Next scheduled Committee Meeting will be held in the Council Chambers, 201 Spring Street, Springdale, Arkansas.

- The date of the next Committee Meeting will be Wednesday, June 2, 2021.
- Committee agendas will be available on the Friday before this meeting.

SPRINGDALE CITY COUNCIL
REGULAR MEETING
COUNCIL CHAMBERS
TUESDAY, May 25, 2021

5:55 p.m.  Pre Meeting Activities
Pledge of Allegiance
Invocation – Brian Powell

6:00 p.m.  OFFICIAL AGENDA

1.  Large Print agendas are available.

2.  Call to Order – Mayor Doug Sprouse

3.  Roll Call – Denise Pearce, City Clerk
Recognition of a Quorum

4.  Comments from Citizens
The Council will hear brief comments from citizens present at the meeting during this period on issues not on the Agenda. No action will be taken tonight. All comments will be taken under advisement.

5.  Approval of Minutes – May 11, 2021 Council Meeting  Pgs. 4 - 20

6.  Procedural Motions
A.  Entertain Motion to read all Ordinances and Resolutions by title only.

B.  Entertain Motion to dispense with the rule requiring that ordinances be fully and distinctly read on three (3) different days for ordinances listed on this agenda as item number(s) 8.A- 8.E, 9. Motion must be approved by two-thirds (2/3) of the council members).

7.  Reappointments
A.  A Resolution reappointing Jayson Janda and Justin Cole to the Advertising and Promotion Commission of the City of Springdale. Resolution presented by Mayor Sprouse.  Pg. 21

B.  A Resolution approving the reappointment of Payton Parker to the Springdale Planning Commission.  Pg. 22

8.  Planning Commission Report and Recommendation by Patsy Christie, Director of Planning and Community Development

A.  An Ordinance amending Ordinance NO. 5586, which rezoned certain lands (2.41 acres located at 611 E. Apple Blossom Ave) from General Commercial District (C-2) to Light Industrial District (I-1) and declaring an emergency.  Pgs. 23 - 25

B.  An Ordinance amending Ordinance NO. 3307 the same being the zoning ordinance of the City of Springdale, Arkansas, and the plat pertaining thereto by rezoning certain lands (1.7 acres located at 807 S. West End St) from certain Low/Medium Density Single Family Residential District (SF-2) to Neighborhood Office District (O-1).  Pgs. 26 - 28

C.  An Ordinance amending Ordinance NO. 3307 the same being the zoning ordinance of the City of Springdale, Arkansas, and the plat pertaining thereto by rezoning certain
lands (0.39 acres located at 515 Sanders Ave) from Neighborhood Commercial District (C-1) to Institutional District (P-1). Pgs. 29 - 31

D. **An Ordinance** amending Ordinance NO. 3307 the same being the zoning ordinance of the City of Springdale, Arkansas, and the plat pertaining thereto by rezoning certain lands (14.05 acres located at 2377 North 56th St) from Agriculture District (A-1) to Low/Medium Density Single Family Residential District (SF-2) and declaring an emergency. Pgs. 32 - 34

E. **An Ordinance** amending Ordinance NO. 3307 the same being the zoning ordinance of the City of Springdale, Arkansas, and the plat pertaining thereto by rezoning certain lands (1.0 acres located west of Grimsley Road and north of Carrie Smith Road) from Agriculture District (A-1) to Low Density Single Family Residential District (SF-1) and declaring an emergency. Pgs. 35 - 37

F. **A Resolution** approving a conditional use at 901 Dorman Street as set forth in Ordinance NO. 4030. Pgs. 38 - 39

G. **A Resolution** approving a conditional use at 5392 Arkansas 112 Highway as set forth in Ordinance NO. 4030. Pgs. 40 - 41

H. **A Resolution** approving a conditional use at 324 North 48th Street as set forth in Ordinance NO. 4030. Pgs. 42 - 43

I. **A Resolution** approving a conditional use at 2556 North 40th Street as set forth in Ordinance NO. 4030. Pgs. 44 - 45

J. **A Resolution** approving a waiver of street improvements, drainage, curbs, gutters and sidewalks as set forth in Ordinance NO. 3725 to NETS Global Holdings, LLC in connection with N20-05 a Non Large Scale Development. Pgs. 46 - 47

K. **A Resolution** approving a waiver of street improvements, drainage, curbs, gutters and sidewalks as set forth in Ordinance NO. 3725 to Huey and Betty Couch in connection with 2675 North 56th Street a Single Family Dwelling. Pgs. 48 - 49

L. **A Resolution** approving a waiver of street improvements, drainage, curbs, gutters and sidewalks as set forth in Ordinance NO. 3725 to Scott and Cheryl Scruton in connection with 8246 Wagon Wheel Road a Single Family Dwelling. Pgs. 50 - 51

9. Ordinance Committee by Chairman Mike Overton

**An Ordinance** amending chapter 106 of the code of ordinances of the City of Springdale, Arkansas. Forwarded to Council with recommendation for approval. Pgs. 52 - 140

10. Finance Committee by Chairman Jeff Watson

A. **A Resolution** expressing the willingness of the City of Springdale to utilize federal funding for the following project: Dean's Trail Phase IIIA. Forwarded from Committee with recommendation for approval. Pg. 141

B. **A Resolution** authorizing the execution of a construction contract at the Springdale Municipal Airport for regional detention. Forwarded from Committee with recommendation for approval. Pgs. 142 - 143

C. **A Resolution** authorizing the execution of a construction contract for a traffic signal. Forwarded from Committee with recommendation for approval. Pgs. 144 - 145

11. Police and Fire Committee by Chairman Brian Powell

**A Resolution** authorizing the change in staffing of the police department. Forwarded from Committee with recommendation for approval. Pgs. 146 - 147

12. **A Resolution** authorizing payment of an invoice for Project No. 18BPC1, Municipal Campus. The invoice in the amount of $1,061,401.28 from Milestone Construction Company exceeds $1,000,000 and requires approval of the City Council. Resolution presented by Wyman Morgan, Administrative and Financial Services Director. Pgs. 148 - 149

13. Comments from Council Members.
14. Comments from Department Heads.

15. Comments from City Attorney.

16. Comments from the Mayor.

17. Adjournment.
SPRINGDALE CITY COUNCIL
MAY 11, 2021

The City Council of the City of Springdale met in regular session on Tuesday, May 11, 2021, in the City Council Chambers, City Administration Building. Mayor Doug Sprouse called the meeting to order at 6:00 p.m.

Roll call was answered by:

Doug Sprouse  Mayor
Brian Powell  Ward 1
Amelia Williams  Ward 3 (Absent)
Jeff Watson  Ward 3
Mike Overton  Ward 2
Mike Lawson  Ward 4
Kevin Flores  Ward 2
Randall Harriman  Ward 1
Mark Fougierousse  Ward 4
Ernest Cate  City Attorney
Denise Pearce  City Clerk/Treasurer

Department heads present:

Mike Irwin  Fire Chief
Mike Peters  Police Chief
Wyman Morgan  Director of Financial Services
Patsy Christie  Planning & Comm. Dev. Director
Ryan Carr  Deputy Engineering Director
Colby Fulfer  Chief of Staff

CITIZEN COMMENTS

Richard Bowman with the B Battery of First142nd Field Artillery invited everyone to the rededication of their plaque on May 22, 2021 from 11 a.m.-1:00 p.m. in front of City Hall. There are 88 names on the plaque that was originally placed at the National Guard Armory formerly on East Sunset Avenue and had to be moved because that location was closed a few years ago.

Melinda Mason, West Allen Avenue, spoke to City Council about property located at 326 Holcomb located right behind her property. It is going to be Baha's Bistro that will be opening soon. She is very much against a bar at this location and feels like it will drastically affect their neighborhood.

INTRODUCTION OF NEW MUSEUM DIRECTOR

Mayor Sprouse introduced Angie Albright, the new Shiloh Museum Director for the City of Springdale. Allyn Lord will be retiring the first part of June 2021.

APPROVAL OF MINUTES

Council Member Harriman moved the minutes of the April 27, 2021 City Council meeting be approved as presented. Council Member Flores made the second.

There was a voice vote of all ayes and no nays.

ORDINANCES AND RESOLUTIONS READ BY TITLE ONLY

Council Member Harriman made the motion to read all Ordinances and Resolutions by title only and to dispense with the rule requiring that ordinances be fully and distinctly read on three (3) different days for all items listed on this agenda. Council Member Fougierousse made the second.

The vote:
RESOLUTION NO. 51-21 – AUTHORIZING THE TEMPORARY OPERATION OF A CARNIVAL CONDUCTED BY CROSS CHURCH LOCATED AT 1709 JOHNSON ROAD ON MAY 26-27, 2021

Mayor Doug Sprouse presented a Resolution authorizing the temporary operation of a carnival conducted by Cross Church located at 1709 Johnson Road on May 26-27, 2021.

A RESOLUTION AUTHORIZING THE TEMPORARY OPERATION OF A CARNIVAL

WHEREAS, Jeremy Gackle, from Cross Church has requested permission to conduct a carnival event at Cross Church located at 1709 Johnson Road, put on by Cross Church, Inc.; and

WHEREAS, the carnival dates will be Wednesday, May 26\textsuperscript{th}, 2021 thru Thursday, May 27\textsuperscript{th}, 2021; and

WHEREAS, the carnival’s hours of operation will be Wednesday, May 26\textsuperscript{th}, 2021 from 6:00 p.m. to 10:00 p.m. and Thursday, May 27\textsuperscript{th}, 2021 from 6:00 p.m. to 10:00 p.m.; and

WHEREAS, Sec. 26-43 of the Springdale Code of Ordinances provides that the operation of a carnival, sideshow or other similar amusement facility within the city must be approved by resolution adopted by the city council,

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that Jeremy Gackle, from Cross Church is hereby authorized to conduct a carnival event at Cross Church located at 1709 Johnson Avenue, May 26\textsuperscript{th} thru May 27\textsuperscript{th} with the carnival’s opening and closing times listed above. In case of a rain out, the Mayor has the authority to reschedule this event.

PASSED AND APPROVED this ___ day of May, 2021.

____________________________
Doug Sprouse, Mayor

ATTEST:

Denise Pearce, City Clerk

APPROVED AS TO FORM:

Ernest B. Cate, City Attorney

Council Member Harriman moved the Resolution be adopted. Council Member Lawson made the second.

The vote:

Yes: Watson, Overton, Lawson, Flores, Harriman, Fougerousse, Powell

No: None

The Resolution was numbered 51-21.
RESOLUTION NO. 52-21 — APPOINTING HEATH WARD TO THE BOARD OF DIRECTORS TO THE NORTHWEST ARKANSAS CONSERVATION AUTHORITY FOR A SIX YEAR TERM TO EXPIRE DECEMBER 31, 2026

Mayor Doug Sprouse presented a Resolution appointing Heath Ward to the Board of Directors to the Northwest Arkansas Conservation Authority for a six year term to expire December 31, 2026. He will be filling the unexpired term of Chris Weiser.

RESOLUTION NO. ___

A RESOLUTION APPOINTING HEATH WARD TO THE BOARD OF DIRECTORS OF THE NORTHWEST ARKANSAS CONSERVATION AUTHORITY

WHEREAS, with the adoption of Ordinance No. 3222 on July 23, 2002, the City of Springdale became an initial member of the Northwest Arkansas Conservation Authority; and

WHEREAS, paragraph 6.02 of the Northwest Arkansas Conservation Authority Agreement established terms of six (6) years and Arkansas Code Annotated § 14-233-108 provides for the appointment of Directors by the governing bodies of the members of the authority; and

WHEREAS, it is the recommendation of the Mayor that Heath Ward be appointed to fill the expired six (6) year term of Chris Weiser on the Board of Directors of the Northwest Arkansas Conservation Authority.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE ARKANSAS, that Heath Ward is hereby appointed to the Board of Directors of the Northwest Arkansas Conservation Authority to a six (6) year term expiring on December 31st, 2026.

PASSED AND APPROVED this ___ day of May, 2021.

__________________________
Mayor Doug Sprouse

ATTEST:

Denise Pearce, CITY CLERK

APPROVED AS TO FORM:

__________________________
Ernest B. Cate, CITY ATTORNEY

Council Member Harriman moved the Resolution be adopted. Council Member Lawson made the second.

The vote:

Yes: Overton, Lawson, Flores, Harriman, Fougerousse, Powell, Watson

No: None

The Resolution was numbered 52-21.
RESOLUTION NO. 53-21 – ADOPTING AND APPROVING THE 2021 PROGRAM YEAR FOR THE COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM

Council Member Kevin Flores presented a Resolution adopting and approving the 2021 Program Year for the Community Development Block Grant Program.

Planning Director Patsy Christie explained that part of the process is to take applications from non-profit organizations in the city that can provide public services. Over the years the number of applications received has increased. They were proposing to raise the amount given to 13.5%. At the last committee meeting it was discussed to lower the amount given to non-profits to 10%.

