectionable matter. When tested according to AASHTO T-176, the aggregate shall have a sand equivalent of not less than forty five (45), and the aggregate shall be non-plastic. When tested according to AASHTO T-104, the aggregate shall show a loss of not more than fifteen (15) percent, and when tested according to AASHTO T-96, the aggregate shall show a loss of not more than thirty five (35) percent.

The combined mineral aggregate shall conform to the requirements of type II or type III slurry as outlined in Table 4.15.

4.7.1.3 FILLER. The mineral filler shall conform to the requirements of AASHTO M-16 and shall be used to improve the gradation of the aggregate, to provide improved stability and workability of the slurry, and to increase the durability of the cured slurry.

4.7.1.4 SET CONTROL ADDITIVE. To control the setting time of the slurry mixture, an additive shall be added which will retard the set when a cationic emulsion is used, or accelerate the set when an anionic emulsion is used. The set control additive shall be aluminum sulfate or Portland Cement Type I/II, and shall be added to the slurry mix by an approved method that will assure uniform distribution and proper control. The exact amount shall be determined by conditions in the field and as directed by City's Representative.

TABLE 4.12
SLURRY SEAL TEST SPECIFICATIONS
TESTS OF EMULSIONS

TESTS	TEST METHOD	TYPE OF EMULSION	
	ASTM	ANIONIC	CATIONIC
		Quick Setting	Quick Setting
		QS-1H	CQS-1H CQS-1H-LM
Particle Charge Test	D244	Negative	Positive
Viscosity, 60 ml., @ 77^0 F., 5 seconds	D244	15 min. to 100 max.	
Residue by distillation	D244	60 percent by weight, minimum	
Settlement After Five Days (%)	D244	5 percent maximum	
Sieve Test Wt., (%)	D244	0.10 maximum	
Cement Mixing Test	D244, 32-36	2 % Maximum	Not Applicable

TABLE 4.13
SLURRY SEAL TEST SPECIFICATIONS
TESTS OF RESIDUE

TESTS	TEST METHOD	TYPE OF EMULSION	
	ASTM	ANIONIC	CATIONIC
		Quick Setting	Quick Setting
		QS-1H	CQS-1H CQS-1H-LM
Penetration 100 gm. @ 77^0 F for 5 seconds	D244	40 to 90 mm	40 to 90 mm
Solubility in Trichloroethylne	D2042-4d	97.5 percent, minimum	
Ductility, 5 cm/mm @	D244	40 cm., minimum	

TABLE 4.14
SLURRY SEAL TEST
SPECIFICATIONS TESTS ON
SLURRY SEAL JOB MIXTURE

TESTS	TEST METHOD		TYPE OF EMULSION	
	AASHTO	ASTM	ANIONIC	CATIONIC
			Quick Setting	Quick Setting
			QS-1H	CQS-1H CQS-1H-LM
Mixing Time @ 77^0 F (ISSA TB #102)	---	---	120 seconds minimum	120 seconds minimum
Set Time Tests (30 minutes) Blotter Test (ISSA TB #102)	---	---	No Brown Stain	No Brown Stain
Displacement Test	---	---	No Displacement	No Displacement
Water Resistance Test @ 30 Min. (ISSA TB #102)	---	---	No Discoloration	No Discoloration
Wet Stripping Test, Coating (ISSA TB #114)	---	---	90 percent, minimum	
System Compatability	---	---	Compatible	

TABLE 4.15
SLURRY MIXTURE GRADATION

Type of Slurry	II	III
General Usage	General seal, medium textured surfaces; second course slurry	First and/or second application of two-course slurry; highly textured surfaces
Sieve Size (USA Standard Series)	PERCENT PASSING	
3/8 inch	100	100
No. 4	90-100	70-90
No. 8	65-90	45-70
No. 16	45-70	28-50
No. 30	30-50	19-34
No. 50	18-30	12-25
No. 100	10-21	7-18
No. 200	5-15	5-15

4.7.1.5 WATER. Water for the slurry mixture shall be potable and free from harmful soluble salts.

4.7.2 MATERIAL QUALITY CONTROL.

4.7.2.1 SAMPLING AND TESTING. Prior to the commencement of sealing operations, sources of all materials shall be selected and tested in accordance with the appropriate test requirements. Additional samples of materials shall be furnished as directed by the City's Representative during the progress of the work. The Contractor's proposed job mix design shall be approved by the City's Representative prior to the commencement of construction.

4.7.2.2 JOB MIX DESIGN. No slurry mixture shall be placed until a mix design submitted by the Contractor has been approved by the City's Representative. The exact proportions of asphalt emulsion, aggregate, mineral filler, and water to be used in the preparation of the slurry seal shall be determined by an approved testing laboratory experienced in slurry mix design procedures.

The residual asphalt content of the mix shall be from 7.5 to 13.5 percent of the dry aggregate for type II slurry seal or 6.5 to 12 percent of the dry aggregate for type III slurry seal.

The slurry shall be a homogeneous mixture, sufficiently stable during the entire mixing-spreading period so that the emulsion will not "break". There shall be no segregation of the fines from the coarser aggregate, and the liquid portion of the mix shall not float to the surface. If it is established that a satisfactory mixture meeting the requirements specified herein cannot be produced from the

materials furnished, the materials shall be rejected and the Contractor shall submit new samples.

The wet track abrasion test shall not exceed a maximum wear loss of seventy five grams per square foot.

4.7.3 EQUIPMENT. The equipment, tools, and machines required for the performance of the work shall be subject to the approval of the City's Representative and shall be maintained in a satisfactory working condition at all times.

4.7.3.1 SLURRY MIXING MACHINE. The slurry mixing machine shall be a continuous flow mixing unit, capable of delivering accurately predetermined proportions of aggregate, water and asphalt emulsion to a revolving spiraled multi-blade mixer tank, and of discharging the thoroughly-mixed product on a continuous basis. The aggregate shall be pre-wetted immediately prior to mixing with the emulsion. The mixing unit shall be capable of thoroughly blending all ingredients together without violent action. The mixing machine shall be equipped with an approved fines feeder with an accurate metering device or method of introducing a predetermined proportion of mineral filler into the mixer as the aggregate is fed into the mixer. The fines feeder shall be used when mineral filler is part of the aggregate blend. The mixing machine shall be equipped with a water pressure system and fog-type spray bar adequate for completely fogging the surface to be sealed with up to 0.05 gallons of water per square yard, immediately ahead of the spreading equipment. The machine shall be capable of mixing materials at pre-set proportions regardless of the speed of the machine and without changing machine settings.

4.7.3.2 SLURRY SPREADER. Attached to the mixing machine shall be a mechanical-type squeegee distributor, having a rubber-like material in contact with the surface to be sealed to prevent unwanted egress of slurry. An appropriate mechanical device for lateral distribution of the slurry shall be operated within the spreader box. There shall also be a steering device and a flexible strike-off. The spreader box shall be adjustable to various widths from eight (8) to twelve (12) feet. The box shall be kept clean with no extensive build-up of asphalt and aggregate on the box. A burlap drag of at least one foot in width shall be attached to the back of the spreader box to smooth out irregularities in the slurry surface.

4.7.3.3 SURFACE CLEANING EQUIPMENT. Power brooms, power blowers, vacuums, air compressors, water flushing equipment, and hand brooms suitable for cleaning the road surface and cracks therein may be used for surface cleaning.

4.7.3.4 AUXILIARY EQUIPMENT. Hand squeegees, burlap mops, shovels and other equipment shall be provided as necessary to perform the work.

4.7.4 ASPHALT EMULSION SLURRY CONSTRUCTION METHODS.

4.7.4.1 RESIDENT NOTIFICATION. The Contractor shall be responsible for notifying all affected residents of pending cleaning and/or sealing operations on streets abutting their properties. Notification shall be no more than forty eight hours, nor less than twenty four hours, in advance of said cleaning/sealing operations. If there should be any change in scheduling for a particular days production, the Contractor shall be required to notify all of the residents affected by the schedule change no later than one hour after the schedule change has been determined.

4.7.4.2 VEHICLE REMOVAL. The Contractor shall be responsible for the removal of all vehicles from the streets to be cleaned, and shall endeavor to notify the owners of the vehicles to move them prior to his cleaning operations. In the event owners of said vehicles cannot be located, the

~~Contractor shall have them towed from the construction zone prior to cleaning and shall be responsible for all costs incurred for said towing.~~

~~4.7.4.3 PREPARATION OF SURFACE. In the event that patching or surface smoothing is required to prepare the street surface for the slurry seal, the Contractor shall patch the street surface with hot mix asphalt prior to the application of the slurry sealing. Prior to the application of the slurry seal, the City's Representative shall give approval that the surfaces have been properly prepared. No slurry seal material will be laid without the City Representative's approval.~~

~~4.7.4.4 CLEANING STREETS. Prior to the commencement of Slurry Seal operations, the Contractor shall thoroughly clean and remove all silt mud spots and loose or objectionable material from the existing pavement surface. Any standard cleaning method will be acceptable, except that water flushing will not be permitted in areas where poor drainage conditions on the road or at the sides of the road are present, as determined by the City's Representative.~~

~~Traffic paint on the surface to be treated that is not tightly bonded to the surface shall be removed.~~

~~Areas impregnated with grease, oil, or fuel shall be scrubbed with industrial-type detergent and flushed thoroughly to remove all traces of detergent and oil.~~

~~After the cleaning operations have been completed, and prior to the application of the surface treatment, the area to be treated will be inspected by the City's Representative to determine it's fitness for receiving the surface treatment. No surface shall be slurry sealed until authorization to do so has been obtained from the City's Representative.~~

~~4.7.4.5 SEWER MANHOLE LIDS AND WATER VALVE COVERS. Prior to the application of the seal coat, all sewer manhole lids, survey monument lids, storm drain manhole lids and water valve covers shall be protected from the application of the slurry seal coat by placing building paper over the lids (cut to the exact dimensions of the frames so as to prevent the slurry seal from entering into the seam between the frame and lid). At the completion of the sealing operations, the Contractor shall remove all building paper protectors placed on said lids and covers.~~

~~4.7.4.6 TEST SECTION. Prior to full production, the Contractor shall place a test section of at least sixty square yards in an area designated by the City's Representative. The test section shall be placed using the same equipment, methods, and mix as will be used on the job.~~

~~If the test section should prove to be unsatisfactory, necessary adjustments to the mix design, equipment, and/or placement methods shall be made. Additional test sections, as required, shall be placed and evaluated for compliance with the specifications. If the test section does not conform to the specification requirements, the defective slurry seal shall be removed. Full production shall not begin without approval of the City's representative.~~

~~4.7.4.7 WATER FOG. Immediately prior to application of the slurry seal, the surface of the pavement shall be moistened with a fog spray of water, applied at the rate of 0.02 to 0.05 gallon per square yard from the spray bar attached to the slurry seal machine. No free water shall pond on the surface of the pavement following the fog spray. The rate of application of the fog spray shall be adjusted during the day to suit pavement temperatures, surface texture, humidity, and dryness of the pavement surface.~~