Representatives from non-profits were present at council and spoke regarding their services and how the money has helped their organizations tremendously. They expressed their appreciation with whatever money they receive, but the difference between 10% and 13.5% would help a lot more people.

After discussion, Council Member Overton made the motion to approve the Resolution for the CDBG 2021 Program giving the non-profits 10%. Council Member Lawson made the second.

The vote:

Yes: Lawson, Watson, Overton

No: Flores, Harriman, Fougerousse, Powell

Motion failed.

Council Member Flores made the motion to adopt the following Resolution for the CDBG 2021 Program giving the non-profits 13.54%. Council Member Harriman made the second.

RESOLUTION NO. ___

A RESOLUTION ADOPTING AND APPROVING THE 2021 PROGRAM YEAR FOR THE COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM

WHEREAS, in accordance with the guidelines established by the Department of Housing & Urban Development for the Community Development Block Grant Program, the 2021 Action Plan was developed, a copy of which is attached and made part of the resolution; and

WHEREAS, a final public hearing was held before the City Council on May 11, 2021

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS:

1. That The 2021 Program Year Action Plan for the use of Community Development Block Grant Program Funds, a copy of which is attached and made a part as though set out herein word or word, is approved and authorized for submission to the United States Department of Housing and Urban Development on May 11, 2021.

2. That Mayor Doug Sprouse is hereby designated as the authorized official to execute all documents pertaining to the Community Development Block Grant Program.
SPRINGDALE CITY COUNCIL
MAY 11, 2021

PASSED AND APPROVED this ___ day of May, 2021.

Doug Sprouse, Mayor

ATTEST:

Denise Pearce, City Clerk

APPROVE AS TO FORM:

Ernest B. Cate, City Attorney

CDBG FY2021 Program Summary

The City of Springdale is anticipating the $793,071 for the PY21. The funds will be dispersed as requested.

The Program year starts July 1, 2021 and ends June 30, 2022

The City of Springdale is an entitlement city in the Department of Housing & Urban Development’s (HUD) Community Development Block Grant (CDBG) Program and receives a formula grant annually. The primary objective of the CDBG Program is the preservation and development of viable communities by providing decent housing, a suitable living environment, economic development opportunities, public services and public facilities principally for low and moderate income persons.

FY18- $869,425 FY19- $812,275
FY20- $812,974 FY21- $793,071

The activities contained in the City’s work program are as follows:

- Rehabilitation of owner occupied single family dwellings from 1978 or older, including emergency repairs-- $410,726 - 51%
- Direct grant to Nonprofit organizations -- $107,345 – 13.5%
- Program administration -- $75,000 - 11%
- Public facilities- $200,000- the funds will allocated for possible facility projects
- The average amount of CDBG program spent on a single family dwelling is $23,308.27, for the 2020 program year CDBG Funding. Thirteen dwelling received rehabilitation assistance. This is to include seven (7) emergency work orders on HVAC systems, roofs, and plumbing issues.
- Qualifying conditions for homeowner assistance is; the structure was built on or before 1978 -and the home owner can meet established income qualified . The qualified application must have occupied the home for more than a year. Guidelines provided by HUD are used to ensure accuracy.
- Anticipated completion time for rehabilitation project is approximately 60 days.
- The nonprofit organizations being requesting to be funded this year:
  - VFW Post- $15,000
    Received CDBG-CV funds- $15,000
  - Bread of Life- $24,000
    Received CDBG-CV funds- $16,000
    Received annual funds for $24,000 since 2009
SPRINGDALE CITY COUNCIL
MAY 11, 2021

- Community Clinic- $12,000
  - Received CDBG-CV funds- $88,706
  - Received CDBG annual funds for $12,000 for the last year
- Returning Home- $12,000
  - Received CDBG-CV funds- $146,183
  - Received CDBG annual funds of $12,000 in 2019- $10,000 and 2020-$10,560
- CASA of NWA- $10,000
  - Received CDBG-CV funds $ 20,000
  - Received CDBG annual funds of $10,000 for the last 5 years
- VFW Aux- $15,000
  - A separate entity from the VFW post, a separate Nonprofit Organization
  - Received CDBG-CV funds $15,394
- Compassion House- $19,345
  - Received CDBG-CV funds $50,000
  - Received CDBG annual funds in 2020 for $19,400 in 2018- $12,500 and 2019 $12,500

The vote:

Yes: Flores, Harriman, Fougerousse, Powell

No: Watson, Overton, Lawson

Mayor Sprouse voted yes. The motion carried.

The Resolution was numbered 53-21.

ORDINANCE NO. 5592 – REZONING TWO PARCELS (6.3 ACRES) OWNED BY THE CITY OF SPRINGDALE LOCATED ON THE SOUTHERN END OF MCCULLOUGH DRIVE, FROM A-1 TO MF-16, AND DECLARING AN EMERGENCY

Planning Director Patsy Christie presented an Ordinance rezoning two parcels (6.3 acres) owned by the City of Springdale located on the southern end of McCullough Drive, from A-1 to MF-16, and declaring an emergency.

Planning Commission recommended approval at their May 4, 2021 meeting.

Bethra Flowers, 405 Sisters Avenue, said she started a plot in the community garden that is presently on this property. She asked if the city was planning on having another community garden in the city if the proposed development goes through.

Mayor Sprouse said they are looking into other options in the city.

After reading the title of the Ordinance, Council Member Harriman moved the Ordinance "Do Pass". Council Member Powell made the second.
SPRINGDALE CITY COUNCIL
MAY 11, 2021

The vote:
Yes: Harriman, Fougereousse, Powell, Watson, Overton, Lawson, Flores
No: None

Council Member Powell moved the Emergency Clause be adopted. Council Member Harriman made the second.

The vote:
Yes: Fougereousse, Powell, Watson, Overton, Lawson, Flores, Harriman
No: None

The Ordinance was numbered 5592.

(Council Member Harriman was out of the room for the next item.)

ORDINANCE NO. 5593 – ACCEPTING THE REPLAT (RP21-06, VICK ENTERPRISES, LLC AT 3118 OLD WIRE ROAD) OF LOT 7, BLOCK 4, HOWARD ACRES SUBDIVISION TO THE CITY OF SPRINGDALE, ARKANSAS AND DECLARING AN EMERGENCY

Planning Director Patsy Christie presented an Ordinance accepting the Replat (RP21-06, Vick Enterprises, LLC at 3118 Old Wire Road) of Lot 7, Block 4, Howard Acres Subdivision to the City of Springdale, Benton County, Arkansas and declaring an emergency.

Planning Commission recommended approval at their meeting.

After reading the title of the Ordinance, Council Member Flores moved the Ordinance “Do Pass”. Council Member Powell made the second.

The vote:
Yes: Powell, Watson, Overton, Lawson, Flores, Fougereousse
No: None

Council Member Powell moved the Emergency Clause be adopted. Council Member Flores made the second.

The vote:
Yes: Watson, Overton, Lawson, Flores, Fougereousse, Powell
No: None

The Ordinance was numbered 5593.

ORDINANCE NO. 5594 – ACCEPTING A NEW ADDITION TO THE CITY OF SPRINGDALE, ARKANSAS TO BE KNOWN AS SAM’S CLUB ADDITION (FP21-01) 1517 GENE GEORGE BOULEVARD, A SUBDIVISION TO THE CITY OF SPRINGDALE, ARKANSAS

Planning Director Patsy Christie presented an Ordinance accepting a new addition to the City of Springdale, Arkansas, to be known as Sam’s Club Addition (FP21-01) located at 1517 Gene George Boulevard, a subdivision to the City of Springdale, Arkansas.
Planning Commission recommended approval at their meeting.

After reading the title of the Ordinance, Council Member Harriman moved the Ordinance “Do Pass”. Council Member Fougerousse made the second.

The vote:
Yes: Overton, Lawson, Flores, Harriman, Fougerousse, Powell, Watson
No: None

Council Member Powell moved the Emergency Clause be adopted. Council Member Harriman made the second.

The vote:
Yes: Lawson, Flores, Harriman, Fougerousse, Powell, Watson, Overton
No: None

The Ordinance was numbered 5594.

ORDINANCE NO. 5595 – TO WAIVE COMPETITIVE BIDDING FOR THE PURCHASE OF A WORK READY FITNESS ASSESSMENT FOR THE SPRINGDALE FIRE DEPARTMENT

Council Member Brian Powell presented an Ordinance to waive competitive bidding for the purchase of a work ready fitness assessment.

Fire Chief Mike Irwin said the funds will come out of the 2021 budget for a fitness assessment and O2X will provide this service for $26,325.

Due to the specialty of this service, competitive bidding is deemed not practical.

After reading the title of the Ordinance, Council Member Harriman moved the Ordinance “Do Pass”. Council Member Flores made the second.

The vote:
Yes: Flores, Harriman, Fougerousse, Powell, Watson, Overton, Lawson
No: None

Council Member Powell moved the Emergency Clause be adopted. Council Member Harriman made the second.

The vote:
Yes: Harriman, Fougerousse, Powell, Watson, Overton, Lawson, Flores
No: None

The Ordinance was numbered 5595.
RESOLUTION NO. 54-21 – AUTHORIZING THE MAYOR AND CITY CLERK TO ENTER INTO A MEMORANDUM OF UNDERSTANDING BETWEEN THE CITY OF SPRINGDALE, THE CITY OF FAYETTEVILLE AND WASHINGTON COUNTY, ARKANSAS

Council Member Brian Powell presented a Resolution authorizing the Mayor and City Clerk to enter into a Memorandum of Understanding between the City of Springdale, the City of Fayetteville, and Washington County, Arkansas.

The parties wish to establish an understanding and agreement among the parties related to ownership and responsibilities for a unified and shared infrastructure of the Arkansas Wireless Information Network (AWIN) operating in Washington County, Arkansas, which benefits the public safety and public service officials serving the citizens of the region.

RESOLUTION NO. ___

A RESOLUTION AUTHORIZING THE MAYOR AND CITY CLERK TO ENTER INTO A MEMORANDUM OF UNDERSTANDING BETWEEN THE CITY OF SPRINGDALE, THE CITY OF FAYETTEVILLE, AND WASHINGTON COUNTY, ARKANSAS.

WHEREAS, the City of Springdale, the City of Fayetteville, and Washington County, Arkansas (collectively referred to herein as "the Parties"), each wish to make improvements to certain radio communication frameworks;

WHEREAS, the Parties wish to establish an understanding and agreement among the Parties related to ownership and responsibilities for a unified and shared infrastructure of the Arkansas Wireless Information Network (AWIN) operating in Washington County, Arkansas, which benefits the public safety and public service officials serving the citizens of the region;

WHEREAS, the Parties wish to enter into a Memorandum of Understanding (attached hereto as Exhibit "A") to memorialize their agreement as it pertains to these issues, and to set forth the terms and conditions pertaining thereto;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that the Mayor and City Clerk are hereby authorized to execute a Memorandum of Understanding, a copy of which is attached to this Resolution.

PASSED AND APPROVED this ___ day of May, 2021.

Doug Sprouse, Mayor

ATTEST:

Denise Pearce, CITY CLERK

APPROVED AS TO FORM:

Ernest B. Cate, CITY ATTORNEY

Council Member Harriman moved the Resolution be adopted. Council Member Fougerousse made the second.

The vote:

Yes: Fougerousse, Powell, Watson, Overton, Lawson, Flores, Harriman
SPRINGDALE CITY COUNCIL
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No: None

The Resolution was numbered 54-21.

RESOLUTION NO. 55-21 – AUTHORIZING THE PURCHASE OF PROPERTY
LOCATED AT 3377 W. HUNTSVILLE AVENUE, SPRINGDALE, WASHINGTON
COUNTY, ARKANSAS

Council Member Jeff Watson presented a Resolution authorizing the purchase of property
from Brandee Madewell located at 3377 W. Huntsville Avenue, Springdale, Washington
County, Arkansas. The amount is $443,000.00, plus associated costs, and will be paid
from the City's General funds.

The City plans to use the property for the relocation and construction of a Fire Station.

RESOLUTION NO. ______

A RESOLUTION AUTHORIZING THE PURCHASE
OF PROPERTY LOCATED AT 3377 W.
HUNTSVILLE AVENUE, SPRINGDALE,
WASHINGTON COUNTY, ARKANSAS.

WHEREAS, Brandee Madewell currently owns property located at 3377 W.
Huntsville Avenue, Springdale, Washington County, Arkansas, Parcel Number 815-
29875-030, ("the Property"), and more particularly described as follows:

A part of the Northeast Quarter of the Southwest Quarter of Section 34,
Township 18 North, Range 30 West, being more particularly described as
follows: Beginning at a point which is S89°50'18"W 396.00 feet from the
Northeast corner of said 40 acre tract, and running thence S00°10'43"W
449.11 feet, thence S89°50'18"W 429.16 feet, thence N00°09'42"W 199.11
feet, thence N00°31'19"W 250.00 feet, thence N89°50'18"E 433.40 feet to
the point of beginning containing 4.43 acres more or less, subject to that
portion in street right-of-way on the north side of herein described tract,
and subject to a 25 foot wide access easement on the east and west side
of herein described tract, and subject to that portion in utility easements of
record.

WHEREAS, the owner has agreed to sell the Property to the City of Springdale
for the total sum of $443,000.00;

WHEREAS, the City wishes to purchase the Property upon the receipt of an
appraisal showing the value of the Property to be at least $443,000.00; and

WHEREAS, the City plans to use the Property for the relocation and construction
of a Fire Station.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR
THE CITY OF SPRINGDALE, ARKANSAS that the Mayor is hereby authorized,
upon receipt of an appraisal of the Property showing the value of the Property to be at
least $443,000.00, to execute all documents necessary for the acquisition of the Property
in the amount of $443,000.00, plus associated costs, to be paid from the City's General
funds.

PASSED AND APPROVED this ______ day of May, 2021.

Doug Sprouse, Mayor

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Council Member Lawson said he has some reservations about purchasing this property. He is concerned about the proposed location with all the traffic around the school and also that the city has already spent money towards proposed renovations to Fire Station No. 4.

Fire Chief Irwin said they have spent money to look at renovating Fire Station No. 4 on Elm Springs Road but the costs came in way to high. For a short fix it was a good idea but long term that station doesn't offer enough room for what is forecasted.

Council Member Powell moved the Resolution be adopted. Council Member Harriman made the second.

The vote:

Yes: Powell, Watson, Flores, Harriman, Fougerousse

No: Overton, Lawson

The Resolution was numbered 55-21.

RESOLUTION NO. 56-21 – AUTHORIZING THE MAYOR AND CITY CLERK TO EXECUTE AN "OPTION AGREEMENT FOR THE PURCHASE OF REAL ESTATE" (MCCULLOUGH DRIVE) OWNED BY THE CITY OF SPRINGDALE

Council Member Jeff Watson presented a Resolution authorizing the Mayor and City Clerk to execute an "Option Agreement for the Purchase of Real Estate", two tracts on McCullough Drive owned by the City of Springdale.

RESOLUTION NO. ___

A RESOLUTION AUTHORIZING THE MAYOR AND CITY CLERK TO EXECUTE AN "OPTION AGREEMENT FOR THE PURCHASE OF REAL ESTATE" ON PROPERTY OWNED BY THE CITY OF SPRINGDALE.

WHEREAS, the City of Springdale owns the following real property located in the City of Springdale, Arkansas, said land being more particularly described as follows ("the Property":)

Washington County Tax Parcel Nos. 815-28738-210 & 815-28738-230, and as shown on the attached Exhibit "A" which is incorporated herein by reference.
EXHIBIT "A"

Part of the SE 1/4 of the SE 1/4 of Section 31, Township 18 North, Range 29 West, described as beginning at a point 330 feet West and 200 feet South of the NE Corner of said 40 acre tract, thence South 1120 feet, thence East 165 feet, thence North 1120 feet, thence West 165 feet to the point of beginning, and

Part of the SE 1/4 of the SE 1/4 of Section 31, Township 18 North, Range 29 West, described as follows, to-wit: Beginning at a point 500 feet South of the NE Corner of said 40 acre tract, thence South 820 feet, thence West 165 feet, thence North 820 feet, thence East 165 feet to the point of beginning.

And an easement for ingress and egress, described as follows, to-wit: Beginning at the NE Corner of the SE 1/4 of the SE 1/4 of Section 31, Township 18 North, Range 29 West, run thence South 610 feet, thence West 165 feet to the true point of beginning, thence North 610 feet, thence West 15 feet, thence South 610 feet, thence East 15 feet to the true point of beginning.

LESS AND EXCEPT: Part of the SE 1/4 of the SE 1/4 of Section 13, Township 18 North, Range 29 West, described as follows: Beginning at a point 500 feet South of the NE Corner of said 40 acre tract, thence South 110 feet, thence West 165 feet, thence North 110 feet, thence East 165 feet to the point of beginning.

LESS AND EXCEPT: Part of the SE 1/4 of the SE 1/4 of Section 31, Township 18 North, Range 29 West, Washington County, Arkansas, being more particularly described as follows: commencing at a found railroad spike, used as the NE Corner of the SE 1/4 of the SE 1/4; thence North 87 degrees 33 minutes 07 seconds West 165.4 feet, thence South 2 degrees 28 minutes 56 seconds West 203.75 feet to a set 5/8" diameter iron pin and the point of beginning; thence continue South 2 degrees 29 minutes 56 seconds West 120.00 feet to a 5/8" diameter iron pin; thence North 87 degrees 33 minutes 07 seconds West 167.31 feet to a set 5/8" diameter iron pin; thence North 2 degrees 14 minutes 07 seconds West 120.00 feet to a set 5/8" diameter iron pin; thence South 87 degrees 33 minutes 07 seconds East 167.83 feet to the point of beginning, containing 0.46 acres, more or less.

WHEREAS, Community Development Corporation of Bentonville/Bella Vista, Inc., and its assigns, wishes to hold an option to purchase the Property;

WHEREAS, the City of Springdale is acceptable with the terms of an Option Agreement for the Purchase of Real Estate, which is attached hereto as Exhibit "B" and is incorporated herein by reference, which memorializes the agreement between the parties;

WHEREAS, Ark. Code Ann. §14-54-302 empowers and authorizes municipalities to sell, transfer, or dispose of real property it owns, subject to approval by the City Council;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that the Mayor and City Clerk of the City of Springdale, Arkansas, are hereby authorized to execute the attached Option Agreement for the Purchase of Real Estate, attached hereto, with Community Development Corporation of Bentonville/Bella Vista, Inc.

PASSED AND APPROVED this ____ day of May, 2021.

ATTEST:

Doug Sprouse, Mayor

Denise Pearce, City Clerk

APPROVED:

Ernest B. Cate, City Attorney

Council Member Harriman moved the Resolution be adopted. Council Member Fougerousse made the second.
SPRINGDALE CITY COUNCIL
MAY 11, 2021

The vote:

Yes: Watson, Overton, Lawson, Flores, Harriman, Fougerousse, Powell

No: None

The Resolution was numbered 56-21.

RESOLUTION NO. 56-21 — AUTHORIZING THE EXECUTION OF A
CONSTRUCTION CONTRACT AND A CHANGE ORDER FOR PARK STREET
PROJECT NO. 18BPS13

Council Member Watson presented a Resolution authorizing the execution of a
construction contract and a change order for Park Street Project No. 18BPS13 with
Crossland Heavy Contractors for the construction of two intersections on Park Street for
the amount of $3,037,507.65.

RESOLUTION NO. ___

A RESOLUTION AUTHORIZING THE EXECUTION OF A
CONSTRUCTION CONTRACT AND A CHANGE ORDER FOR
PARK STREET - PROJECT NO 18BPS13

WHEREAS, sealed bids were received on March 16, 2021 at 2:00 p.m. for two
intersections on Park Street; and

WHEREAS, Crossland Heavy Contractors was the low bidder for this project at
$3,037,507.65; and

WHEREAS, the low bid exceeded our expectations and negotiations with the
contractor resulted in a proposed cost reduction of $232,816.00.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR
THE CITY OF SPRINGDALE, ARKANSAS, that

Section 1. The Mayor and City Clerk are hereby authorized to execute a contract
with Crossland Heavy Contractors for construction of two intersections on Park Street for
$3,037,507.65.

Section 2. The Mayor is hereby authorized to execute change order number #1 to this
contract.

Section 3. The Mayor is authorized to approve additional construction change orders
as long as the cumulative total of the additional change orders does not exceed 10% of
the original contract price.

PASSED AND APPROVED this ___ day of May, 2021.

______________________________
Doug Sprouse, Mayor

ATTEST:

______________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

______________________________
Ernest B. Cate, City Attorney
Council Member Watson moved the Resolution be adopted. Council Member Harriman made the second.

The vote:

Yes: Overton, Lawson, Flores, Harriman, Fougerousse, Powell, Watson

No: None

The Resolution was numbered 57-21.

RESOLUTION NO. 58-21 – EXPRESSING THE INTENT OF THE CITY OF SPRINGDALE, ARKANSAS TO CONSTRUCT A NEW 100' X 100' AIRPORT HANGAR AT THE SPRINGDALE MUNICIPAL AIRPORT

Council Member Jeff Watson presented a Resolution expressing the intent of the City of Springdale, Arkansas to construct a new 100' x 100' airport hangar at the Springdale Municipal Airport.

The city has applied to the Arkansas Department of Aeronautics for two grants to pave access to a new hangar and the taxiway. One is an 80/20 matching grant for $250,000. The other one is 90/10 matching grant for $150,000.

Mayor Sprouse said the Arkansas Department of Aeronautics asked that language be added to the Resolution pertaining to the date construction will begin. They don't want to approve a grant for infrastructure and the hangar not be built.

RESOLUTION NO. ___

A RESOLUTION EXPRESSING THE INTENT OF THE CITY OF SPRINGDALE, ARKANSAS, TO CONSTRUCT A NEW AIRPORT HANGAR AT THE SPRINGDALE MUNICIPAL AIRPORT

WHEREAS, the Springdale Municipal Airport is one of the busiest airports in the State of Arkansas;

WHEREAS, there is currently a waiting list for individuals wishing to utilize airport hangar space at the Springdale Municipal Airport;

WHEREAS, given the need for additional airport hangar space, the City of Springdale wishes to make a commitment to construct a new 100' x 100' airport hangar at the Springdale Municipal Airport;

WHEREAS, the City of Springdale wishes to avail itself of grant funding which is available for airports;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that the City hereby expresses its intent to construct a new 100' x 100' airport hangar at the Springdale Municipal Airport, with construction to begin within ninety (90) days of this Resolution, to help address the ongoing need for additional airport hangar space at the Springdale Municipal Airport; and a copy of this Resolution shall be communicated to state and federal airport authorities, so that they will be aware of the City of Springdale's intentions.

PASSED AND APPROVED this ____ day of May, 2021.

Doug Sprouse, Mayor
SPRINGDALE CITY COUNCIL
MAY 11, 2021

ATTEST:

Denise Pearce, City Clerk

APPROVED:

Ernest B. Cate, City Attorney

Council Member Overton moved the Resolution be adopted. Council Member Flores made the second.

The vote:

Yes: Lawson, Flores, Fougerousse, Powell, Watson, Overton
No: Harriman

The Resolution was numbered 58-21.

RESOLUTION NO. 59-21 – SETTING A HEARING DATE ON A PETITION TO ABANDON A PORTION OF A UTILITY EASEMENT LOCATED AT THE NORTHWEST CORNER OF LOT 2, WILLOW BEND SUBDIVISION PHASE 1, IN THE CITY OF SPRINGDALE, WASHINGTON COUNTY, ARKANSAS

City Attorney Ernest Cate presented a Resolution setting a hearing date for June 8, 2021 to hear a petition by Zach Davis to abandon a portion of a utility easement at the northwest corner of Lot 2, Willow Bend Subdivision Phase 1, in the City of Springdale, Washington County, Arkansas.

RESOLUTION NO. 59-21

A RESOLUTION SETTING A HEARING DATE ON A PETITION TO ABANDON A PORTION OF A UTILITY EASEMENT IN THE CITY OF SPRINGDALE, WASHINGTON COUNTY, ARKANSAS.

WHEREAS, Zach Davis has petitioned for the abandonment of a portion of a utility easement on Lot 2, Willow Bend Subdivision Phase 1, to the City of Springdale, Washington County, Arkansas, as per plat of said addition on file in the Office of the Circuit Clerk and Ex-Officio Recorder of Washington County, Arkansas, also known as Washington County Tax Parcel No. 815-35229-000, 3250 Willow Bend Circle, and being more particularly described as follows:

Commencing at a set rebar with cap marking the Northwest Corner of Lot 2. Thence along the North line of said Lot 2, South 87 degrees 36 minutes 46 seconds East, 41.00 feet. Thence leaving said North line, South 03 degrees 06 minutes 10 seconds West, 23.91 feet to the Point of Beginning. Thence continue South 03 degrees 06 minutes 10 seconds West, 34.01 feet. Thence North 87 degrees 59 minutes 07 seconds West, 3.70 feet. Thence North 02 degrees 00 minutes 53 seconds East, 34.00 feet. Thence South 87 degrees 59 minutes 07 seconds East to the Point of Beginning containing 176.78 square feet.

WHEREAS, the City Council finds that a hearing date should be set on the request to abandon the portion of the utility easement;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that June 8, 2021, at 6:00 p.m. is set as
SPRINGDALE CITY COUNCIL  
MAY 11, 2021

the date and time for the City Council to hear the petition; that the City Clerk shall give notice of the date and time of said hearing as required by law.

PASSED AND APPROVED this _____ day of May, 2021.