~~4.7.4.8 PREPARATION OF SLURRY. The slurry seal shall be mixed and applied with a slurry machine as outlined below. The amount and type of asphalt emulsion to be blended with~~

~~aggregate shall be determined by the laboratory mix design. A minimum amount of water, added as specified by the City's Representative, shall be used as necessary, to obtain a workable and homogeneous mixture. The slurry mixture shall be of proper consistency with no segregation when deposited on the surface of the pavement and no additional elements shall be added. The slurry mixture shall show no signs of uncoated aggregate, or premature breaking of emulsion, when applied to the pavement surface. Total time of mixing shall not exceed four minutes.~~

~~4.7.4.9 APPLICATION OF SLURRY. Sufficient quantities of the slurry seal mixture shall be fed into the spreader box such that a uniform and complete coverage of the pavement is obtained. The slurry seal machine shall be operated at such a speed that the amount of slurry in the spreader box shall remain essentially constant. The slurry seal shall be placed at a rate within the following general limits: Type II slurry - 10-15 #/yd.2; Type II slurry - 15-20 #/yd.2. The finished slurry thickness shall not be less than 3/8 of an inch. No build-up of the cured slurry seal mix shall be allowed to collect in the spreader box. No streaks caused by oversized aggregate particles, or build-up of slurry mix on squeegees, shall be left on the finished surface.~~

~~If a uniform thickness cannot be met with one application due to irregularities in the pavement surface, multiple applications shall be made. Where multiple applications are required, as determined by the City's Representative, each application shall be thoroughly cured prior to the application of the subsequent courses.~~

~~4.7.4.10 HANDWORK. Approved squeegees and mops shall be used to spread slurry in areas not accessible to the slurry spreader box. Care shall be exercised in leaving no unsightly appearance from handwork. When doing handwork in small areas, especially fill-in behind the slurry machine, the material shall be spread and mopped in the direction of the machine pass.~~

~~4.7.4.11 JOINTS. The longitudinal joints between adjacent lanes shall have no visible lap, pinholes, or uncovered areas. Thick spots caused by overlapping shall be smoothed immediately with hand squeegees before the emulsion breaks. Overlaps which occur at transverse joints shall also be smoothed before the emulsion breaks, so that a uniform surface is obtained which contains no breaks or discontinuities.~~

~~4.7.4.12 CURING. Treated areas shall be allowed to cure until the treated pavement will not be damaged by traffic. The Contractor shall protect this area for the full curing period with suitable barricades or markers. Areas which are damaged before being opened to traffic shall be repaired by the Contractor.~~

~~4.7.4.13 WEATHER LIMITATIONS. The slurry seal shall not be applied when either atmospheric or pavement temperature is below 55 degrees, or above 100 degrees Fahrenheit, when raining or during periods of abnormally high relative humidity, or as determined by the City's Representative~~

~~4.8~~

4.7 CONCRETE WORK. This section defines the materials to be used and the requirements for mixing, placing, finishing and curing all Portland cement concrete work.

4.7.1 ~~4.8.1~~ **MATERIALS**. Concrete materials shall conform to the following requirements.

4.7.1.1 ~~4.8.1.1~~ **PORTLAND CEMENT CONCRETE MATERIAL.** Concrete shall be composed of coarse aggregate, fine aggregate, Portland Cement and water, air entrainment and add mixtures and shall conform to the requirements of this section. A concrete mix design shall be prepared by the supplier, certified by an independent testing lab and submitted to the ~~City~~city for review and approval prior to concrete being used in ~~City~~city projects.

A. ~~A.~~ **PORTLAND CEMENT.** ~~ANSI/ASTM C 150~~AASHTO M 85, Type V or equivalent according to the table below, shall be used unless otherwise indicated, or approved by the ~~City Engineer.~~city. Only one brand of cement shall be used throughout a project, unless otherwise approved by ~~City's Representative.~~the city. Certified copies of the mill test for the cement shall be furnished upon request of the ~~City's Representative~~city.

1. ~~B. AGGREGATE. Except as otherwise specified herein, concrete aggregate shall conform to all applicable provisions of the latest revision of ASTM Standard Specification C 33~~ Blended Hydraulic Cement

a. Blended hydraulic cement substituted for Portland Cement:

1. Use ASTM C 1567 to verify that expansion is less than 0.1 percent 14 days after the zero reading.

2. Refer to the equivalent cements listed in the table below.

b. Do not exceed 30 percent total pozzolan limit when adding fly ash to a blended hydraulic cement.

1. Submit documentation of the total pozzolan content with the mix design.

Do not mix cements originating from different sources.

Do not use air-entrained cement.

~~**B.**1 Fine Aggregate. Fine aggregate shall consist of natural sand having clean, hard, durable, uncoated grains and shall conform to the requirements of these standards. Other inert materials with similar characteristics shall not be used unless approved by the City Engineer. The amount of deleterious substances shall not exceed the following limits.~~

DELETERIOUS MATERIALS MAXIMUMS

MATERIAL	Portland Cement/Blended Hydraulic Cement Equivalencies	
Clay Lumps AASHTO M 85 Equivalent Alkalis 0.80 max percent	1.00 ASTM C 595	ASTM C 1157
Coal and lignite Type I	0.50 IP, IL, IT	GU
Material passing No. 200 sieve Type II	3.00 IP(MS), IT(MS)	MS
Other deleterious substances such as shale, alkali, mica, coated grains, soft and flaky particles, etc. Type III	3.00	HE
Gypsum Type V	1.00 IP(HS), IT(HS)	HS

The combined sum

B. AGGREGATE.

1. Coarse Aggregate

a. Use coarse aggregate that meets AASHTO M 80 physical properties.

b. Do not exceed 1.0 percent gypsum by Quantitative Analysis of the percentage Gypsum test procedure S-3171-96.

Do not exceed percentages of all deleterious substances as specified in fine aggregate listed above shall not exceed three percent by weight.

Fine aggregate shall be well graded and shall range in size from fine to coarse within the following percentages by weight:

FINE AGGREGATE GRADATION REQUIREMENTS

SIEVE SIZE	PERCENT PASSING (by weight)
3/8 inch	100

~~No. 4~~	~~95-100~~
~~No. 8~~	~~80-90~~
~~No. 16~~	~~50-75~~
~~No. 30~~	~~30-50~~
~~No. 50~~	~~10-20~~
~~No. 100~~	~~2-5~~

AASHTO M 80, Table 2,~~**Coarse Aggregate**. Coarse aggregate shall consist of crushed or natural stone, gravel, slag or other approved inert material with similar characteristics or combination thereof, having clean, hard, durable, uncoated~~

particles free from deleterious matter. Deleterious substances shall not be present in the aggregate in excess of the following limits:

FINE AGGREGATE GRADATION REQUIREMENTS

SIEVE SIZE	PERCENT PASSING (by weight)
3/8 inch	100
No. 4	95-100
No. 8	80-90
No. 16	50-75
No. 30	30-50
No. 50	10-20
No. 100	2-5

COARSE AGGREGATE DELETERIOUS MATERIAL MAXIMUMS

MATERIAL	PERCENT (by weight)
Soft fragments	2.00
Coal and lignite	0.30
Clay Lumps	0.25
Material passing No. 200 sieve	1.00
Other deleterious substances such as shale, alkali, mica, coated grains, soft and flaky particles, etc.	3.00
Gypsum	1.00

The combined sum of the percentages of deleterious substances (in both course and fine aggregate), shall not exceed five percent, by weight.

Coarse aggregate shall be rejected if it fails to meet the following test requirements:

~~a. Los Angeles Abrasion Test. If the percent of loss by weight exceeds ten percent at one hundred revolutions, or forty percent at five hundred revolutions.~~

~~b. Sodium Sulfate Test for Soundness. If the weighted average loss after five cycles is more than twelve percent by weight.~~

c. for Class A aggregates.

d. Gradation. Coarse aggregate shall be graded by weights as follows:

~~c.~~

COURSE AGGREGATE GRADATION REQUIREMENTS

SIEVE SIZE	PERCENT PASSING (by weight)
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5
No. 200	0-1.0

~~d.~~**e.** Aggregate Size. The maximum size of the aggregate shall ~~be~~ not be larger than one-fifth of the narrowest dimension between forms within which the concrete is to be encased, and in no case larger than three-fourths of the minimum clear spacing between reinforcing bars or between reinforcing bars and forms. For non-reinforced concrete slabs, the maximum size of aggregates shall not be larger than one-fourth the slab thickness.

2. ~~C.~~ **Fine Aggregate**

a. Use fine aggregate that meets AASHTO M 6 physical properties.

b. Do not exceed 1.0 percent gypsum by Quantitative Analysis of Gypsum test procedure S-3171-96.

c. Do not exceed percentages of deleterious substances as specified in AASHTO M 6, Table 2, for class A aggregates, using option “b” for material finer than the No. 200 sieve.

d. Fine aggregate shall be graded by weights as follows:

FINE AGGREGATE GRADATION REQUIREMENTS

SIEVE SIZE	PERCENT PASSING (by weight)
3/8 inch	100
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	2-10
No. 200	0-3.0

C. WATER. Sufficient potable water shall be added to the mix to produce concrete with the minimum practical slump, the slump shall not be greater than four inches. However, a higher slump may be allowed with plasticizers, providing there is no loss of strength or durability and prior approval for use is obtained from the ~~City's Representative~~city.

The maximum permissible water-cement ratio (including free moisture in the aggregate) shall be five gallons per bag of cement (0.44) for Class A and five and three-quarter gallons per bag of cement (0.51) for Class C concrete.

D. ~~D. ENTRAINING AGENT. An air-entraining agent shall be used in all concrete exposed to~~ADMIXTURES

D.1 Do not use calcium chloride.

D.2 Air Entrainment according to ASTM C 260 as modified by AASHTO M 154 including the ~~weather.~~optional uniformity requirements in ASTM C 260, Section 5. The ~~agent shall conform to ASTM designation C 260. Air~~ air content ~~for~~of air-entrained concrete mixes shall be five percent (5%) by volume (plus or minus one percent~~). The air-entraining agent shall be added as a liquid~~ (1%)).