Doug Sprouse, Mayor

ATTEST:

Denise Pearce, CITY CLERK

APPROVED AS TO FORM:

Ernest B. Cate, CITY ATTORNEY

Council Member Watson moved the Resolution be adopted. Council Member Lawson made the second.

The vote:

Yes: Flores, Harriman, Fougerousse, Powell, Watson, Overton Lawson,

No: None

The Resolution was numbered 59-21.

ORDINANCE NO. 5596 – AUTHORIZING THE CITY CLERK TO FILE A CLEAN-UP LIEN FOR THE REMOVAL OF OVERGROWN BRUSH AND DEBRIS ON PROPERTY LOCATED AT 309 PARK STREET – OWNER: BRICK CITY CAPITOL

City Attorney Ernest Cate presented an Ordinance authorizing the City Clerk to file a clean-up lien for the removal of overgrown brush and debris on property located at 309 Park Street (815-24896-000). Brick City Capitol is the owner of the property.

After reading the title of the Ordinance, Council Member Powell moved the Ordinance "Do Pass". Council Member Harriman made the second.

The vote:

Yes: Harriman, Fougerousse, Powell, Watson, Overton, Lawson, Flores

No: None

Council Member Powell moved the Emergency Clause be adopted. Council Member Harriman made the second.

The vote:

Yes: Fougerousse, Powell, Watson, Overton, Lawson, Flores, Harriman

No: None

The Ordinance was numbered 5596.
SPRINGDALE CITY COUNCIL
MAY 11, 2021

COUNCIL COMMITTEE MEETING

Because the next City Council committee meeting falls on Memorial Day, Monday, May 31, 2021, it was decided to move the next committee meeting to Wednesday, June 2, 2021.

ADJOURNMENT

Council Member Overton made the motion to adjourn. Council Member Lawson made the second.

After a voice vote of all ayes and no nays, the meeting adjourned at 7:41 p.m.

________________________________________
Doug Sprouse, Mayor

________________________________________
Denise Pearce, City Clerk/Treasurer
RESOLUTION NO._______

A RESOLUTION MAKING A RE-APPOINTMENT TO THE ADVERTISING AND PROMOTION COMMISSION OF THE CITY OF SPRINGDALE

WHEREAS, the term of Jayson Janda, Seat #2 expired May 31st, 2020 and Justin Cole, Seat #3, his term is set to expire May 31, 2021; and

WHEREAS, A.C.A. 26-75-605 and Ordinance No. 3293 provide that appointments for these positions will be made by the remaining members of the Commission subject to approval of the City Council, and

WHEREAS, the Advertising and Promotion Commission has recommended the re-appointment of Jayson Janda to Seat #2 and Justin Cole to Seat #3; and

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS that Jayson Janda, Seat #2 is hereby re-appointed with a term set to expire May 31st, 2024; and Justin Cole, Seat #3 is hereby re-appointed with a term set to expire on May 31, 2025 on the Advertising and Promotion Commission.

PASSED AND APPROVED this 25th day of May, 2021.

_________________________
Doug Sprouse, Mayor

ATTEST:

_________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

_________________________
Ernest Cate, City Attorney
RESOLUTION NO. _____

A RESOLUTION APPROVING THE RE-APPOINTMENT OF PAYTON PARKER TO THE SPRINGDALE PLANNING COMMISSION.

WHEREAS, Payton Parker’s term on the Springdale Planning Commission expired January 31, 2020; and

WHEREAS, Section 90-26 of the Springdale Code of Ordinances provides for these appointments by the Mayor with the approval of the City Council; and

WHEREAS, the Mayor has selected Payton Parker to be reappointed to Seat #7 on the Springdale Planning Commission; in accordance with Section 90-26 of the Springdale Code of Ordinances; and

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS that the Mayor’s re-appointment of Payton Parker is hereby reappointed to Seat #7 on the Springdale Planning Commission for a (4) four-year term expiring on January 31, 2024.

PASSED AND APPROVED this 25th day of May, 2021.

______________________________
Doug Sprouse, Mayor

ATTEST:

______________________________
Denise Pearce, CITY CLERK

APPROVED AS TO FORM:

______________________________
Ernest B. Cate, CITY ATTORNEY
ORDINANCE NO. ______

AN ORDINANCE AMENDING ORDINANCE NO. 5586, WHICH REZONED CERTAIN LANDS FROM GENERAL COMMERCIAL DISTRICT (C-2) TO LIGHT INDUSTRIAL DISTRICT (I-1) AND DECLARING AN EMERGENCY.

WHEREAS, the City Council for the City of Springdale, Arkansas, passed Ordinance No. 5586 on the 27th day of April, 2021, which amended the zoning ordinance for the City of Springdale by rezoning certain lands from General Commercial District (C-2) to Light Industrial District (I-1), and said Ordinance was filed for record with the Circuit Clerk and Ex-Officio Recorder of Benton County, Arkansas, as Document No. L202132190;

WHEREAS, Ordinance No. 5586 contained a scrivener's error by incorrectly stating the legal description of the property subject to the rezoning; and

WHEREAS, Ordinance No. 5586 should be amended to correct the legal description of the property rezoned by Ordinance No. 5586, as follows:

Layman's Description: 611 E. Apple Blossom Ave.

Legal Description: A PART OF THE NW 1/4 OF THE NE 1/4 OF Section 13, T18N, R30W in Benton County, Arkansas and being described as follows: Commencing at the NW Corner of said NW1/4, NE/14, thence S02°06'47" W 35.01 feet, thence S86°32'48" E 446.14 feet the POINT OF BEGINNING; thence S86°32'48" E 346.98 feet, thence S03°27'12" W 84.00 feet, thence N86°32'48" W 50.00 feet, thence S03°27'12" W 255.00 feet, thence N86°32'48"W 296.98 feet, thence N03°27'12" E 339.00 feet to the POINT OF BEGINNING. Containing 2.41 acres, more or less, subject to easements and rights of way of record.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS:

SECTION 1: That Ordinance No. 5586 is hereby amended as provided herein;
SECTION 2: Emergency Clause. It is hereby declared that an emergency exists
and this ordinance, being necessary for the preservation of the health, safety and welfare
of the citizens of Springdale, Arkansas, shall be in effect immediately upon its passage
and approval.

PASSED AND APPROVED THIS _____ DAY OF ____________, 2021.

ATTEST:

_______________________________________
Doug Sprouse, Mayor

Denise Pearce, City Clerk

APPROVED AS TO FORM:

_______________________________________
Ernest Cate, City Attorney
ORDINANCE NO.______

AN ORDINANCE AMENDING ORDINANCE NO. 3307 THE SAME BEING THE ZONING ORDINANCE OF THE CITY OF SPRINGDALE, ARKANSAS, AND THE PLAT PERTAINING THERETO BY REZONING CERTAIN LANDS FROM LOW/MEDIUM DENSITY SINGLE FAMILY RESIDENTIAL DISTRICT (SF-2) TO NEIGHBORHOOD OFFICE DISTRICT (O-1) AND DECLARING AN EMERGENCY.

WHEREAS, the Planning Commission of the City of Springdale, Arkansas, Washington County, gave notice required by law and set a hearing date of May 4, 2021 for hearing the matter of a petition of Donald A. Brady, requesting that the following described tract of real estate to be zoned from Low/Medium Density Single Family Residential District (SF-2) to Neighborhood Office District (O-1).

Layman's Description: 807 S. West End Street

Legal Description: Beginning at a point which is six hundred and sixty feet (660') North and nine hundred and ninety feet (990') West of the Southeast corner of the Southwest Quarter of the Northeast Quarter (SW1/4 NE1/4) of Section Two (2), Township Seventeen (17) North, Range Thirty (30) West, for a beginning corner for the lands herein intended to be conveyed, and running thence East four hundred thirty-five and two tenths feet (435.2'); thence North one hundred sixty-four and thirty-one hundredths Feet (164.31'); thence West two hundred and eighty-two feet (282') thence South sixty-six and five-tenths feet (66.5'); thence West two hundred thirty-four feet (234') to the center of the road; thence South twelve (12) degrees and thirty (30) minutes West one hundred feet (100'); thence East one hundred ten and eight-tenths feet (110.8') to the beginning corner.

AND WHEREAS, after notice as required by law, the Springdale Planning Commission held a hearing and after hearing arguments for and against such rezoning, recommends to the Springdale City Council that the area described herein should be rezoned from Low/Medium Density Single Family Residential District (SF-2) to Neighborhood Office District (O-1) for the purposes of that Zoning Ordinance would be
more properly carried out by such rezoning, and that unless granted, citizens of Springdale will suffer irreparable harm and damage, and will be substantially deprived of the use of their property.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS:

SECTION 1: That Ordinance No. 3307, the Amendments thereto, and the Zoning Plat pertaining thereto of the City of Springdale, Arkansas, should be and the same is amended as follows:

From Low/Medium Density Single Family Residential District (SF-2) to Neighborhood Office District (O-1).

SECTION 2: That all ordinances and parts of ordinances in conflict herewith are hereby repealed.

SECTION 3: EMERGENCY CLAUSE: It is hereby declared that an emergency exists and this ordinance, being necessary for the preservation of the health, safety and welfare of the citizens of Springdale, Arkansas shall be in effect immediately upon its passage and approval.

PASSED AND APPROVED THIS _____ DAY OF ______________, 2021

__________________________________
Doug Sprouse, Mayor

ATTEST:

__________________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

__________________________________
Ernest Cate, City Attorney
ORDINANCE NO. ___

AN ORDINANCE AMENDING ORDINANCE NO. 3307 THE SAME BEING THE ZONING ORDINANCE OF THE CITY OF SPRINGDALE, ARKANSAS, AND THE PLAT PERTAINING THERETO BY REZONING CERTAIN LANDS FROM NEIGHBORHOOD COMMERCIAL DISTRICT (C-1) TO INSTITUTIONAL DISTRICT (P-1) AND DECLARING AN EMERGENCY.

WHEREAS, the Planning Commission of the City of Springdale, Arkansas, Washington County, gave notice required by law and set a hearing date of May 4, 2021 for hearing the matter of a petition of Berean Baptist Church, requesting that the following described tract of real estate to be zoned from Neighborhood Commercial District (C-1) to Institutional District (P-1).

Layman’s Description: 515 Sanders Avenue

Legal Description: Part of the Northwest Quarter (NW1/4) of the Northwest Quarter (NW1/4) of Section Thirty-Six (36) Township Eight (18) North, Range Thirty (30) West, more particularly described as follows, to-wit: Beginning at a point 330 feet South and 345.34 feet West of the Northeast corner of said 40 acre tract, thence West 70 feet, thence North 224 feet to a point on the South right of way line of Sanders Avenue, thence along said right of way line North 74 degrees 41 feet to appoint due North of the point of Beginning, thence South to the point of Beginning.

AND WHEREAS, after notice as required by law, the Springdale Planning Commission held a hearing and after hearing arguments for and against such rezoning, recommends to the Springdale City Council that the area described herein should be rezoned from Neighborhood Commercial District (C-1) to Institutional District (P-1) for the purposes of that Zoning Ordinance would be more properly carried out by such rezoning, and that unless granted, citizens of Springdale will suffer irreparable harm and damage, and will be substantially deprived of the use of their property.
NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS:

SECTION 1: That Ordinance No. 3307, the Amendments thereto, and the Zoning Plat pertaining thereto of the City of Springdale, Arkansas, should be and the same is amended as follows:

From Neighborhood Commercial District (C-1) to Institutional District (P-1).

SECTION 2: That all ordinances and parts of ordinances in conflict herewith are hereby repealed.

SECTION 3: EMERGENCY CLAUSE: It is hereby declared that an emergency exists and this ordinance, being necessary for the preservation of the health, safety and welfare of the citizens of Springdale, Arkansas shall be in effect immediately upon its passage and approval.

PASSED AND APPROVED THIS _______ DAY OF ______________, 2021

________________________
Doug Sprouse, Mayor

ATTEST:

________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

________________________
Ernest Cate, City Attorney
FILE NO. R21-21
APPLICANT: Berean Baptist Church
REQUEST: Rezoning from neighborhood commercial (C-1) to institutional (P-1)

PLANNING COMMISSION MEETING
May 4, 2021
ORDINANCE NO. _____

AN ORDINANCE AMENDING ORDINANCE NO. 3307 THE SAME BEING THE ZONING ORDINANCE OF THE CITY OF SPRINGDALE, ARKANSAS, AND THE PLAT PERTAINING THERETO BY REZONING CERTAIN LANDS FROM AGRICULTURAL DISTRICT (A-1) TO LOW/MEDIUM DENSITY SINGLE FAMILY RESIDENTIAL DISTRICT (SF-2) AND DECLARING AN EMERGENCY.

WHEREAS, the Planning Commission of the City of Springdale, Arkansas, Washington County, gave notice required by law and set a hearing date of May 4, 2021 for hearing the matter of a petition of Loy and Alma Boyd Revocable Trust, requesting that the following described tract of real estate to be zoned from Agricultural District (A-1) to Low/Medium Density Single Family Residential District (SF-2).