D.3 Water Reducing Agents

a. Refer to AASHTO M 194

b. High Range Water Reducer (HRWR) – Include details regarding HRWH ingredients, production methods, handling, and placing in the written plan for admixtures

D.4 Accelerators – Refer to ~~the mixing water by means of mechanical equipment capable of accurate measurement and control.~~AASHTO M 194

D.5 ~~**E.**~~ Set Retarding and Hydration Stabilizing Admixtures – Refer to AASHTO M 194

~~**C.**~~ Establish and inform ~~**ADMIXTURES**~~

a. ~~**E.1 Pozzolan. When authorized by**~~ the ~~**City**~~ Engineer~~**, pozzolan conforming**~~ of the effective life of the set-retarding or stabilizing admixture by trial batch if admixtures are required due to ~~**the requirements of ASTM**~~ haul times exceeding the time limitations in section 4.8.2.1.C ~~**618 Class F may be added to**~~Concrete Mixing.

b. Do not exceed manufacturer's recommendations for the use of the set retarding admixture.

c. Do not re-dose the concrete ~~**mix as outlined below:**~~with additional set retarding admixture.

d. ~~**Pozzolan may be used as**~~Add admixture at the batch plant at the time of initial batching operations.

e. Show on batch tickets the amount of admixture used.

f. Time of placement is established by the trial batch and supersedes the requirements in section 4.8.2.1.C Concrete Mixing.

E. POZZOLAN. Use at least twenty percent (20%) pozzolan and no more than thirty percent (30%) pozzolan by weight of the total cementitious material at a replacement of ratio of 1.1

E.1 Fly Ash

a. Class F according to ~~**the required Portland Cement**~~AASHTO M 295 except modify Table 2 with the following:

- Loss of Ignition (LOI) Not to exceed three percent (3%)
- Allowable CaO content Not to exceed fifteen percent (15%)

b. Label the storage silo for fly ash to distinguish it from cement

c. Use different size unloading hoses and fittings for cement and fly ash

E.2 Natural Pozzolan (Class N)

a. Refer to AASHTO M 295

~~**a.**~~**b.** May use instead of fly ash provided ~~**no other supplemental specification prevents its use. The maximum percentage of Portland Cement replacement on a weight basis is 15 percent**~~that the expansion does not exceed 0.1 percent. Refer to ASTC C 1567.

~~b. Pozzolan/cement replacement ratio is 1.25 to 1 (pozzolan/cement).~~

c. Water/cement ratio is established before Portland Cement is replaced with pozzolan.
d. Loss of ignition of pozzolan is less than 1 percent.
e. Trial batches for each aggregate source and concrete class have been run for each mix design.
f. All other requirements and references to testing procedures and specifications of Section 4.8 “Concrete Work” shall apply.

Pozzolan shall be sampled and tested as prescribed in ASTM C 618 and ASTM C 311. The Concrete Supplier shall obtain and deliver to the City’s Representative a certification of compliance signed by the pozzolan supplier identifying the pozzolan and stating that the pozzolan delivered to the batching site complies with applicable specifications.

Pozzolan material shall be handled and stored in the same manner as Portland Cement. When facilities for handling bulk pozzolan are not available, the pozzolan shall be delivered in original unopened sacks bearing the name and brand of supplier, the type and source of the pozzolan, and the weight contained in each sack plainly marked thereon.

Different brands or types of pozzolan shall not be mixed together unless written permission has first been obtained from the Owner’s Representative. All pozzolan used in the manufacture of concrete for any individual structure shall be of the same type, and from the same source unless otherwise approved by the City’s Representative.

COMPLIANCE ANALYSIS. During the course of concrete testing, the ~~City~~city may require, at random, additional concrete cylinders for the purpose of performing a "Petrographic Examination" in accordance with ASTM C 856.

The "Petrographic Examination" may be initiated when compressive strength tests show inconsistencies, when batch tickets show indications that material is batched which is not in accordance with approved mix designs, or when there are other indicators that the concrete may not meet Standards.

The "Petrographic Examination" will be performed by a Certified Testing Laboratory qualified to perform such testing. In the event that the sampled concrete is not in compliance with these standards, the supplier of the concrete will be required to pay for the "Petrographic Examination" and will no longer be allowed to supply concrete for use in any improvements for which ~~City~~city Standards apply until acceptable adjustments are made. If the sampled concrete is found to be in compliance with these standards, the ~~City~~city will pay the cost for the "Petrographic Examination". Additional testing may be required by the ~~City Engineer~~city, at the supplier's expense, to determine the extent of the non-compliant concrete. All work on a project, affected by the non- compliant concrete, will be suspended until the non-compliant concrete work is brought into compliance.

The "Petrographic Examination" will determine the quantity of cementitious matrix including mineral admixture (pozzolan/fly ash) in the mix, proportions of the mix, and other properties of the sampled concrete to verify compliance with the approved mix design. The acceptability of the concrete represented by the examination shall be established by comparing the proportions determined by the examination with those indicated on the batch tickets. When this comparison shows that the pozzolan proportions are within 2% +/- of the approved mix design the admixture proportions will be considered to be in compliance. When comparisons of other proportions of the mix indicate that the concrete is not within acceptable allowable deviation limits the concrete may be rejected even though the pozzolan proportion is acceptable.

The ~~City~~city may use the results of the "Petrographic Examination", inspection _records, _observation _of _batch _plant _operation,

compressive strength test results, or any other pertinent information to determine compliance. If any portion of a project is found to be -in non-compliance, additional testing shall be required to verify full compliance of all concrete within the project. If the ~~City Engineer~~city has reasonable cause, ~~he~~ may require removal and replacement of any concrete which has been found to be in non-compliance. (For the purpose of demonstrating the acceptability of this admixture specification, compressive strength alone shall not be considered as justification for acceptance).

Repeated violations of these admixture standards may subject the offending concrete supplier to be prohibited from providing concrete that is used in public or private infrastructure improvements within the ~~City of~~ city~~St. George~~.

E.2~~.~~ **Calcium Chloride.** Calcium Chloride shall not be added to any concrete mix. Non-chloride accelerators may be used upon approval of the ~~City Engineer or his Representative~~city.

F. ~~F.~~ **CONCRETE MIX.** For the purpose of practical identification, concrete has been divided into classes. The basic requirements of class A and class C concrete and the use for each is defined in Table 4.~~16~~15 of the ~~City~~city Standard Specifications.

r, r.1 02/03

F.1. **Submittals.** -The following information must be included with all concrete -mix designs submitted for review and approval by the ~~City~~city as per subsection 4.~~8~~7.1.1 "Portland Cement Concrete Material".

a. Test results on ~~coarse~~course and fine aggregates to verify compliance with applicable specifications.

b. Trial batch test results and past history test information on proposed mix designs, which support compliance with the requirements for compressive strength, durability, etc. Performance curves used to verify 28 day, 56 -day, and 90-day strengths must be submitted with trial batch tests or history information.

c. Certification of compliance from the cement supplier, the pozzolan supplier, and the air-entraining agent supplier, stating that the materials being delivered are in compliance with applicable specifications.

d. All mix designs shall be certified by a Certified Testing Laboratory.

G. ~~G.~~ **BATCH PLANT TICKET**. All concrete produced and delivered to a

job site within ~~St. George City~~the city, will be accompanied by a batch plant ticket. The ticket will state the time manufactured or batched and accurately show all components used for that particular load or batch. Sufficient copies shall be provided for testing personnel and ~~St.George City representatives~~the city, if requested.

TABLE 4.16

CONCRETE MIX SPECIFICATIONS

Class	~~Minimum Cement Content~~**Maximum Water/Cementitious Ratio**	**Maximum** ~~Water Content** (gal./bag of cement~~**Slump (inch)**	~~Maximum Slump~~**Air Content Percent (%)**	**Minimum 28-day** ~~Comp.~~**Compressive Strength (psi)**	**Primary Use**
A	~~(Bags/ C.Y.)~~0.45	~~(pounds/ C.Y.)~~4 (1.5 inches for machine placement)	4.0-7.5	4500	Reinforced structural concrete; curbs & gutters; cross gutters; pavements; unreinforced footings
~~A~~B	~~6~~0.45	4.5~~*~~	4" ~~1 ½"*~~.0-7.5	~~4000~~4500	~~Reinforced structural concrete; sidewalks; curbs & gutters; cross gutters; pavements; unreinforced footings~~Sidewalks
C	0.5	~~4~~704	~~5.75~~4.0-7.5 (exposed/exterior) ≤ 2.0% (buried/interior/ mass)	3000	Minor non-structural items such as thrust blocks; anchors, mass concrete, etc.

~~*For machine placement only.~~
~~** Including free moisture in aggregate.~~

NOTE: Unless otherwise specifically designated by the ~~City Engineer~~city all concrete placed shall be Class "A", six-bag mix, with a minimum allowable compressive strength of 4000 psi at the age of twenty-~~-~~eight days. ~~r, r.1 02/03~~

4.7.1.2 ~~4.8.1.2~~ **CONCRETE REINFORCING MATERIALS.** Concrete reinforcing materials shall conform to the following requirements.

A. ~~A.~~ **STEEL BARS.** All bar material used for reinforcement of concrete shall be hard grade deformed round steel conforming to the requirements of ASTM Designation A 615. All reinforcing steel shall be minimum grade sixty (60) unless approved otherwise by the ~~City Engineer.~~city. All bars shall be deformed, round and have a net section equivalent to that of plain bar of equal nominal size. Only hard grades will be used. Twisted bars will ~~-~~not be accepted.

All rebar shall be clearly marked with identifying markings in accordance with industry standards.

All reinforcing steel, at the time concrete is placed, shall be free from flaws, cracks, rust, oil, dirt, paint, or other coatings that will destroy or reduce the bond.

B. ~~B.~~ **WIRE OR WIRE FABRIC REINFORCEMENT.** Welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM A 185. Wire for concrete reinforcement shall conform to the requirements of the "Standard Specification for Cold Drawn Steel Wire for Concrete Reinforcement" ASTM A-82. All wire reinforcement, wire fabric, or expanded metal shall be of the type designated unless an alternate type is approved by the ~~City Engineer~~city.

C. ~~C.~~ **STEEL FIBER REINFORCEMENT.** Deformed steel fiber for concrete reinforcement shall conform to the requirements of ASTM A-820, type I, deformed fiber, except that the average tensile strength shall be not less than 150,000 psi.

D. ~~D.~~ **SYNTHETIC REINFORCING FIBERS.** Engineered synthetic reinforcing fibers shall be 100% polypropylene collated, fibrillated fibers. Fiber length, and amount per manufacturer's recommendations shall correspond with the concrete mixture (generally 1.5 pounds per cubic yard of concrete).

Physical property of the fibers shall be as follows:

Specific Gravity	**0.91**
Modulus of elasticity	500,000 to 700,000 psi
Tensile strength	70,000 to 110,000 psi
Length	0.25 to 2.50 inches

The fiber manufacturer shall certify that all polypropylene fibers meet the physical properties~~,~~ and are specifically manufactured for use in concrete from virgin polypropylene, containing no reprocessed olefin materials. If

the fiber manufacturer is other than the brand name listed on the literature and packaging, the certification must be from the original manufacturer of the fibers.

Fiber-mesh shall be added only at the concrete batch plant to assure uniform and complete dispersion of the collated-fibrillated fiber bundles into single mono-filaments within the concrete.

~~4.8.1.3~~

4.7.1.3 CURB, GUTTER, SIDEWALK AND BASE MATERIALS.

Concrete and base materials shall conform to the following requirements.

A. ~~A,~~GENERAL. This subsection defines materials, practices and designs to be used in the construction of all public curb, gutter and sidewalk.

All curb, gutter and sidewalk shall consist of air-entrained Type V Portland Cement Concrete and shall be constructed on a prepared subgrade in accordance with these specifications. All work shall conform to the lines and grades, thickness, and typical cross sections shown on the approved plans or established by the ~~City's Representative~~city.

B. SUBGRADE. The subgrade shall be excavated and filled with suitable material, as specified in Section 4.3.2.3 of these standards. All soft, yielding and otherwise unsuitable material shall be removed and replaced with suitable materials as outlined above. Filled sections shall be compacted and extend to a minimum of one (1) foot outside the form lines according to Section 4.3.2.3 of these standards.

C. ~~B.~~GRAVEL BASE COURSE. A gravel base course consisting of crushed road base gravel shall be placed under all curbs, gutters, driveways, waterways, sidewalks and other miscellaneous flatwork. The gravel base material shall conform to the requirements contained in Section 4.5.7 of these specifications. Where the foundation material is found to be unstable, the Contractor shall furnish and place sufficient additional gravel or other suitable material as directed by the ~~City's Representative~~city to provide an adequate foundation upon which the concrete will be placed.

4.7.2 ~~4.8.2~~ CONSTRUCTION METHODS AND EQUIPMENT. The methods employed in performing the work, all equipment, tools and machinery, and other appliances used in handling the materials and executing the work shall be the responsibility of the Contractor. The Contractor shall make such changes in the methods employed and in the equipment used as are necessary whenever the concrete being installed does not meet the specifications herein established. ~~These methods shall include, but are not limited to the following:~~

These methods shall include, but are not limited to the following:

~~**4.8.2.1**~~

4.7.2.1 GENERAL CONCRETE PLACEMENT. Generally, concrete shall be placed as follows.

A. ~~A.~~ **FORMS.** Forms shall be properly built and adequately braced to withstand the liquid weight of concrete being placed in the forms. All linings, studding, whaling and bracing shall be such as to prevent bulging, spreading, loss of true alignment or displacement while placing and during setting of concrete.

B. ~~B.~~ **PREPARATIONS.** Prior to batching and placing concrete, all equipment for mixing and transporting the concrete shall be cleaned. All debris and ice shall be removed from the areas to be occupied by the concrete. All forms shall be oiled with a form-release agent. Masonry support or filler units that will be in contact with concrete shall be well drenched with water (except in freezing weather). Reinforcement shall be thoroughly cleaned of ice or other coatings. Water shall be removed from areas to receive concrete.

Reinforcement that has become too hot, due to sun exposure, in the opinion of the ~~City Representative~~city, will be cooled with water prior to concrete being placed.

When placing concrete on earth surfaces, the surfaces shall be free from frost, ice, mud, water and other deleterious materials. When the subgrade is dry or pervious, it shall be sprayed with water prior to the placing of concrete or shall be covered with water-proof sheathing paper or a plastic membrane. No concrete shall be placed until the preparatory work (i.e. forms, reinforcement, etc~~).~~) has been inspected and approved by the ~~City's Representative~~city.

C. ~~C.~~ **CONCRETE MIXING.** The concrete shall be mixed until there is a uniform distribution of the materials. Sufficient water shall be used in concrete in which reinforcement is to be imbedded, to produce a mixture which will flow sluggishly when worked and can be conveyed from the mixer to the forms without separation of the coarse aggregate from the mortar. In no case shall the quantity of water used be sufficient to cause the collection of a surplus in the forms.

Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in Specifications for Ready-Mixed Concrete (ASTM C-94). Concrete shall be delivered and deposited in its final position within sixty (60) minutes after the cement and water have been added to the mixture.

D. ~~D.~~ **DEPOSITING.** Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Concrete placement shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the corners of forms and around reinforcing bars. Concrete that has partially hardened or is contaminated by foreign material shall not be deposited in the work. Re-tempered concrete shall not be used.

Temperature of the mixed concrete shall be maintained between 60BF and 90BF at time of placement.

All concrete in structures shall be compacted by means of high- frequency internal vibrators of approved type and design during the

operation of placing, and shall be thoroughly worked around reinforcement and embedded fixtures and into the corners of the forms. Care must be taken not to over use vibrators causing separation of cement and aggregates.

E. ~~E.~~ FINISHING. ~~-~~ After the concrete for slabs has been brought to the established grade and screeded, it shall be worked with a magnesium float and then given a light "broom" finish. In no case shall dry cement or a mixture of dry cement and sand be sprinkled on the surface to absorb moisture or hasten hardening. Surface edges of all slabs shall be rounded to a radius of one quarter to one half (1/2) inch with standard concrete finishing tools. Additional water shall not be sprinkled on the surface to aid finishing.

F. ~~F.~~ CURING AND PROTECTION. As soon as the concrete has hardened sufficiently, it shall be protected and cured in accordance with ACI Standards. The finished surface shall be kept moist for a minimum of seven days, or a chemical curing agent used to prevent the concrete from premature drying.

The freshly finished surface shall be protected from hot sun and drying winds until it can be sprinkled or covered as above specified. The concrete surface shall not be damaged or pitted by rain. The Contractor shall provide and use, when necessary, sufficient tarpaulins to completely cover all sections that have been placed within the preceding twelve (12) hours. The Contractor shall erect and maintain suitable barriers to protect the finished surface. Any section damaged from traffic, weather, people or other causes occurring prior to its final acceptance, shall be repaired or replaced by the Contractor in a manner satisfactory to the ~~City's Representative~~city.

G. ~~G.~~ WEATHER LIMITATIONS. Concrete shall not be poured where the air temperature is lower than thirty ~~-~~ five (35^0)degrees F. unless approved by the ~~City's Representative~~city. When there is likelihood of freezing during the curing period, the concrete shall be protected by means of an insulating covering to prevent freezing of the concrete for a period of not less than seven days after placing. Equipment for protecting the concrete from freezing shall be available at the job site prior to placing concrete. Particular care shall be exercised to protect edges and exposed corners from freezing. Cold weather placement shall generally follow the requirements of ACI 306.1

Hot weather placement shall generally conform to the requirements of ACI 305.

~~4.8.2.2~~

4.7.2.2 CONCRETE REINFORCEMENT INSTALLATION. Concrete reinforcement shall be installed in accordance with ACI (American Concrete Institute) standard requirements for reinforced concrete and generally as follows.

A. ~~A.~~BENDING. Reinforcing bars shall be accurately formed to the dimensions indicated on the plans. Bends for stirrups and ties shall be made around a pin having a diameter not less than two (2) times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six (6) times the minimum thickness of the bar, except that for bars larger than one(1) inch, the pin shall be not less than eight (8) times the minimum thickness of the bar.
~~(1) inch, the pin shall be not less than eight (8) times the minimum thickness of the bar.~~

~~B.~~
B. SPLICING. Splicing of bars at points other than where shown on the plans will be permitted only by approval of the ~~City's Representative.~~city. Splices of reinforcement at points of maximum stress shall be avoided wherever possible, and when used shall be staggered and in accordance with ACI Standards. The minimum overlap for a lapped splice shall be twenty four (24) bar diameters, but not less than twelve (12) inches and properly tied together.

C. ~~C.~~PLACING. All reinforcing bars shall be placed accurately in the position shown on the plans, and shall be securely held in position by annealed iron wire ties of not less than sixteen (16) gauge or suitable clips at intersections. All reinforcing bars shall be supported by metal supports, spacers or hangers, in such a manner that there will not be any displacement while placing concrete.

D. ~~D.~~ EMBEDMENT AND PROTECTION. All reinforcing steel shall be protected by concrete embedment and protective cover as shown in Table 4.~~17~~16, such cover in each case being the shortest distance between the face of the form or concrete surface, and the nearest edge or face of the reinforcement.

TABLE 4.~~21REINFORCING~~17
REINFORCING BAR CLEARANCE

LOCATION OF REINFORCEMENT	COVER
Bottom bars - where concrete is deposited against ground without use of forms.	Not less than 3"
Main bars - where concrete is exposed to the weather, or exposed to the ground but placed in forms.	Not less than 2"
Bars in slabs and walls not exposed to the ground or weather.	Not less than 1"

4.7.2.3 ~~4.8.2.3~~ CURB, GUTTER AND SIDEWALK CONCRETE PLACEMENT. The concrete shall be placed either by an approved slipform/extrusion machine, by the formed method, or by a combination of both methods. Curb and gutter shall be placed as follows:

A. ~~A.~~ MACHINE PLACEMENT. The slipform/extrusion machine shall place, spread, consolidate, screed, and finish the concrete in one complete pass to provide a dense and homogeneous concrete section. A minimum amount of hand finishing should be necessary. The machine shall shape, vibrate, and/or extrude the concrete for the full width and depth of the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible. All operations of mixing, delivery, and spreading concrete shall provide for uniform progress, with stopping and starting of the machine held to a minimum.

B. ~~B.~~ FORMED METHOD. The forms shall be of wood, metal, or other suitable material straight and free from warp, having sufficient strength to resist the pressure of the concrete without displacement and sufficient tightness to prevent the leakage of mortar. ~~-~~Flexible or rigid forms of proper curvature shall be used for curves having a radius of one hundred feet, or less.

Forms shall be cleaned and coated with an approved form-release agent before concrete is placed against them.

The concrete shall be deposited into the forms without segregation and then tamped and spaded or mechanically vibrated for thorough consolidation. Front and back forms shall be removed without damage to the concrete after it has set.

~~C.~~

C. **FINISHING.** The concrete shall be finished smooth, by a wood or magnesium float and then given a final surface texture using a light broom or burlap drag unless otherwise specified or directed. Concrete that is adjacent to forms and formed joints shall be edged with a standard jointer or edging tool as shown in the standard drawings. The top, face, and flow-line of the curb, and the top of driveway apron, shall be finished true to line and grade without any noticeable surface irregularities.

The Contractor shall be responsible for neatly stamping an "S" in the curb face at all sewer lateral locations and a "W" in the curb face at all water lateral locations along the curb.

The gutter shall not pond water. The surface of the curb and gutter shall not exceed more than one fourth (1/4) of an inch in ten (10) feet. No part of the exposed surface shall present a wavy appearance.

D. JOINTING.

D.1 ~~D.1~~ **Contraction Joints**. Transverse weakened-plane contraction joints shall be constructed at right angles to the curb line at intervals not exceeding the values in accordance with standard drawings. Where the sidewalk abuts the curb and gutter, joints should align unless otherwise approved by the ~~City's Representative.~~city. Joint depth shall at least be one quarter (1/4) of the cross section depth of the concrete. Generally, surface areas shall not exceed fifty square feet without contraction joints unless otherwise approved by the ~~City's Representative~~city.