Layman's Description: 2377 North 56th Street

Legal Description:
PART OF THE SOUTHWEST QUARTER (SW1/4) OF THE NORTHWEST QUARTER (NW1/4) OF SECTION 28, TOWNSHIP 18 NORTH, RANGE 30 WEST OF THE FIFTH PRINCIPAL MERIDIAN, CITY OF SPRINGDALE, WASHINGTON COUNTY, ARKANSAS, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE NORTHWEST CORNER OF THE SW 1/4 OF THE NW 1/4 OF SAID SECTION 28, SAID POINT BEING A SET "MAG" NAIL IN NORTH 56TH STREET; THENCE ALONG THE NORTH LINE OF SAID SW 1/4, S87°34'12" E A DISTANCE OF 35.00 FEET TO THE EASTERNLY RIGHT OF WAY LINE OF SAID NORTH 56TH STREET AND THE POINT OF BEGINNING, THENCE CONTINUING ALONG SAID NORTH LINE, S°34'12" E A DISTANCE OF 1290.65 FEET TO THE NORTHEAST CORNER OF SAID SW 1/4 OF THE NW 1/4 AND A SET IRON PIN WITH CAP "PS663"; THENCE LEAVING SAID NORTH LINE AND ALONG THE EAST LINE OF SAID SW 1/4 OF THE NW 1/4, S02°26'38" W A DISTANCE OF 543.30 FEET TO A SET IRON PIN WITH CAP "PS663"; THENCE LEAVING SAID EAST LINE, N87°16'34" W A DISTANCE OF 986.16 FEET; THENCE N02°25'48"E A DISTANCE OF
264.46 FEET; THENCE N87°34′12″W A DISTANCE OF 321.86 FEET TO THE EASTERNLY RIGHT OF WAY LINE OF SAID NORTH 56TH STREET; THENCE ALONG SAID RIGHT OF WAY LINE, N02°19′26″E A DISTANCE OF 273.88 FEET TO THE POINT OF BEGINNING, CONTAINING 14.05 ACRES, MORE OR LESS, AND SUBJECT TO ALL RIGHTS OF WAY, EASEMENTS OR RESTRICTIVE COVENANTS OF RECORD OR FACT.

AND WHEREAS, after notice as required by law, the Springdale Planning Commission held a hearing and after hearing arguments for and against such rezoning, recommends to the Springdale City Council that the area described herein should be rezoned from Agricultural District (A-1) to Low/Medium Density Single Family Residential District (SF-2) for the purposes of that Zoning Ordinance would be more properly carried out by such rezoning, and that unless granted, citizens of Springdale will suffer irreparable harm and damage, and will be substantially deprived of the use of their property.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS:

SECTION 1: That Ordinance No. 3307, the Amendments thereto, and the Zoning Plat pertaining thereto of the City of Springdale, Arkansas, should be and the same is amended as follows:

From Agricultural District (A-1) to Low/Medium Density Single Family Residential District (SF-2).

SECTION 2: That all ordinances and parts of ordinances in conflict herewith are hereby repealed.

SECTION 3: EMERGENCY CLAUSE: It is hereby declared that an emergency exists and this ordinance, being necessary for the preservation of the health, safety and welfare of the citizens of Springdale, Arkansas shall be in effect immediately upon its passage and approval.

PASSED AND APPROVED THIS ______ DAY OF ____________, 2021

ATTEST:

Doug Sprouse, Mayor

Denise Pearce, City Clerk

APPROVED AS TO FORM:

Ernest Cate, City Attorney
ORDINANCE NO. ______

AN ORDINANCE AMENDING ORDINANCE NO. 3307 THE SAME BEING THE ZONING ORDINANCE OF THE CITY OF SPRINGDALE, ARKANSAS, AND THE PLAT PERTAINING THERETO BY REZONING CERTAIN LANDS FROM AGRICULTURAL DISTRICT (A-1) TO LOW DENSITY SINGLE FAMILY RESIDENTIAL DISTRICT (SF-1) AND DECLARING AN EMERGENCY.

WHEREAS, the Planning Commission of the City of Springdale, Arkansas, Benton County, gave notice required by law and set a hearing date of May 4, 2021 for hearing the matter of a petition of Earl and Irene Dossett, Ted and Patricia Dossett, requesting that the following described tract of real estate to be zoned from Agricultural District (A-1) to Low Density Single Family Residential District (SF-1).

Layman’s Description: 1.00 acre tract north of Carrie Smith Road and west of Grimsley Road

Legal Description:
PART OF THE SW/4 OF THE NW/4 OF SECTION 19, TOWNSHIP 18 NORTH, RANGE 30 WEST, BENTON COUNTY, ARKANSAS BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: COMMENCING AT THE SE CORNER OF SAID SW/4 OF THE NW/4, THENCE ALONG THE EAST LINE OF SAID SW/4 OF THE NW/4 N 02°19’31” E 797.05 FEET, THENCE LEAVING SAID EAST LINE N 87°54’43” W 29.36 FEET TO THE POINT OF BEGINNING, THENCE S 02°36’37” W 146.56 FEET, THENCE N 85°59’42” W 204.26 FEET, THENCE S 02°36’55” W 208.11 FEET, THENCE N 85°58’16” W 39.45 FEET, THENCE N 02°10’13” E 346.49 FEET, THENCE S 87°54’43” E 246.33 FEET TO THE POINT OF BEGINNING, CONTAINING 1.00 ACRES, MORE OR LESS, AND SUBJECT TO THE RIGHT-OF-WAY OF GRIMSLY ROAD, AND SUBJECT TO ANY AND ALL OTHER RIGHTS-OF-WAY AND EASEMENTS OF RECORD OR FACT.
AND WHEREAS, after notice as required by law, the Springdale Planning Commission held a hearing and after hearing arguments for and against such rezoning, recommends to the Springdale City Council that the area described herein should be rezoned from Agricultural District (A-1) to Low Density Single Family Residential District (SF-1) for the purposes of that Zoning Ordinance would be more properly carried out by such rezoning, and that unless granted, citizens of Springdale will suffer irreparable harm and damage, and will be substantially deprived of the use of their property.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, ARKANSAS:

SECTION 1: That Ordinance No. 3307, the Amendments thereto, and the Zoning Plat pertaining thereto of the City of Springdale, Arkansas, should be and the same is amended as follows:

From Agricultural District (A-1) to Low Density Single Family Residential District (SF-1).

SECTION 2: That all ordinances and parts of ordinances in conflict herewith are hereby repealed.

SECTION 3: EMERGENCY CLAUSE: It is hereby declared that an emergency exists and this ordinance, being necessary for the preservation of the health, safety and welfare of the citizens of Springdale, Arkansas shall be in effect immediately upon its passage and approval.

PASSED AND APPROVED THIS _____ DAY OF __________, 2021

________________________________________
Doug Sprouse, Mayor

ATTEST:

________________________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

________________________________________
Ernest Cate, City Attorney
FILE NO. R21-24
APPLICANT: Earl & Irene Dosset, Patricia & Ted Dosset
REQUEST: Rezoning from agricultural (A-1) to single family residential (SF-1)

PLANNING COMMISSION MEETING
May 4, 2021

Public Hearing Sign Posted Prior/On: 04/23/2021
Public Hearing Sign Posted By: RB
Public Hearing Sign Location

For Location Reference Only

[Map with property numbers and landmarks]
RESOLUTION NO. ______
A RESOLUTION APPROVING A CONDITIONAL USE
AT 901 DORMAN STREET AS SET FORTH IN
ORDINANCE NO. 4030

WHEREAS, Ordinance #4030 amending Chapter 130 (Zoning Ordinance) of the
Springdale Code of Ordinance, provides that an application for a conditional use on
appeal must be heard first by the Planning Commission and a recommendation made
to the City Council; and

WHEREAS, the Planning Commission held a public hearing on May 4, 2021, on
a request by Sonny and Douhpone Chanhsvang for a Use Unit 42
(Church/Synagogue) in a General Commercial District (C-2).

WHEREAS, following the public hearing the Planning Commission by a vote of
seven (7) yes and zero (0) no recommends that a Conditional Use be granted to Sonny
and Douhpone Chanhavong with the following conditions: Will meet on Sundays only.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY
OF SPRINGDALE, that the City Council hereby grants a conditional use to Sonny and
Douhpone Chanhsvang with the following conditions: Will meet on Sundays only.

PASSED AND APPROVED THIS _______ DAY OF _________, 2021.

ATTEST:______________________________________
Doug Sprouse, Mayor

________________________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:_____________________
Ernest Cate, City Attorney
FILE NO. C21-05
APPLICANT: Sonny and Kouhpone Chanhsavang
REQUEST: Conditional Use - Use Unit
42 in a C-2 (Church/Synagogue)
RESOLUTION NO. ______
A RESOLUTION APPROVING A CONDITIONAL USE AT
5392 ARKANSAS 112 HIGHWAY AS SET FORTH IN
ORDINANCE NO. 4030

WHEREAS, Ordinance #4030 amending Chapter 130 (Zoning Ordinance) of the
Springdale Code of Ordinance provides that an application for a conditional use on
appeal must be heard first by the Planning Commission and a recommendation made
to the City Council; and

WHEREAS, the Planning Commission held a public hearing on May 4, 2021, on
a request by Jim and Betty Cash for a Tandem Lot Split.

WHEREAS, following the public hearing the Planning Commission by a vote of
seven (7) yes and zero (0) no recommends that a Conditional Use be granted to Jim
and Betty Cash for a Tandem Lot Split with the following conditions: No conditions set.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY
OF SPRINGDALE, that the City Council hereby grants a Conditional Use to Jim and
Betty Cash for a Tandem Lot Split with the following conditions: No conditions set.

PASSED AND APPROVED THIS _______ DAY OF __________, 2021.

ATTEST: ____________________________

Doug Sprouse, Mayor

Denise Pearce, City Clerk

APPROVED AS TO FORM:

Ernest Cate, City Attorney
FILE NO. C21-10
APPLICANT: Jim & Betty Cash Trust
REQUEST: Tandem Lot Split in A-1 zone

PLANNING COMMISSION MEETING
April 6, 2021
RESOLUTION NO. ______

A RESOLUTION APPROVING A CONDITIONAL USE AT
324 NORTH 48TH STREET AS SET FORTH IN
ORDINANCE NO. 4030

WHEREAS, Ordinance #4030 amending Chapter 130 (Zoning Ordinance) of the
Springdale Code of Ordinance provides that an application for a conditional use on
appeal must be heard first by the Planning Commission and a recommendation made
to the City Council; and

WHEREAS, the Planning Commission held a public hearing on May 4, 2021, on
a request by GPS Partners, LLC for a Use Unit 35 (Transportation Services) in a
Thoroughfare Commercial District (C-5).

WHEREAS, following the public hearing the Planning Commission by a vote of
seven (7) yes and zero (0) no recommends that a Conditional Use be granted to GPS
Partners, LLC for a Use Unit 35 (Transportation Services) in a Thoroughfare
Commercial District C-5) with the following conditions: Large Scale Development Plan is
needed for the entire tract and parking of all vehicles on paved surfaces only.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY
OF SPRINGDALE, that the City Council hereby grants a conditional use to GPS
Partners, LLC for a Use Unit 35 (Transportation Services) in a Thoroughfare
Commercial District (C-5) with the following conditions: Large Scale Development Plan
is needed for the entire tract and parking of all vehicles on paved surfaces only.

PASSED AND APPROVED THIS _______ DAY OF __________, 2021.

__________________________
Doug Sprouse, Mayor

ATTEST:

__________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

__________________________
Ernest Cate, City Attorney
RESOLUTION NO. _____

A RESOLUTION APPROVING A CONDITIONAL USE AT
2556 N. 40TH STREET AS SET FORTH IN ORDINANCE
NO. 4030

WHEREAS, Ordinance #4030 amending Chapter 130 (Zoning Ordinance) of the Springdale Code of Ordinance provides that an application for a conditional use on appeal must be heard first by the Planning Commission and a recommendation made to the City Council; and

WHEREAS, the Planning Commission held a public hearing on May 4, 2021, on a request by Timothy and Teresa Oelke for a Tandem Lot Split.

WHEREAS, following the public hearing the Planning Commission by a vote of six (6) yes and zero (0) no recommends that a Conditional Use be granted to Timothy and Teresa Oelke for a Tandem Lot Split with the following conditions: No conditions set.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, that the City Council hereby grants a Conditional Use to Timothy and Teresa Oelke for a Tandem Lot Split with the following conditions: No conditions set.

PASSED AND APPROVED THIS _______ DAY OF __________, 2021.