Contraction joints may be sawed, hand-formed, or made by placing division plates in the form-work. Sawing shall be done within twenty four hours after the concrete has set to prevent the formation of uncontrolled cracking. The joints may be hand-formed either by using an appropriate jointing tool, or a thin metal blade to impress a plane of weakness into the plastic concrete, or by inserting one eighth (1/8) inch thick steel strips into the plastic concrete temporarily. Steel strips shall be withdrawn before final finishing of the concrete. Where division plates are used to make contraction joints, the plates shall be removed after the concrete has set while the forms are still in place.

D.2 ~~**D.2**~~ Expansion Joints. Expansion joints for curb and gutter shall be constructed at right angles to the curb line at no greater than one hundred fifty (150) foot intervals, at immovable structures and at points of curvature for short-radius curves. Spacing for sidewalk

expansion joint shall not exceed twenty (20) feet. Filler material for expansion joints shall conform to requirements of ASTM D-994, D- 1751, or D-1752 and shall be furnished in a single one half inch thick piece for the full depth and width of the joint.

Expansion joints in a ~~slipformed~~slip formed curb and gutter shall be constructed with an appropriate hand tool by raking or sawing through partially set concrete for the full depth and width of the section. The cut shall be only wide enough to permit a snug fit for the joint filler. After the filler is placed, open areas adjacent to the filler shall be filled with concrete and then troweled and edged.
Contaminated concrete shall be discarded.

Alternately, an expansion joint may be installed by removing a short section of freshly extruded curb and gutter, immediately installing temporary holding forms, placing the expansion joint filler, and replacing and reconsolidating the concrete that was removed.
Contaminated concrete shall be discarded.

D.3 ~~**D.3**~~ Other Jointing. Construction joints may be either butt or expansion-type joints. Curbs and gutters constructed adjacent to existing concrete shall have the same type of joints as in the existing concrete with similar spacing, however, contraction joint spacing shall not exceed ten feet.

A silicone joint sealer as defined in ASTM C 962 shall be applied to all form-plate expansion joints. The silicone joint sealer shall be applied under pressure to a depth of not less than two inches from the outside surface of the curb and gutter.

E. ~~**E.**~~ **PROTECTION.** At all times during the construction of the project, the Contractor shall have materials available at the site to protect the surface of the plastic concrete against rain or other detrimental elements. These materials shall consist of waterproof paper, plastic sheeting or other approved material. For slip-form construction, materials to protect the edges shall also be required.

When concrete is being placed in cold weather and the temperature is expected to drop below 35 degrees F., suitable protection shall

be provided to keep the concrete from freezing until it is at least seven (7) days old. Concrete damaged by frost action shall be removed and replaced.

F. ~~F.~~ CURING. Concrete shall be cured for at least three days after placement to protect against loss of moisture, rapid temperature change, and mechanical damage. Liquid membrane curing compound, or other approved methods, or a combination thereof maybe used as the curing material. Membrane curing shall not be permitted in frost-affected areas when the concrete will be exposed to de-icing chemicals within thirty days after completion of the curing period.

G. ~~G.~~ BACKFILLING. At least three days after placement and after form removal, the concrete shall be backfilled to the lines and elevations as shown on the drawings or as required by the ~~City's Representative.~~city. The length of time may be shortened if it can be demonstrated that the concrete has reached design strength. Any concrete damaged during backfill or other operations, shall be removed and replaced as directed by the ~~City's Representative~~city.

H. ~~H.~~ CONCRETE REPAIR. In lieu of removing and replacing concrete containing minor cracks, the ~~City's Representative~~city may direct the Contractor to repair the affected sections by sawing, routing, cleaning and sealing the cracks. All cracks repaired shall be sealed with a polyurethane TTS-230 type II crack filler or an approved silicone base joint sealer. Where modifications are to be made to existing concrete, the edges to be poured against shall be sawcut in neat, straight lines and the new concrete shall be edged with a standard edging tool.

I. ~~I.~~ WEATHER LIMITATIONS. Concrete shall not be poured when there is likelihood of freezing. During the curing period, the concrete shall be protected by means of insulating covers to prevent freezing of the concrete for a period of not less than seven days after placing. Equipment for protecting the concrete from freezing shall be available at the job site prior to placing concrete. Particular care shall be exercised to protect edges and exposed corners from freezing.

Hot weather concreting shall be in accordance with the latest ACI 305 Standards for "Hot Weather Concreting".

4.7.2.4 ~~4.8.2.4~~ CONCRETE BASE MATERIALS PLACEMENT. The placement

of concrete base materials under curb, gutter and sidewalk shall conform to Section 4.5.7 of these standards.

4.~~8~~7.3 QUALITY CONTROL. All concrete and base materials shall be placed in accordance with these standards and tested as follows. These are minimum requirements and additional testing may be required by the ~~City's Representative~~city or the Project Geotechnical Engineer. Testing documentation provided to the city shall fully address the requirements of these standards.

~~Testing documentation provided to the City's Representative shall fully address the requirements of these standards.~~

4.7.3.1 CONCRETE TESTING. Minimum testing of the concrete shall be as follows:

Mix Design Certification: One per job. Testing shall be according to the latest ASTM standards.

Compressive Strength Tests: One set of four cylinders for each fifty cubic yards of concrete placed or portion thereof. Tests shall be according to ASTM C-31.

Air Entrainment: Tested at beginning of placement until two consecutive loads pass. Others tests shall be taken as required. Tests shall be according to ASTM C-231.

Slump Tests: Tested at beginning of placement until two consecutive loads pass. Others tests shall be taken as required. Tests shall be according to ASTM C-143.

4.7.3.2 CONCRETE BASE MATERIAL TESTING. Minimum testing of the curb, gutter and sidewalk base materials shall be as follows:

Gradation Tests: One test per five hundred (500) lineal feet of curb & gutter or fraction thereof. One test per one thousand three hundred fifty (1,350) square feet of a combination of sidewalk and driveway, or fraction thereof.

The sieve analysis shall be according to ASTM C-136, C-117.

Proctor: One determination for each source of base course as necessary to provide required compaction testing.

Test shall be according to ASTM D-1557, Method A or D (modified proctor).

Moisture Density Tests: One test per three hundred (300) lineal feet of curb & gutter and one test per three hundred (300) lineal feet of a combination of sidewalk and driveway or fraction thereof. Moisture content shall be at plus or minus two percent of optimum. Proper moisture shall be maintained until the concrete is poured. Tests shall be according to ASTM D-1556 or D-2922 and D-3017.

Thickness: One random boring or test hole per two hundred (200) lineal feet of curb & gutter and one random boring or test hole per two hundred (200) lineal feet of a combination of sidewalk and driveway or fraction thereof. If sufficient observation has been made by the ~~City's Representative~~city to verify required thickness, the ~~City's Representative~~city may waive thickness testing. Said waiver must be in writing.

No single measured thickness shall be less than the required thickness.

4.7.3.3 ACCEPTANCE. A total of four (4) concrete test cylinders shall be taken at time of pouring from loads passing the requirements of section 4.8.3.1. One cylinder, shall be broken at seven (7) days and shall be used as an indication of future strength. Two (2) cylinders shall be broken at twenty eight (28) days. If the average of the twenty-eight day breaks is below minimum compressive strength, the concrete may be rejected unless retests prove otherwise. At the Contractor's option, the fourth cylinder (the "hold" cylinder) may be broken at twenty eight (28) days, and included with the average, or it can be held for future testing if additional tests are needed.

Concrete with an average compressive strength below the required strength shall be reviewed by the ~~City's Representative~~city. The "hold" cylinder, if available, may be broken or other specialized tests (such as a spectrum analysis) may be required. If additional tests are required to determine if strength tests are representative they shall be performed by coring in accordance with ASTM C-42 method or other acceptable non- destructive methods. The re-tested strength shall be the average of three cores (or other acceptable method). The ~~City's Representative~~city may accept the concrete as a result of these additional tests~~,~~ or may require the work to be removed and replaced. The ~~City's Representative~~city shall make the final decision. All costs incurred in resampling and retesting are not the responsibility of the ~~City~~city.

All curb, gutter or sidewalk base material not in compliance with these standards shall be removed and replaced. Any costs for testing the re- work are not the responsibility of the ~~City~~city.

4.8 RESTORATION OF EXISTING SURFACE IMPROVEMENTS.

4.8.1 INTRODUCTION. The Contractor shall be responsible for the protection and restoration, or replacement, of all existing improvements on public or private property and all improvements placed during the progress of the work. Existing improvements shall include, but not be limited to, asphalt, curbs, gutters, ditches, driveways, culverts, fences, signs, sidewalks, utilities, landscaping and walls, etc.

All existing improvements damaged during construction shall be reconstructed to equal or better condition than that which existed. However, as a minimum, the requirements contained in these specifications shall be adhered to.

All traveled surfaces shall be maintained flush with the existing surfaces at all times until permanent repairs are completed.

Prior to the beginning of any work activity involving tunneling under, or making any excavation in any street, alley or other public place, the Contractor shall comply with all requirements for permits and bonding. The Contractor shall also comply, during the work activity, with all of the requirements contained within Section 2.5, BARRICADES AND WARNING SIGNS - WORK AREA PROTECTION, of these specifications.

4.8.2 **GRAVEL SURFACES.** Where existing gravel surfaces are damaged due to trenching or other works the surfaced areas (such as roads and driveways) shall be restored and maintained as follows.

4.8.2.1 The gravel shall be placed deep enough to provide a minimum of six inches thickness , or to match the thickness of existing material, or to these specifications, whichever is greater.

4.8.2.2 The gravel shall be placed and compacted in the trench (or other work) at the time it is backfilled. The surface shall be maintained by blading, sprinkling, rolling or adding gravel in order to maintain a safe uniform surface satisfactory to the ~~City's Representative.~~city. Excess material shall be removed from the premises immediately.

4.8.2.3 Material for use on gravel surfaces shall conform to the requirements contained within these specifications.

4.8.3 **BITUMINOUS SURFACES.** Where existing bituminous surface is damaged due to trenches or other works, the bituminous surfaced roads, driveways, parking areas, etc., shall be restored within five (5) days as follows:

4.8.3.1 Mud or other soft or spongy material shall be removed from the trench and the space filled with granular backfill to within twelve (12) inches of finished grade. The granular backfill shall be rolled and compacted to a minimum of ninety-five (95) percent of maximum dry density in layers not exceeding six (6) inches in compacted thickness. Base gravel shall then be placed to a depth equal to the original gravel base or the requirements of these specifications, but not less than six (6) inches thick and compacted to a minimum of ninety five (95) percent of maximum dry density.

4.8.3.2 Prior to permanent resurfacing, the Contractor shall saw-cut the

existing paving to provide vertical, clean, straight lines as nearly parallel to the centerline of the trench as practical. The existing bituminous paving shall be cut back beyond the limits of any excavation so that the edges of the new paving will rest on at least six (6) inches of undisturbed base material.