ATTEST:

______________________________
Doug Sprouse, Mayor

Denise Pearce, City Clerk

APPROVED AS TO FORM:

______________________________
Ernest Cate, City Attorney
FILE NO. C21-12
APPLICANT: Timothy & Teresa Oelke
REQUEST: Conditional Use - for Tandem Lot in A-1 zone

PUBLIC HEARING SIGN POSTED PRIOR/ON: 04/23/2021
PUBLIC HEARING SIGN POSTED BY: RB
PUBLIC HEARING SIGN LOCATION

PLANNING COMMISSION MEETING
May 4, 2021

Page 45
RESOLUTION NO. _____

A RESOLUTION APPROVING A WAIVER OF STREET IMPROVEMENTS, DRAINAGE, CURBS, GUTTERS AND SIDEWALKS AS SET FORTH IN ORDINANCE NO. 3725 TO NETS GLOBAL HOLDINGS, LLC IN CONNECTION WITH N20-05 A NON LARGE SCALE DEVELOPMENT

WHEREAS, Ordinance #3047 provides for the waiver of street improvements, drainage relating thereto, curbs, gutters and sidewalks to be first heard by the Planning Commission and a recommendation made to the City Council, with any waivers to be granted by the City Council only; and

WHEREAS, the Planning Commission reviewed a request for waiver of street improvements to including drainage improvements related thereto, sidewalks in connection with N20-05 a Non-Large Scale Development for NETS Global Holdings, LLC and the Planning Commission recommends denial of the waiver request.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, that the City Council hereby:

Option 1: Grants a waiver of street improvements to 4876 North Thompson Street including drainage improvements related thereto, sidewalks in connection with N20-05 a Non-Large Scale Development for NETS Global Holdings, LLC.

Option 2: Denies a waiver of street improvements to 4876 North Thompson Street including drainage improvements related thereto, sidewalks in connection with N20-05 a Non-Large Scale Development for NETS Global Holdings, LLC.

Option 3: Approves payment in lieu of improvements to 4876 North Thompson Street in connection with N20-05 a Non-Large Scale Development for NETS Global Holdings, LLC with estimated cost to be submitted by the developer’s engineer for confirmation by the Planning Department.

Option 4: Denies a waiver and allow a Bill of Assurance for a period not to exceed _____ years for street improvements to 4876 North Thompson Street including drainage improvements related thereto, sidewalks to be built in connection with N20-05 a Non-Large Scale Development for NETS Global Holdings, LLC.

PASSED AND APPROVED THIS ___________ DAY OF __________, 2021.

_________________________________________
Doug Sprouse, Mayor

ATTEST:

_______________________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

_______________________________________
Ernest Cate, City Attorney
FILE NO. W21-03
APPLICANT: NETS Global Holdings, Inc
REQUEST: Waiver of street improvement requirements.
RESOLUTION NO. _____

A RESOLUTION APPROVING A WAIVER OF STREET IMPROVEMENTS, DRAINAGE, CURBS, GUTTERS AND SIDEWALKS AS SET FORTH IN ORDINANCE NO. 3725 TO HUEY AND BETTY COUCH IN CONNECTION WITH 2675 NORTH 56TH STREET A SINGLE FAMILY DWELLING

WHEREAS, Ordinance #3047 provides for the waiver of street improvements, drainage relating thereto, curbs, gutters and sidewalks to be first heard by the Planning Commission and a recommendation made to the City Council, with any waivers to be granted by the City Council only; and

WHEREAS, the Planning Commission reviewed a request for waiver of street improvements to including drainage improvements related thereto, sidewalks in connection with 2675 N. 56th Street a Single Family Dwelling for Huey and Betty Couch and the Planning Commission recommends approval of the waiver request.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, that the City Council hereby:

Option 1: Grants a waiver of street improvements to N. 56th Street including drainage improvements related thereto, sidewalks in connection with 2675 N. 56th Street a Single Family Dwelling for Huey and Betty Couch.

Option 2: Denies a waiver of street improvements to N. 56th Street including drainage improvements related thereto, sidewalks in connection with 2675 N. 56th Street a Single Family Dwelling for Huey and Betty Couch.

Option 3: Approves payment in lieu of improvements to N. 56th Street in connection with 2675 N. 56th Street a Single Family Dwelling for Huey and Betty Couch, with estimated cost to be submitted by the developer’s engineer for confirmation by the Planning Department.

Option 4: Denies a waiver and allow a Bill of Assurance for a period not to exceed ______ years for street improvements to N. 56th Street including drainage improvements related thereto, sidewalks to be built in connection with 2675 N. 56th Street a Single Family Dwelling for Huey and Betty Couch.

PASSED AND APPROVED THIS _________ DAY OF __________, 2021.

_____________________________________
Doug Sprouse, Mayor

ATTEST:

Denise Pearce, City Clerk

APPROVED AS TO FORM:

Ernest Cate, City Attorney
RESOLUTION NO. ______

A RESOLUTION APPROVING A WAIVER OF STREET IMPROVEMENTS, DRAINAGE, CURBS, GUTTERS AND SIDEWALKS AS SET FORTH IN ORDINANCE NO. 3725 TO SCOTT AND CHERYL SCRUTON IN CONNECTION WITH 8246 WAGON WHEEL ROAD A SINGLE FAMILY DWELLING

WHEREAS, Ordinance #3047 provides for the waiver of street improvements, drainage relating thereto, curbs, gutters and sidewalks to be first heard by the Planning Commission and a recommendation made to the City Council, with any waivers to be granted by the City Council only; and

WHEREAS, the Planning Commission reviewed a request for waiver of street improvements to including drainage improvements related thereto, sidewalks in connection with 8246 Wagon Wheel Road a Single Family Dwelling for Scott and Cheryl Scruton and the Planning Commission recommends approval of the waiver request.

NOW, THEREFORE BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SPRINGDALE, that the City Council hereby:

Option 1: Grants a waiver of street improvements to Wagon Wheel Road including drainage improvements related thereto, sidewalks in connection with 8246 Wagon Wheel Road a Single Family Dwelling for Scott and Cheryl Scruton.

Option 2: Denies a waiver of street improvements to Wagon Wheel Road including drainage improvements related thereto, sidewalks in connection with 8246 Wagon Wheel Road, a Single Family Dwelling for Scott and Cheryl Scruton.

Option 3: Approves payment in lieu of improvements to Wagon Wheel Road in connection with 8246 Wagon Wheel Road a Single Family Dwelling for Scott and Cheryl Scruton with estimated cost to be submitted by the developer’s engineer for confirmation by the Planning Department.

Option 4: Denies a waiver and allow a Bill of Assurance for a period not to exceed _____ years for street improvements to Wagon Wheel Road including drainage improvements related thereto, sidewalks to be built in connection with 8246 Wagon Wheel Road, a Single Family Dwelling for Scott and Cheryl Scruton.

PASSED AND APPROVED THIS _______ DAY OF __________, 2021.

Doug Sprouse, Mayor

ATTEST:

Denise Pearce, City Clerk

APPROVED AS TO FORM:

Ernest Cate, City Attorney
FILE NO. W21-06
APPLICANT: Wendall Adams
REQUEST: Waiver of sidewalk requirement
That which is underlined is added; that which is stricken through is deleted.

ORDINANCE NO. 

AN ORDINANCE AMENDING CHAPTER 106 OF THE CODE OF ORDINANCES OF THE CITY OF SPRINGDALE, ARKANSAS.

WHEREAS, Chapter 106 of the Code of Ordinances of the City of Springdale, Arkansas, contains the Stormwater Drainage Criteria Manual for the City of Springdale, Arkansas;

WHEREAS, it is in the best interest of the City of Springdale, Arkansas, for the City Council of the City of Springdale, Arkansas, to amend Section 5.4.5 of the Stormwater, Drainage Criteria Manual for the City of Springdale, Arkansas, to allow for and to implement the City of Springdale Low Impact Development Design Guide;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS:

Section 1: Section 5.4.5 of the Springdale Drainage Criteria Manual is hereby amended to read as follows:

5.4.5 LOW IMPACT DEVELOPMENT AND OTHER METHODS

Low Impact Development (LID) design alternatives for stormwater mitigation are permitted; however, LID proposals must meet the detention requirements of Section 2.1 and 5.1 of this ordinance. Hybrid systems that combine detention ponding areas and LID elements are permitted. Permeable pavement designs should follow the methods outlined in the latest edition of ASCE 68-18 and manufactured product guidance. Manufacturer’s product documentation must be provided. LID proposals for greenspace features should follow the methods outlined in the "City of Springdale Low Impact Development Design Guide", which is incorporated herein by reference. Other methods of detention such as seepage pits, French drains, etc. are not permitted. If other methods are proposed, proper documentation of soil data, percolation, geological features, etc., will be needed for review and consideration. Other methods proposed must meet the detention requirements of Section 2.1 and 5.1 of this ordinance.

Section 2: All other provisions of the Springdale Drainage Criteria Manual (Chapter 106 of the Code of Ordinances of the City of Springdale, Arkansas) not specifically modified herein shall remain in full force and effect.

Section 3: There is adopted by reference the amended Stormwater Drainage Criteria Manual, which includes the City of Springdale Low Impact Development Design Guide, three copies of which are on file in the office of the City Clerk of the City of Springdale, being marked and designated as the Stormwater Drainage Criteria Manual for the City of Springdale, Arkansas.

PASSED AND APPROVED this _____ day of ____________, 2021.

____________________________
Doug Sprouse, Mayor

ATTEST:

____________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

____________________________
Ernest B. Cate, City Attorney
City of Springdale
Low Impact Development
Design Guide
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ACRONYMS AND ABBREVIATIONS

ASTM .......................................................... American Society for Testing and Materials
BMP ............................................................... Best Management Practice
EPA ............................................................... United States Environmental Protection Agency
EPDM ............................................................ ethylene propylene diene monomer
F ................................................................. Fahrenheit
ft ................................................................. Feet
in ............................................................... Inches
LID ............................................................... Low Impact Development
MCBUR ......................................................... Monolithic multi-ply hot asphalt mineral surfaced built-up-roof
PVC ............................................................. Polyvinylchloride
SCS ............................................................. Soil Conservation Service
TPO ............................................................. thermoplastic olefin
TSS ............................................................. Total Suspended Solids
US .............................................................. United States
WMS ........................................................... Watershed Management Services
VARIABLES AND CONSTANTS

A .......................................................... Contributing Area (feet²)
Aₕ .......................................................... Contributing Area (acres)
Aᵣ .......................................................... Bioretention cell Footprint (feet²)
Aᵣ .......................................................... Trench Footprint (feet²)
A₀ .......................................................... Orifice Opening Area (feet²)
C .......................................................... Runoff Coefficient per Chapter 106
Cᵣ .......................................................... Coefficient of Discharge
Dᵣ .......................................................... Infiltration Trench Depth (feet)
Dᵣ .......................................................... Total Depth of Bioretention cell With Subdrain (feet)
Dᵣ .......................................................... Depth of the Engineered Soils (feet)
Fᵣ .......................................................... Freeboard (inches)
G .......................................................... Grate Reduction Factor
g .......................................................... Gravitational Constant (feet/second²)
H .......................................................... Head (feet)
h₀ .......................................................... Height of the Berm (feet)
I .......................................................... Design Infiltration Rate (inches/hour)
Iᵣ .......................................................... Infiltration Rate of Engineered Soils (inches/hour)
Lᵣ .......................................................... With of Filter Strip Parallel to Flow Path (feet)
Iᵣ .......................................................... Length of Infiltration Trench (feet)
Lᵣ .......................................................... Approximate Length of Bioretention cell Along the Axis of the Subdrain (feet)
N .......................................................... Manning’s “n” Roughness Coefficient
Nᵣ .......................................................... Number of Orifices
Nᵣ .......................................................... Number of Outfall Structures
nᵢ .......................................................... Storage Media Void Ratio
P ⊖ .......................................................... Target Precipitation (inches)
Pᵣ .......................................................... Depth of Ponded Water (inches)
Pₛ .......................................................... Perimeter of the Stand Pipe (feet)
Q .......................................................... Flow Rate (feet³/second)
q .......................................................... Volumetric Discharge per Foot Width (feet³/second-foot)
S .......................................................... Slope of Filter Strip (ft/ft)
Sᵣ .......................................................... Depth Required for Subdrain Diameter and Drain Rock (feet)
t .......................................................... Detention Time (hours)
Tᵣ .......................................................... Target Infiltration Volume (feet³)
Tᵣ .......................................................... Travel Time through Filter Strip (minutes)
Vᵣ .......................................................... Volume of a Wedge (feet³)
Vᵣ .......................................................... Velocity (feet/second)
Wᵣ .......................................................... Width of Filter Strip Parallel to Flow (feet)
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Wᵣ .......................................................... Width of Bioretention cell (feet)
Y .......................................................... Allowable Depth of Flow (inches)
1 Introduction

The Low Impact Development Design Guide has been developed by the City of Springdale to provide the engineering and development community with additional guidance for the design of infiltration controls as stormwater mitigation. This manual also introduces other infiltration controls for consideration such as pervious pavements. The application of such mechanisms and strategies is referred to as Low Impact Development (LID).

LID is a storm water management strategy that focuses on maintaining or restoring the natural hydraulic functions of a site for the purpose of water resources protection. LID uses a decentralized approach that disperses flows and manages runoff closer to where it originates, as opposed to collecting storm water in a piped or channelized network and managing it at a large-scale "end of pipe" location. This management practice focuses on mimicking the natural retention, filtration, and infiltration mechanisms that storm water runoff would encounter on an undeveloped site. Therefore, the most important factor to consider in the application of LID to site design is the preservation of native vegetation and natural drainage features.

An essential part of the LID approach is conserving portions of the site in its predeveloped state to preserve the hydrologic functions of the site. To achieve this, site planners should identify and preserve areas that most affect hydrology, such as streams, wetlands, floodplains, steep slopes, and high-permeability soils. The development layout should be adjusted to reduce, minimize, and disconnect the total impervious area. Finally, on-site options for handling runoff from the impervious areas should be employed before conventional off-site storm water practices are used.

In addition to the importance of preserving native vegetation and natural drainage features, gains are made in the effort to mimic natural conditions by reducing and or disconnecting proposed impervious surfaces. Areas of pavement that can be easily broken up into multiple disconnected impervious surfaces include traffic lanes, parking lots, and paved walkways. Traffic lanes can be separated by pervious medians that receive runoff from roadway surfaces. Parking lots can be designed to incorporate vegetated strips of land to collect and convey runoff. Paved walkways can be separated from roadways by vegetated strips of land providing not only opportunities for infiltration but also increase pedestrian safety.

While water quality treatment is not the principle purpose of LID, these practices also provide water quality benefits. Overall reduction in surface runoff reduces the volume of runoff that can potentially transport pollutants. Infiltration as an LID technique reduces the mass of pollutants by filtration of particles and adsorption of chemicals to soil.
This LID policy provides guidance for the design of the following LID elements: filter strips (a type of infiltration surface), bioretention cells (a type of infiltration basin), infiltration trenches and pervious pavements. This manual also includes discussions of other LID elements that are applicable for storm water treatment in Northwest Arkansas.

The design guidance presented in this manual is based in part on the requirements presented in Springdale’s Drainage Criteria Manual (Chapter 106). When performing the design of an LID element, guidance presented in both manuals should be followed. This guidance is provided to facilitate and encourage the usage of LID elements in development and redevelopment projects within the City of Springdale. The guidance provided in this manual is not intended to supplant professional judgment.

1.1 Costs and Benefits of LID

In 2007, the Environmental Protection Agency (EPA) published a report titled Reducing Storm Water Costs through Low Impact Development: Strategies and Practices (EPA, 2007). The report compares the projected or known costs of LID practices with those of conventional storm water management approaches. The EPA defines “traditional approaches” to storm water management as those that typically involve hard infrastructure such as curbs, gutters, and piping.

The report indicates that LID techniques can significantly reduce infrastructure costs by eliminating the need for extensive storm water infrastructure such as underground conveyance systems. The report also notes that by infiltrating or evaporating runoff, LID techniques can reduce the size and cost of flood control structures. In some circumstances, LID practices can offset the costs associated with regulatory requirements for storm water control. However, it should be noted that LID techniques may in some cases result in higher costs due to expensive plant materials, additional site preparation, soil amendments, construction of underdrains, and increased project management costs. Other cost considerations include the amount of land required to implement LID practices and potential additional maintenance requirements.

The above-mentioned cost consideration notwithstanding, case studies reviewed in the EPA report demonstrate that LID practices can reduce project costs and improve the overall environmental performance of a development. Though not all the benefits of the LID applications were monetized, with a few exceptions, LID practices were shown to be both fiscally and environmentally beneficial to communities. In a few case studies, initial project costs were higher than those for conventional designs. In most cases, however, significant savings were realized due to reduced costs for site grading and preparation, storm water infrastructure, and site paving. Total capital cost savings ranged from 15 to 80% when LID techniques were used.

The project benefits that were not monetized in the EPA study include improved aesthetics, expanded recreational opportunities, increased property values due to the desirability of the lots and their proximity to open space, increased marketing potential,
and faster sales. These are all positive impacts that LID can bring to the surrounding community. On a municipal level, the EPA case studies indicate benefits such as reduced runoff volumes and pollutant loadings to downstream waters, and reduced incidences of combined sewer overflows. These benefits save taxpayer dollars and reduce pollution in downstream waters that support wildlife and recreation. This manual is intended to give the design community some of the design tools necessary to implement LID on residential, commercial, and transportation related projects so that both the monetary and non-monetary benefits discussed here can be realized.

In addition to the benefits discussed above, LID elements such as bioretention cells and filter strips can be used to meet drainage requirements in Chapter 106.

1.1 How to Use this Manual

It is not necessary for designers to read every section of this manual to design a particular LID element. After reading Section 1, designers may turn to the section that addresses the particular LID element of interest. However, being familiar with the design considerations associated with each LID element will greatly assist designers in the proper selection of the element best suited for a particular application.

1.1.1 General Structure of the Design Guidance Sections

This manual contains three major LID design guidance sections.

- **Section 2: Bioretention** – Shallow depressions planted with vegetation, underlain by local or engineered soils and a subdrain and/or impermeable liner.

- **Section 3: Infiltration Trenches** – Rectangular excavations lined with geotextile filter fabric and filled with coarse stone aggregate that serve as underground infiltration reservoirs for sheet flow runoff from impervious surfaces such as parking areas.

- **Section 4: Permeable Pavements** – Permeable interlocking concrete pavers underlain by local or engineered soils and a subdrain and/or permeable liner. Spaces between pavers are filled with washed, small-sized joint aggregate.

The development of a proper LID element design can be accomplished by following the guidance provided in Sections 2, 3, and 4 of this manual. Section 5 is provided to introduce additional LID elements for consideration. While the guidance provided in Section 5 is not as in-depth as that provided in the other sections, the information should be adequate to assist designers in the appropriate application and design for these elements.

A brief description of the LID element is provided at the beginning of each section. The design process is then presented in three major sections: preliminary site evaluation, preliminary design, and final design. In the preliminary site evaluation subsection, the minimum considerations to be evaluated to establish that a site is, or is not, a good
candidate for the use of the particular LID element are presented. These considerations are in addition to the basic site evaluation considerations presented in Subsection 1.3. At the end of each preliminary site evaluation subsection, a checklist is introduced to assist designers in conducting a preliminary site evaluation. In the preliminary design subsection, the minimum considerations to be evaluated during the preliminary design of each LID element are presented. Where necessary, these discussions include equations to be used during the preliminary design. At the end of each preliminary design subsection, a calculation table is introduced to assist designers in conducting a preliminary design. In the final design subsection, the minimum considerations to be addressed during the final design are discussed.

Design examples for each of the three LID elements are provided in the appendices of this manual. Each design example starts with a brief description of the theoretical site being considered for the application of the particular LID element. The description is followed by a checklist for an example preliminary site evaluation. The preliminary design example is then presented using a preliminary design calculation table. In the final design example sections, discussions are provided of how the minimum considerations presented in each section are to be addressed in the final design. Conceptual design figures are also presented.

1.1.2 Selecting an LID Element

Bioretention and infiltration trenches are suitable for applications where infiltration of the adjusted 2-year, 24-hour storm event is desired. Thus, by incorporating these LID elements into small and large developments, designers can potentially limit the amount of infrastructure required to meet the requirements listed in Chapter 106.

Filter strips are suitable for applications where treatment of the first flush of runoff is desired. Filter strips are also suitable for use as pretreatment devices upstream of other LID elements such as bioretention cells and infiltration trenches.

Each of the elements presented in Sections 2 through 4 of this manual are suitable to a wide range of applications. Table 1 below provides some suggestions for suitable applications for each element. To perform a detailed evaluation of whether or not a particular LID element is suitable for application to a particular site or portion of a site, performance of a preliminary site evaluation and a preliminary site design is required.
Table 1 – Suggested Suitable Applications for LID Elements

<table>
<thead>
<tr>
<th>LID Element</th>
<th>Parking Lot Runoff</th>
<th>Roof Top Runoff</th>
<th>Roadway Runoff</th>
<th>Airport Drainage</th>
<th>Residential Development</th>
<th>Pretreatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioretention</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Infiltration Trenches</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Filter Strips</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Permeable Pavers</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

1.2 Basic Site Evaluation Considerations

The considerations listed below should be included in the site evaluation for each of the LID elements in Section 2 through Section 4. Considerations specific to the particular elements are listed under the preliminary site evaluation discussion within each section.

1.2.1 Infiltration Rate of the Surrounding Soil

The utility of LID elements such as bioretention cells, infiltration trenches, and soak-away pits is dependent on the rate at which the local soil can infiltrate storm water. To operate properly, these LID elements should completely infiltrate storm water runoff from a particular event within 48 hours. Thus, soils with low infiltration rates are not desirable.

Infiltration rates must be estimated based on site investigations. All LID designs must be accompanied by a geotechnical report addressing sections 1.2.1-1.2.4. Infiltration testing includes soil borings or test pits in the vicinity of the proposed facility as well as physical in-situ infiltration tests. Accepted engineering methods should be used. The acceptable range of measured infiltration rates of soils in an area being considered for use of these LID elements is 0.3 to 8 inches/hour. These infiltration rates must be representative of the soil at the bottom of the proposed facility. The minimum infiltration rate does not apply to bioretention cells with impermeable liners (known as “lined bioretention cells”).

For design purposes, the measured infiltration rate of soils is adjusted using a factor of safety to account for soil non-homogeneity and to reflect reduction in infiltration capacity over the life of the facility. Equations in this manual use design rather than measured infiltration rates and 1 inch per hour is specified as the maximum design infiltration rate.

Use of higher design infiltration rates may be allowed, based on site specific investigation.

1.2.2 Depth to Groundwater

To protect groundwater resources, it is important to provide ample separation between LID elements and the surface of the local groundwater table. The minimum separation distance between the seasonal high groundwater table elevation and the bottom of infiltration trenches is 4 feet. The minimum separation distance between the seasonal
high groundwater table elevation and the surface of an unlined bioretention cell is 4 feet. Due to difficulties with bioretention cell construction at or near the groundwater surface, the minimum separation distance between the bottom of lined bioretention cells and the seasonal high groundwater table elevation is 2 feet.

1.2.3 Depth to Bedrock or Relatively Impervious Soils

Bedrock or Hydrologic Soil Group Class D soils directly below the bottom of LID elements can have undesirable effects, such as limiting the infiltrative capacity of the element, or in the case of highly fractured bedrock, allowing untreated discharge to reach groundwater. To reduce the possibility of limited infiltration or treatment due to the presence of bedrock or impervious soils, the minimum separation distance between these materials and the bottom of unlined bioretention cells and infiltration trenches is 3 feet.

1.2.4 Separation Distance from Foundations and Road Subgrades

Unlined bioretention cells and infiltration trenches must be either outside of the zone of influence of foundations and road subgrades or separated from these structures by a horizontal distance of 20 feet. The zone of influence refers to the area of the surrounding subgrade that is critical to proper function and support of the overlying and/or adjacent foundation or road subgrade. The zone of influence can be defined as the area bounded within a 3-dimensional surface extending at a 1:1 slope down and away from the outer edge of a foundation or road subgrade. An additional horizontal setback may be required when there is potential for surface seepage due to the vertical elevation difference between the bottom of the infiltration facility and adjacent land or property due to steep slopes or retaining walls.

1.3 Construction Considerations

Construction of the LID elements discussed in Sections 2 through 4 of this manual shall incorporate the considerations discussed below in addition to those provided in the construction considerations discussion presented in the section specific to each LID element.

1.3.1 Excavation

Care must be taken during the excavation of areas for LID elements to assure that the existing infiltrative capacity of the soil is not reduced due to compaction. Excavation should be performed by machinery operating adjacent to the excavated area, if possible. When it is necessary for excavation equipment to operate within the footprint of an LID element, lightweight, low ground contact pressure equipment should be used. Heavy equipment with narrow tracks, narrow tires or large lugged, high pressure tires should not be allowed on the bottom of the excavations. Following excavation, the base of the excavation should be ripped to re fracture the soil to a minimum of 12 inches.
1.3.2 Excess Sediment

Care must be taken to assure that LID elements are not overburdened with sediment generated by construction in adjacent areas. LID elements should not be used as sediment control facilities for construction. Runoff from adjacent construction should be directed away from LID elements with temporary diversion swales or other protection. Flow to newly constructed LID elements should not be allowed until all of the contributing area is stabilized according to the satisfaction of the engineer.

1.4 Separation from Underground Utilities

Generally, LID elements should have the following separation distances from underground utilities:

<table>
<thead>
<tr>
<th>Utility</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater</td>
<td>10 feet</td>
</tr>
<tr>
<td>Electric</td>
<td>6 feet</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>10 feet</td>
</tr>
<tr>
<td>Gas</td>
<td>6 feet</td>
</tr>
</tbody>
</table>

Deviation from these separation distances may be granted at the discretion of the Springdale Engineering Department and in cooperation with the utility company or companies.