4.8.3.3 Pavement restoration shall include tacking of pavement edges with type SS-1H bituminous material, and placing and compacting plant mix asphalt in accordance with these specifications to the level of the adjacent pavement surfaces.

4.8.3.4 The bituminous surface shall be restored by standard paving practices to a thickness equal to the original pavement or the requirements of these specifications, but in no case less than two inches. The finished repaired surface shall not deviate more than one quarter (1/4) inch (vertically) from the existing road surface. Any deviations greater than that specified shall be immediately removed and replaced to the proper standards.

4.8.4 CONCRETE SURFACES. All concrete curbs, gutter, sidewalks, and driveways shall be removed and replaced to the next joint or score line beyond the actually damaged or broken sections; or saw-cut to neat, plane faces. All new concrete shall match, as nearly as possible, the appearance and texture of adjacent concrete improvements unless adjacent improvements do not meet these specifications.

All damaged base material shall be restored and compacted in accordance with these specifications.

EXHIBIT B
PowerPoint Presentation

Standard Specifications
Section 4 - Construction Standards

A revision to Table 4.3 (Minimum Roadway Structural Requirements) specifying that for Major Collector roadways and larger, the City will pay for any upsizing of asphalt pavement thickness required by a project specific geotechnical investigation, covering the difference between the Table values and the geotechnically specified thickness.

TABLE 4.3: MINIMUM ROADWAY STRUCTURAL REQUIREMENTS

	Roadway Class	Design ESALs (Million)	Travel Lanes	Min. CBR	Asphalt (in.)	Road Base (in.)
Residential-Local	I	≤0.150	2	10	3	6
Residential- Standard	II	0.150-0.400	2	10	3	8
Residential- Collector	II	0.400-0.700	2	10	3	8
Major Collector	II	0.700-2.2	2	10	3	8
Minor Arterial	III	2.2-7.0	4	10	3.5	10
Arterial Major	III	7.0-9.5	4	10	4	10
Commercial- Local	III	7.0-9.5		10	4	10
Industrial- Local	III	9.5-22		10	5	12

BRYNLEE ST
BRYNLEE ST
PRW
SOPHIE DR
DAWSON DR
450 N ST
450 N ST
450 N ST
2720 E
490 N
2720 E
450 N
2720 E
430 N
2675 E
450 N
2675 E Unit 25
2675 E Unit 26
2675 E Unit 27
2675 E Unit 28
2675 E Unit 29
2675 E Unit 30
2675 E Unit 24
2675 E Unit 23
2675 E Unit 22
2675 E Unit 21
2675 E Unit 20
2675 E Unit 19
2675 E Unit 18
2675 E Unit 17
2675 E Unit 16
2675 E Unit 15
2675 E Unit 14
2675 E Unit 13
2675 E Unit 31
2675 E Unit 32
2675 E Unit 33
2675 E Unit 34
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2675 E Unit 37
2675 E Unit 38
2675 E Unit 9
2675 E Unit 10
2675 E Unit 11
2675 E Unit 12
2675 E Unit 8
2675 E Unit 7
2675 E Unit 6
2675 E Unit 5
2675 E Unit 4
2675 E Unit 3
2675 E Unit 2
2675 E Unit 1
2801 E Unit 601
2801 E Unit 602
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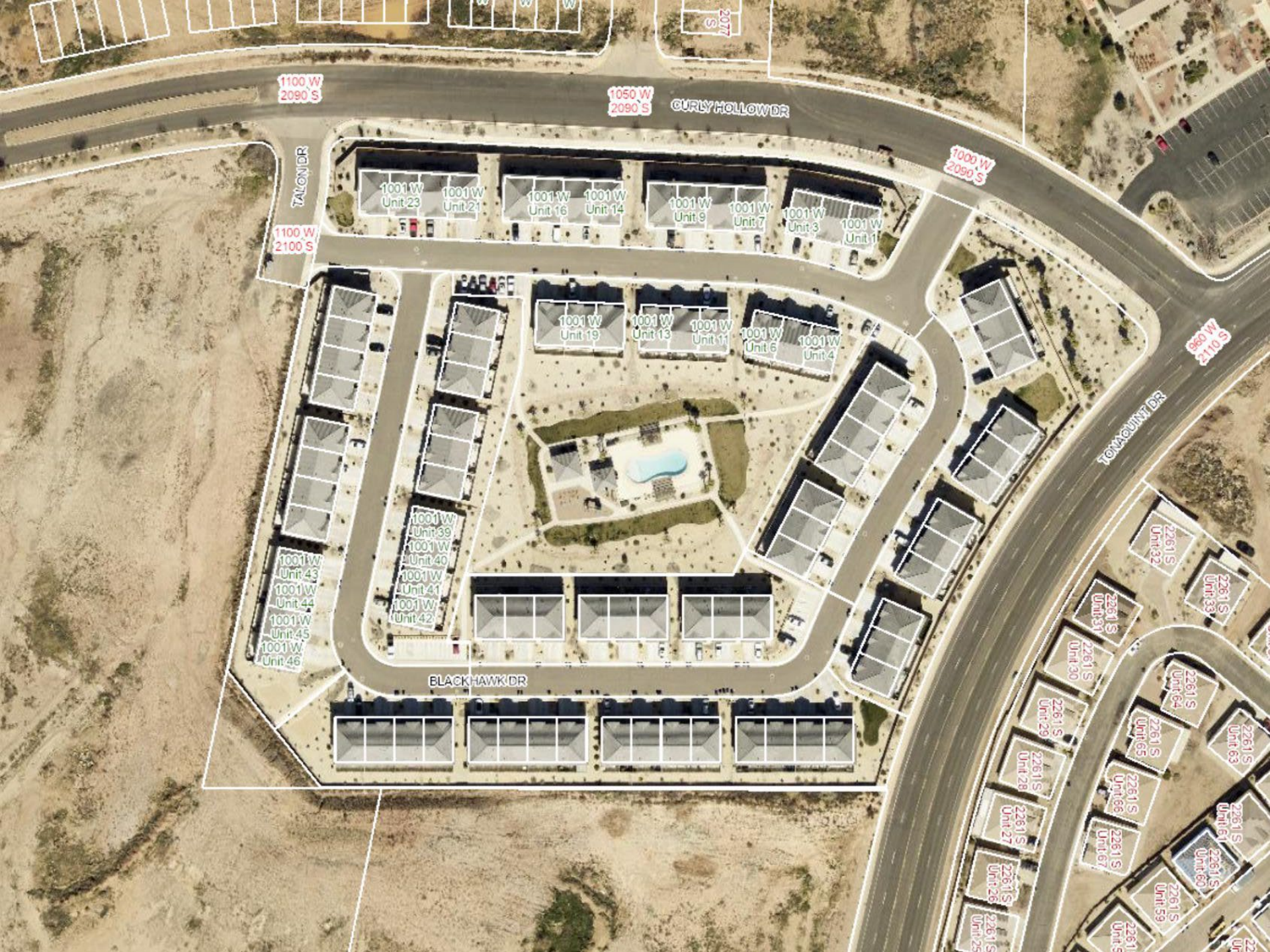
454 N
2480 E CIR
2733 E
2713 E
2699 E
2687 E
2679 E
2663 E
2641 E
2609 E


1100 W
2090 S
1050 W
2090 S
CURLY HOLLOW DR
1000 W
2090 S
TALON DR
1100 W
2100 S
1001 W
Unit 23
1001 W
Unit 21
1001 W
Unit 16
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Unit 14
1001 W
Unit 9
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Unit 7
1001 W
Unit 3
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Unit 1
GARAGE
1001 W
Unit 19
1001 W
Unit 13
1001 W
Unit 11
1001 W
Unit 6
1001 W
Unit 4
980 W
2110 S
TONAQUINT DR
1001 W
Unit 39
1001 W
Unit 40
1001 W
Unit 41
1001 W
Unit 42
1001 W
Unit 43
1001 W
Unit 44
1001 W
Unit 45
1001 W
Unit 46
BLACKHAWK DR
2261 S
Unit 32
2261 S
Unit 33
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Unit 31
2261 S
Unit 30
2261 S
Unit 64
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Unit 61
2261 S
Unit 60
2261 S
Unit 26
2261 S
Unit 59

Clarify roadbase gradation acceptance and suspension limits to meet the minimum acceptable CBR, if the material is unacceptable, it must be removed and replace at the contractor's expense. The geotechnical firm shall notify the City, the source will be removed from the City’s Approved Supplier List, and the supplier may not furnish roadbase for city projects until quality control results are demonstrated and the city re-approves the source.

SIEVE SIZE	ACCEPTANCE LIMIT	SUSPENSION LIMIT
1/2” TO 1”	± 11%	± 15%
3/8”	± 10%	± 15%
No. 4	± 9%	± 14%
No. 16	± 7%	± 11%
No. 200	± 3.0%	± 4.5%

If roadbase gradations exceed the Suspension Limit or fail to meet the minimum acceptable CBR value, the material shall be considered unacceptable and must be removed and replaced with acceptable roadbase at the Contractor’s expense.

The geotechnical firm shall notify the city and the city will remove the roadbase source from the City’s Approved Supplier List if any of the following conditions occur:

- A gradation test result exceeds the Suspension limit;
- A CBR value does not meet the minimum acceptable value;
- Fifty percent (50%) of more of gradation test results on a project exceed the Acceptance Limit;

or

- Four (4) or more consecutive gradation test results exceed the Acceptance Limit.

Require aggregate gradations for Table 4.6 (Master Grading Bands) to meet the specified target tolerance, with gradations analyzed by weight, percent-passing basis; the project's target grading curve must lie within the selected aggregate grade in Table 4.6, and the field gradations may not deviate from the target by more than the allowed tolerance.

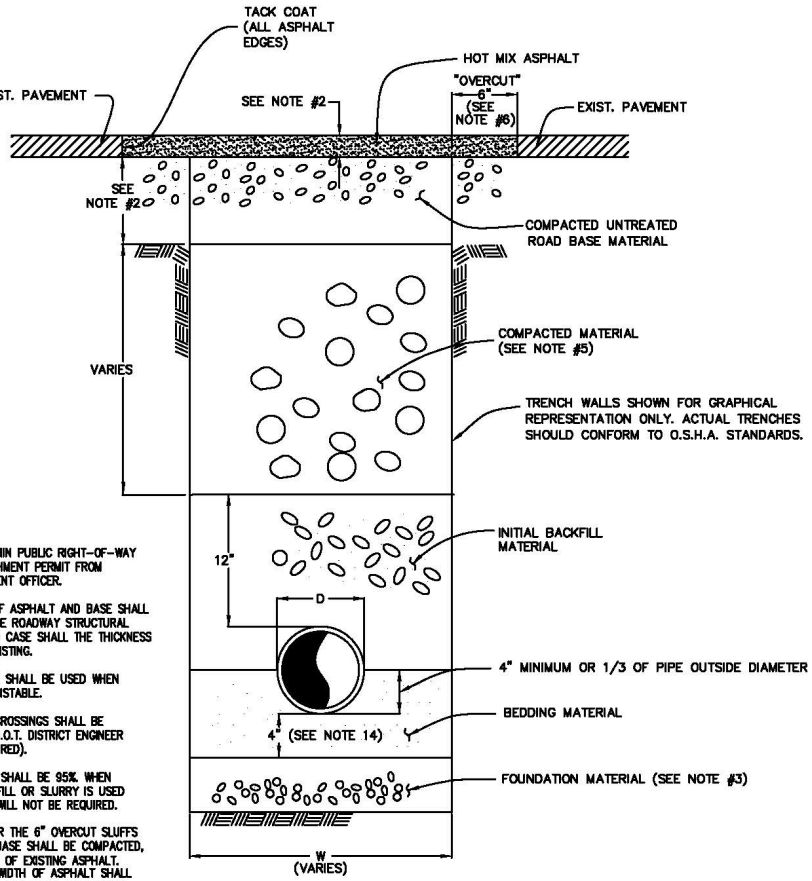
Table 4.6 – Master Grading Bands

Sieve	Aggregate Grade			Target Tolerance
	Grade 1-1/2	Grade 1	Grade 3/4	
1-1/2"	100	–	–	
1 "	–	100	–	±11%
3/4 "	70 – 85	–	100	±11%
1/2 "	–	79 – 91	–	±11%
3/8 "	55 – 75	–	78 – 92	±10%
No. 4	40 – 65	49 – 61	55 – 67	±9%
No. 16	25 – 40	27 – 35	28 – 38	±7%
No. 200	7 – 11	7 – 11	7 – 11	±2.9%

NOTES
(a) It is assumed fine and coarse aggregate have same bulk specific gravity.
(b) Target tolerance for 3/4 sieve in Grade 3/4, and 1” sieve in Grade 1 is not applicable.
(c) Percentage of fines passing No. 200 sieve determined by washing, ASTM C117.

Removal of section 4.6 “Bituminous Seal Coat (Seal Coat) and section 4.7 Asphalt Emulsion Seal Coat (Slurry Seal) as these specifications are provided in contract specifications.

Revision to Standard Drawing 170 – Trench Backfill and Repair Detail



NOTES:

1- ALL EXCAVATIONS WITHIN PUBLIC RIGHT-OF-WAY REQUIRE AN ENCROACHMENT PERMIT FROM THE CITY ENCROACHMENT OFFICER.

2- MINIMUM THICKNESS OF ASPHALT AND BASE SHALL BE AS OUTLINED IN THE ROADWAY STRUCTURAL REQUIREMENTS. IN NO CASE SHALL THE THICKNESS BE LESS THAN THE EXISTING.

3- FOUNDATION MATERIAL SHALL BE USED WHEN TRENCH BOTTOM IS UNSTABLE.

4- ALL STATE HIGHWAY CROSSINGS SHALL BE APPROVED BY THE U.D.O.T. DISTRICT ENGINEER (U.D.O.T. PERMIT REQUIRED).

5- MINIMUM COMPACTION SHALL BE 95% WHEN APPROVED FLOWABLE FILL OR SLURRY IS USED COMPACTION TESTING WILL NOT BE REQUIRED.

6- WHEN MATERIAL UNDER THE 6" OVERCUT SLUFFS OFF OR IS REMOVED, BASE SHALL BE COMPACTED, TO THE BOTTOM LEVEL OF EXISTING ASPHALT. AN ADDITIONAL 6" IN WIDTH OF ASPHALT SHALL BE CUT, REMOVED AND REPLACED AS PART OF THE OVERALL PATCH.

7- WHERE ROAD SECTION HAS A DESIGNED GRANULAR SUB-BASE, IT SHALL BE REPLACED IN KIND OR WITH ROAD BASE GRAVEL.

8- IN GENERAL, STREET SURFACES LESS THAN 24 MONTHS OLD WILL NOT BE CUT I IF A CUT MUST BE MADE, ADDITIONAL, STRICTER REQUIREMENTS MAY BE INVOKED. SEE ENCROACHMENT OFFICER.

9- 24 HOUR NOTICE REQUIRED ON ALL INSPECTIONS.

10- ALL TRENCH BACKFILL SHALL MEET MIN. COMPACTION REQUIREMENTS.

11- EXCLUDING EMERGENCY CLOSURES ALL ROAD CLOSURES AND DETOURS REQUIRE 48 HOURS PRIOR NOTICE.

12- ASPHALT PATCHWORK OVER 3.5" THICK SHALL REQUIRE PLACEMENT IN 2 SEPARATE COMPACTED LIFTS.

13- WHEN WATER MAIN JOINT RESTRAINTS ARE REQUIRED, THE ASPHALT PATCH SHALL BE CONTIGUOUS ALONG THE ENTIRE LENGTH OF THE RESTRAINED SECTION.

14- WHEN ROCK IS ENCOUNTERED AT THE BOTTOM OF THE PIPE TRENCH, 4" OF PIPE BEDDING SHALL BE INSTALLED BETWEEN ROCK AND BOTTOM OF PIPE.

CITY OF ST. GEORGE ENGINEERING DEPARTMENT

REVISIONS		
DATE	DESCRIPTION	BY

TRENCH BACKFILL AND REPAIR DETAIL

STANDARD DWG. NO.	
170	1 OF 1
APPROVED:	
DATE: 2025	BY: JPT

Revisions to Minimum Testing Requirements

the requirements of these standards.

4.8.3.1 CONCRETE TESTING. Minimum testing of the concrete shall be as follows:

Mix Design Certification:	One per job. Testing shall be according to the latest ASTM standards.
Compressive Strength Tests:	One set of four cylinders for each fifty cubic yards of concrete placed or portion thereof. Tests shall be according to ASTM C-31.
Air Entrainment:	Tested at beginning of placement until two consecutive loads pass. Others tests shall be taken as required. Tests shall be according to ASTM C-231.
Slump Tests:	Tested at beginning of placement until two consecutive loads pass. Others tests shall be taken as required. Tests shall be according to ASTM C-143.

4.8.3.2 CONCRETE BASE MATERIAL TESTING. Minimum testing of the curb, gutter and sidewalk base materials shall be as follows:

Gradation Tests:One test per five hundred (500) lineal feet of curb & gutter or fraction thereof. One test per one thousand three hundred fifty (1,350) square feet of a combination of sidewalk and driveway, or fraction thereof.

The sieve analysis shall be according to ASTM C-136, C-117.

Proctor:	One determination for each source of base course as necessary to provide required compaction testing. Test shall be according to ASTM D-1557, Method A or D (modified proctor).
Moisture Density Tests:	One test per three hundred (300) lineal feet of curb & gutter and one test per three hundred (300) lineal feet of a combination of sidewalk and driveway or fraction thereof. Moisture content shall be at plus or minus two percent of optimum. Proper moisture shall be maintained until the concrete is poured. Tests shall be according to ASTM D-1556 or D-2922 and D-3017.

Subgrade and Pavement/Concrete Requirements

St. George City Minimum Testing Requirements

Subgrade Requirements

Location	Minimum Requirements	Frequency	Specification Reference
Roadway Subgrade	95% for granular soils, 90% for fine grained soilsand +/- 2% per D-1557	1 test per 750 square yards	Section 4.3.3.1
Roadway/Embankment/Backfill	95% for granular soils, 90% for fine grained soilsand +/- 2% per D-1557	Embankments: 1 test per 250 linear feet of roadway	Section 4.3.3.1
Under Curb and Gutter	95% and +/- 2% per D-1557	1 test per 400 feet of linear roadway	Section 4.3.3.1
Under Sidewalks and Driveways	95% and +/- 2% per D-1557	1 test per 500 feet of linear sidewalk and 1 per entrance (commercial)	Section 4.3.3.1
Utility Trenches under Roadway, Curb and Gutter, or Sidewalk*	95% and +/- 2% per D-1557	1 test per 200 linear feet and 2 vertical feet (additionally 1 test per crossing)	Section 4.4.3.1
Sewer and Water Laterals*	95% and +/- 2% per D-1557	2 tests per sewer lateral , 1 test per water lateral	Section 4.4.3.1
Sewer Manhole and Storm Drain Box/Curb Inlet*	95% and +/- 2% per D-1557	3 tests per sewer/storm drain manhole, 1 tests per storm drain box/curb inlet	Section 4.4.3.1
Water Valves*	95% and +/- 2% per D-1557	1 test per valve/valve cluster	Section 4.4.3.1

Untreated Base Course and Subbase Requirements

Location & Test Type	Minimum Requirements	Frequency	Specification Reference
Roadway (Compaction)	95% and +/- 2% per D-1557	1 test per 200 linear foot of roadway	Section 4.5.24.1 part A
Roadway (Gradation)	Job-Mix Target	1 test per 500 linear foot	Section 4.5.24.1 part C
Curb and Gutter (Compaction)	95% and +/- 2% per D-1557	1 test per 300 linear feet	Section 4.8.3.2
Curb and Gutter (Gradation)	Job-Mix Target	1 sample per 750 lineal feet	Section 4.5.24.1 part C Section 4.8.3.2
Sidewalk/Trail (Compaction)	95% and +/- 2% per D-1557	1 test per 300 linear feet	Section 4.8.3.2
Sidewalk/Trail (Gradation)	Job-Mix Traget	1 sample per 750 linear feet	Section 4.5.24.1 part C Section 4.8.3.2

Bituminous Surface Course Requirements (Asphalt)**

Location and Test Type	Minimim Requirements	Frequency	Specification Reference
Roadway (Compaction)	96% Average, no test below 92% Marshall 92% Average, no test below 90% Rice	1 test per 7,000 square feet	Section 4.5.24.3 Part A
Roadway (Extraction)	Job-Mix Target	1 Rice test per 500 tons	Section 4.5.24.3 Part C
Roadway (Extraction)	Job-Mix Target	1 Marshall test per 1 day's production	Section 4.5.24.4

**Temperature observation required during winter months (December 1 through February 15)

Concrete Testing Requirements (Curb, Gutter and Sidewalk)

Test Type	Requirements	Frequency	Specification Reference
Compressive Strength	4,000 psi at 28 days	1 set (4 cylinders) per 50 cubic yards	Section 4.8.3.1
Air Entrainment	4-6% by volume	Until 2 consecutive tests pass	Section 4.8.3.1
Slump	4-inch maximum 1 1/2-inch maximum for machine placement	Until 2 consecutive tests pass	Section 4.8.3.1
Temperature	90° F. Maximum conrete temperature 60° F. Minimum concrete termperature	At least once per load	Section 4.8.3.1

ST. GEORGE PLANNING COMMISSION MINUTES
October 28, 2025, 5:00 P.M.
CITY COUNCIL CHAMBERS

PRESENT:
Planning Commission Chair Austin Anderson
Planning Commission Member Ben Rogers
Planning Commission Member Terri Draper
Planning Commission Member Lori Chapman
Planning Commission Member Nathan Fisher
Planning Commission Member Kelly Casey

EXCUSED:
Planning Commission Member Brandon Anderson

STAFF MEMBERS PRESENT:
City Deputy Attorney Jami Bracken
Community Development Director Carol Winner
Public Works Engineering Manager Cathy Hasfurther
Planner Brenda Hatch
Planner Dan Boles
Planner Brian Dean
Development Office Supervisor Angie Jessop

OTHERS PRESENT:
Applicant Patrick Darragh
Applicant Sam Patel
Applicant Stacy Young

CALL TO ORDER:
Planning Commission Chair Anderson called the meeting to order and welcomed all in attendance. The Pledge of Allegiance to the Flag was led by Commission Member Rogers.

Link to call to order and flag salute: 00:00:35

Link to call for disclosures 00:01:15

ITEM 1
ZONE CHANGE- St George Downtown Hyatt – PUBLIC HEARING
Consider a request to change the zoning from C-3 (General Commercial) to PD-C (Planned Development Commercial) on approximately 1.75 acres for the purpose of building a hotel. The property is located at 559 East St. George Blvd. The applicant is Rosenberg Associates and the representative is Patrick Darragh. Case No. 2025-ZC-018 (Staff – Brenda Hatch)

Agenda Packet [Page 3]

Link to Presentation by Brenda Hatch 00:01:35

Link to question by Commission Member Chapman and discussion 00:05:53

DRAFT

Link to public hearing 00:12:52

Link to comment by Brad Harr 00:13:09

Public Hearing Closed

Link to comment by Applicant Sam Patel 00:13:39

Link to question by Commission Member Chapman and discussion with applicant 00:16:05

Link to question by Commission Chair Anderson and discussion with applicant 00:17:48

Link to discussion by Commission Members and Ms. Hatch 00:23:18

Link to comments by Public Works Engineer Cathy Hathsfurther 00:24:11

Link to discussion by Commission Members 00:25:25

Link to comment by Community Development Director Carol Winner 00:31:14

Link to discussion by Commission Members 00:31:49

Link to question by Commissioner Rogers and Ms. Hatch 00:41:27

Link to discussion by Commission Members 00:44:09

Link to comment by Applicant Patrick Darragh 00:44:40

Link to motion 00:46:53

MOTION:

A motion was made by Planning Commission Member Casey to forward a positive recommendation to the City Council for the zone change for the St George Downtown Hyatt as presented. Including the staff recommendations that the height is increased to allow the additional height, as requested by the applicant and shown in the staff report. The applicant must combine the lots the site can be approved. And that a 15 foot landscape strip must be provided along the right of way on 600 East. And also that the use list be changed to only include Bar Establishment, Restaurant, Hotel/Motel.

SECOND:

The motion was seconded by Planning Commission Member Fisher.

VOTE:

Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye

DRAFT

Planning Commission Member Chapman – aye
Planning Commission Member Rogers –aye
Planning Commission Member Draper –aye

The vote was unanimous. Motion carries.

ITEM 2

ZONE CHANGE- First West – PUBLIC HEARING

Consider a request to change the zoning from C-4 (Central Business District Commercial) to PD-MU (Planned Development Mixed Use) on approximately 3.76 acres. The project will consist of commercial and residential uses. The property is located on the north-west and north-east corners of 100 West Street and St. George Blvd. The applicant is DSG Engineering and the representative is Mike Terry. Case No. 2025-ZC-019 (Staff – Brenda Hatch)

Agenda Packet [Page 22]

Link to Presentation by Brenda Hatch 00:48:13

Link to discussion between Commission Members and Ms. Hatch 00:58:33

Link to comment by Community Development Director Winner and discussion with Commission Members 01:04:40

Link to public hearing 01:06:05

Link to comment by Katherine Gardner Staheli 01:06:10

Public Hearing Closed

Link to discussion by Commission Members 01:11:10

Link to discussion between Applicant Stacy Young and Commission Members 01:11:26

Link to motion 01:15:44

MOTION:

A motion was made by Planning Commission Member Draper to forward a positive recommendation to change the zoning from C-4 to PD-MU, based on the conditions and findings in the staff report, according to the height restriction increase so that it is allowed for the additional request and is harmonious with the area.

SECOND:

The motion was seconded by Planning Commission Member Rogers.

VOTE:

Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent

DRAFT

Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye
Planning Commission Member Chapman – aye
Planning Commission Member Rogers –aye
Planning Commission Member Draper –aye

The vote was unanimous. Motion carries.

ITEM 3

PLANNED DEVELOPMENT AMENDMENT 311 West St George Blvd – PUBLIC HEARING

Consider a request for an amendment to the 300 West Mixed Use PD-MU (Planned Development Mixed-Use) zone on approximately 1.28 acres to allow for a new mixed-use building. This property is located at 311 West St. George Blvd. The applicant is Rosenberg & Associates, and the representative is Jared Bates. Case No. 2025-PDA-030 (Staff -Brenda Hatch) THIS ITEM WILL NOT BE HEARD AT THIS MEETING. IT WILL BE RE-NOTICED FOR A MEETING AT A LATER DATE.

ITEM 4

ZONE REGULATION AMENDMENT Title 10-19-3B6 Parking Ordinance – PUBLIC HEARING

Consider a request to amend portions of the city zoning ordinance, Title 10, in order to amend various setback and parking standards, and to make other clarifications to orientation requirements. The applicant is SUHBA (Southern Utah Home Builders Association), and the representative is Stacy Young. Case No. 2025-ZRA-012 (Staff – Brenda Hatch)

Agenda Packet [Page 56]

Link to Presentation by Brenda Hatch 01:16:56

Link to discussion between Commission Members and Ms. Hatch 01:20:50

Link to comment by Community Development Director Winner and discussion with Commission Members 01:22:40

Link to comment by Assistant City Attorney Jami Bracken and discussion with Commission Members 01:29:20

Link to public hearing 01:36:20

Public Hearing Closed

Link to discussion by Commission Members 01:36:25

Link to motion 01:37:13

MOTION:

A motion was made by Planning Commission Member Rogers to forward a positive recommendation to City Council for Item 4, zone regulation amendment for parking ordinance.

DRAFT

SECOND:

The motion was seconded by Planning Commission Member Casey.

VOTE:

Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye
Planning Commission Member Chapman – nay
Planning Commission Member Rogers –aye
Planning Commission Member Draper –aye

The vote is 5-1. Motion carries.

ITEM 5

PRELIMINARY PLAT Mojave Crossing

Consider a request for a three-lot (3) preliminary plat planned development commercial subdivision in the Atkinville Interchange Area Zone Plan totaling approximately 5.057 acres, generally located at the corner of Pioneer Road and Nighthawk Drive. The applicant is CIR Engineering and the representative is Colby Anderson. Case No. 2025-PP-034 (Staff – Brian Dean)

Agenda Packet [Page 71]

Link to Presentation by Brian Dean 01:38:00

Link to motion 01:39:33

MOTION:

A motion was made by Planning Commission Member Rogers to approve Item 5, preliminary plat for Mojave Crossing.

SECOND:

The motion was seconded by Planning Commission Member Fisher.

VOTE:

Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye
Planning Commission Member Chapman – aye
Planning Commission Member Rogers –aye
Planning Commission Member Draper –aye

The vote was unanimous. Motion carries.

DRAFT

ITEM 6

PRELIMINARY PLAT Desert Canyons Town Center West

Consider a request for a four-lot (4) preliminary plat commercial subdivision on approximately 9.357 acre, generally located at north of Flowers Way and west of Desert Canyons Parkway The applicant is DSG Engineering Inc., and the representative is Ken Miller. Case No. 2025-PP-035 (Staff – Brian Dean)

Agenda Packet [Page 83]

Link to Presentation by Brian Dean 01:40:03

Link to motion 01:41:17

MOTION:

A motion was made by Planning Commission Member Draper to approve Item 6, preliminary plat for Desert Canyons Town Center West.

SECOND:

The motion was seconded by Planning Commission Member Fisher.

VOTE:

Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye
Planning Commission Member Chapman – aye
Planning Commission Member Rogers –aye
Planning Commission Member Draper –aye

The vote was unanimous. Motion carries.

ITEM 7

PRELIMINARY PLAT Ascesa Court at Divario

Consider a request for a nine-lot (9) preliminary plat subdivision on approximately 12.24 acres including common area located at 302 South Divario Canyon Drive. The applicant is Rosenberg Associates, and the representative is Allen Hall. Case No. 2025-PP-036 (Staff – Dan Boles)

Agenda Packet [Page 91]

Link to Presentation by Dan Boles 01:42:00

Link to question by Commission Member 01:43:07

Link to motion 01:43:39

MOTION:

A motion was made by Planning Commission Member Chapman to approve Item 7, Ascesa Court at Divario, the additional plat, with staff conditions.

DRAFT

SECOND:
The motion was seconded by Planning Commission Member Rogers.

VOTE:
Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye
Planning Commission Member Chapman – aye
Planning Commission Member Rogers –aye
Planning Commission Member Draper –aye

The vote was unanimous. Motion carries.

ITEM 8
PLANNING COMMISSION TRAINING

Link to presentation by City Attorney Jami Bracken 01:42:00

APPROVAL OF MINUTES:
Consider a request to approve the meeting minutes from the October 14, 2025 meeting.

Agenda Packet [Page 99]

Link to motion 02:31:53

MOTION:
A motion was made by Planning Commission Member Rogers to approve minutes of October 14, 2025 meeting.

SECOND:
The motion was seconded by Planning Commission Member Chapman

VOTE:
Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson -absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey – aye
Planning Commission Vice Chair Chapman –aye
Planning Commission Member Rogers – aye
Planning Commission Member Draper- aye

The vote was unanimous and the motion carried.

DRAFT

CITY COUNCIL ITEMS:

Carol Winner, the Community Development Director, will report on items heard at the October 16, 2025, City Council Meeting.

1. *Dixie Commons Lot 6*
2. *Zen Trails Townhomes*
3. *Anasazi Hills Phase 4*
4. *Maverik St George White Dome*

ADJOURN:

Link to motion: 02:33:10

MOTION:
A motion was made by Planning Commission Member Fisher to adjourn.

SECOND:
The motion was seconded by Planning Commission Member Rogers.

VOTE:
Commission Chair Anderson called for a vote, as follows:

Planning Commission Chair Anderson – aye
Planning Commission Member Anderson –absent
Planning Commission Member Fisher – aye
Planning Commission Member Casey –aye
Planning Commission Member Chapman –aye
Planning Commission Member Rogers –aye
Planning Commission Member Draper – aye

The vote was unanimous, and the motion carries.

/s/ October 28, 2025
Angie Jessop, Development Services Date

DRAFT