1.5 Equations

This document contains a number of design equations that are provided to assist the development community in the proper design of the LID elements presented in this manual. A brief discussion of each equation, including an explanation of constants, is provided in Appendix A.

1.6 LID Design Notes

The following design notes are common to the design of bioretention, infiltration trenches, and filter strips.

- Rainfall Depth: The guidance provided in this manual has been developed in part to assist the development community in the design of LID elements capable of infiltrating the base 2-year, 24-hour event.

- Runoff Coefficient per Chapter 106: The preliminary design process for bioretention, infiltration trenches, and filter strips requires the calculation and input of the Runoff Coefficient. The term “Runoff Coefficient” is used in this document to refer to the “Rational Method Coefficient” as described in Chapter 106. In all cases, the Runoff Coefficient is to be calculated according to guidance contained in Chapter 106.

- Soil Infiltration Rates: The design of bioretention cells, infiltration trenches, and filter strips requires knowledge of the local infiltration rate. In addition, when
engineered soil is used in a bioretention cell design, the design process requires knowledge of the infiltration rate of the engineered soil. Measured infiltration rates should be adjusted to design infiltration rates using appropriate factors of safety. For estimation of the infiltration rate for engineered soils, designers are referred to Appendix C of this manual.

- Overflow Structures: In all cases, overflow structures for LID elements should be designed and sized to assure that during a 100-year 24-hour storm water is provided a clear, safe, non-destructive path to an appropriately sized conveyance system without causing any kind of localized flooding.

- Target Infiltration Volume (TIV): The term Target Infiltration Volume is used in this manual to define the target volume for design of LID elements.
2 Bioretention

A bioretention cell or bioswale is a shallow depression planted with vegetation, underlain by local or engineered soils and a subdrain and/or impermeable liner. Both bioretention cells and bioswales are intended to temporarily retain and treat storm water runoff through filtration and other mechanisms. A subdrainage system that discharges to an open channel or storm drain is required.

Bioretention cells are an extremely versatile LID element and several variations exist. In Springdale, all Bioretention cells require a subdrain. Impervious liners are sometimes required to protect groundwater or to protect adjacent foundations. Conceptual profile drawings of both types of bioretention cells are presented in Figure 1.

The soil within a bioretention cell serves as the filtration medium and also provides a rooting area for the bioretention cell plants. The bioretention cell plants play an important role in the storm water treatment process, as they encourage infiltration (if the bioretention cell is not lined) and provide treatment for pollutants, such as total petroleum hydrocarbons, through the process of phytoremediation. In addition to their value as storm water treatment devices, bioretention cells can be designed as attractive landscaping features.

Bioretention cells are a good choice to treat and/or infiltrate runoff from impervious parking lots, both high- and low-density housing developments and recreation areas. They can also be used in high-density urban applications when the proper precautions are taken to protect adjacent foundations. Bioretention cells are capable of removing fine suspended solids as well as other pollutants including copper, lead, zinc, phosphorous, and nitrogen.

In order for rain gardens and bioswales to be effective, they must be designed to meet the geologic, vertical, and horizontal constraints of a site. The process of developing an appropriate bioretention cell design based on local site constraints is presented in the following sections.

2.1 The Bioretention Cell Design Process

The bioretention cell design process involves preliminary site evaluation, preliminary and final design, the basic site evaluation considerations discussed in Subsection 1.3, and the following more specific considerations.
Figure 1 – Conceptual Bioretention Cell Profiles
2.1.1 Preliminary Site Evaluation – Bioretention cells

The following subsections present the minimum site-specific factors, in addition to those discussed in Subsection 1.3, that are to be considered when evaluating a site for the potential use of a bioretention cell to treat storm water runoff. The minimum considerations presented below do not include typical engineering considerations such as utility conflicts and are not a substitute for sound engineering judgment.

2.1.1.1 Runoff Source

Bioretention cells are intended to treat runoff from urban and suburban drainage areas where pollutant loads are related primarily to residential, parking, and road surface runoff. Bioretention cells are not appropriate to receive runoff from industrial facilities or areas where runoff is likely to contain industrial pollutants.

2.1.1.2 Contributing Area

Because of the difficulty of providing retention and infiltration of runoff from a large area within the relatively small footprint of a bioretention cell, it is necessary to limit the size of the area contributing runoff. Generally, a single bioretention cell should not be designed to receive runoff from areas larger than 5 acres. It is possible to treat runoff from very large areas if multiple bioretention cells or bioretention cells in combination with other LID elements are used.

2.1.1.3 Slope of Available Area for Bioretention cell

Bioretention cells are generally difficult to construct on steep sites. This is because the surface of a bioretention cell must be designed to be relatively level to promote infiltration evenly across the surface of the garden. For this reason, the maximum recommended slope of an area where a bioretention cell will be placed is 5%.

2.1.1.4 Available Area

A fundamental consideration to make when evaluating a site for use of a bioretention cell is whether or not there will be adequate space available. A general rule of thumb is that a bioretention cell will require an area that is approximately 10% of the total contributing area. While the exact area required for a bioretention cell can only be established through the design process, this generalization is a good starting point to use during the preliminary site evaluation process.

2.1.1.5 Down Gradient Slope

It's important to consider the slope of adjacent properties that are down gradient of the site to limit the possibility of seepage from the subgrade to the ground surface at lower elevations. For this reason, unlined bioretention cells should not be
used when the average slope of an adjacent down gradient property is 12% or
greater. This consideration does not apply to lined bioretention cells.

In order to assist designers in the evaluation of sites for use of a bioretention cell, a
checklist of each of the above considerations, as well as those discussed in Subsection
1.3, is provided in Table 2. A site must meet all of the requirements discussed in these
subsections to be a candidate for the use of a bioretention cell.

2.1.2 Preliminary Design Considerations – Bioretention cells

If the preliminary site evaluation indicates that the site is a good candidate for the use of a
bioretention cell to treat storm water, the preliminary design can be carried out to
establish the approximate dimensions of the bioretention cell. Knowing the required
dimensions of the bioretention cell will allow for further evaluation of whether or not
there is adequate space within the site to accommodate one. There are several important
considerations to be made when performing a preliminary design. Descriptions of the
minimum preliminary design considerations are provided in the subsections below.

2.1.2.a Target Treatment Volume

The target treatment volume will ultimately determine the surface area for the
bioretention cell. The target treatment volume is referred to in this manual as the
Target Infiltration volume. This volume is a function of the contributing area,
runoff coefficient, and target precipitation. The equation relating the three
variables is presented below.

\[ TIV = \frac{A \cdot P \cdot C}{12} \]

_Equation 2.1_

_TIV_ = Target Infiltration Volume (feet³)
_A_ = Contributing Area (feet²), generally less than 5 acres
_P_ = Target Precipitation (inches), 1.1 for the 1-Year, 24-Hour Storm
_C_ = Runoff Coefficient

2.1.2.b Ponding Depth and Freeboard

Both the design and function of a bioretention cell rely on the garden’s ability to
temporarily store a known depth of water at the surface. The maximum allowable
ponding depth for bioretention cells is 8 inches. In addition to this ponding depth,
a freeboard of 4 inches is also required.
### Table 2 – Bioretention cells – Preliminary Site Evaluation Checklist

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Applies to Lined Bioretention cell?</th>
<th>Applies to Bioretention cells with Subdrains?</th>
<th>Requirement/Recommendation</th>
<th>Site Conditions /Notes</th>
<th>Pass /Fail</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Infiltration</td>
<td>Y</td>
<td>N</td>
<td>Measured soil infiltration rate must be between 0.3 and 8 in/hr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to Surface Waters</td>
<td>N</td>
<td>Y</td>
<td>Bioretention cell should be located at least 100 feet from surface waters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth to Seasonal High</td>
<td>Y</td>
<td>Y</td>
<td>4 feet or more below the top of an unlined bioretention cell and 2 feet or more below the top of a lined rain garden.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth To Bedrock</td>
<td>N</td>
<td>Y</td>
<td>Bedrock must be 3 feet or more below the bottom of a bioretention cell.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to Building</td>
<td>N</td>
<td>Y</td>
<td>Bioretention cell must be located outside of the zone of influence or at least 20 feet from building foundations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to Road Subgrades</td>
<td>N</td>
<td>Y</td>
<td>Bioretention cell must be located outside of the zone of influence or at least 20 feet from road subgrades.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runoff Source</td>
<td>Y</td>
<td>Y</td>
<td>Bioretention cell is not to receive runoff containing industrial pollutants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributing Area</td>
<td>Y</td>
<td>Y</td>
<td>The contributing area must be less than 5 acres.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available Area Slope</td>
<td>Y</td>
<td>Y</td>
<td>The slope must be less than or equal to 5%.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available Area</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down Gradient Slope</td>
<td>N</td>
<td>Y</td>
<td>Average slope of adjacent down gradient property must be less than 12%.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.1.2.c Bioretention cell Footprint and Geometry

The bioretention cell footprint is the total area of the bioretention cell in plan view. The bioretention cell footprint is a function of the target treatment volume, ponding depth, and side slopes. The recommended side slope for a bioretention cell is 3:1 (horizontal: vertical). The equation for determining the bioretention cell footprint is provided below.

\[
A_r = \left( \frac{12 + TIV}{P_d} \right) \times (0.26 \times I_e^{-0.52})
\]

Equation 2.2

\(A_r\) = Bioretention cell Footprint (feet\(^2\))

\(TIV\) = Target Infiltration Volume (feet\(^3\)), Equation 2.1

\(P_d\) = Depth of Ponded Water (inches), 8 inches maximum

\(I_e\) = Infiltration Rate of Engineered Soils (inches/hour)*, 1.0 inches/hour

Bioretention cells are an extremely versatile LID element in terms of plan view geometry. They can take nearly any shape to fit within the site plan. While there is a great deal of freedom associated with specifying the shape of a bioretention cell, it is important to consider that runoff discharging to the bioretention cell (typically along the long side of the garden) should be spread evenly across the surface of the garden to promote infiltration across the entire garden surface.

2.1.2.d Depth of Engineered Soils

The engineered soils within a bioretention cell provide a medium for infiltration and plant growth. In order for the soil to provide adequate treatment, the minimum depth of engineered soils within a bioretention cell is 2.5 feet.

2.1.2.e Overflow Structure

All bioretention cells must incorporate some kind of emergency overflow structure that will safely transmit any storm water to an appropriately sized storm water conveyance system when ponding depths are exceeded. Overflow structures may include perimeter weirs and/or stand pipes. Depending on the nature of the overflow structure, an underground conveyance system may be necessary, which should be determined at the preliminary design stage.

2.1.2.f Subdrain

All bioretention systems in Springdale require a subdrain system that discharges to an open channel or storm drain. Subdrain systems are needed because local soil infiltration rates are low.

Subdrains may serve as discharge points from overflow structures to limit the amount of buried infrastructure necessary for the bioretention cell construction.
Minimum slope of subdrains is 5%.

2.1.2.g Total Depth

The total depth of a bioretention cell is the depth from the freeboard elevation to the bottom of the excavation.

For bioretention cells with a subdrain or underground overflow structure within the boundary of the bioretention cell, the total depth can be calculated with the following relationship.

\[ D_{T2} = \frac{P_d + F_d}{12} + E_d + S_d + (0.0005 \times L_f) \]  

\[ D_{T2} = \text{Total Depth of Bioretention cell with Subdrain (feet)} \]
\[ P_d = \text{Depth of Ponded Water (inches), 8 inches maximum} \]
\[ F_d = \text{Freeboard (inches), 2 inches minimum} \]
\[ E_d = \text{Depth of the Engineered Soils (feet), 2.5 feet maximum} \]
\[ S_d = \text{Depth Required for Subdrain Diameter and Drain Rock (feet), can assume 1.75 during the preliminary design} \]
\[ L_f = \text{Approximate Length of Bioretention cell, Along the Axis of the Subdrain (feet)} \]

Note: The equation above is intended to assist designers in the conservative estimation of the depth required for the bioretention cell at its deepest point. The exact depth is determined during final design.

In order to assist designers in the preliminary design of a bioretention cell, a blank sample calculation sheet has been developed and is presented as Table 3. The sample calculation sheet includes the preliminary design considerations and equation discussed above and is presented in three steps.
### Table 3 – Bioretention Cell Preliminary Design

<table>
<thead>
<tr>
<th>Site Location:</th>
<th>Evaluated by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td><strong>Step 1: Calculate the Target Infiltration Volume, ( TIV )</strong></td>
<td>Notes</td>
</tr>
<tr>
<td>( A ) (ft(^2))</td>
<td></td>
</tr>
<tr>
<td>Target Infiltration Rainfall, ( P )</td>
<td>1.1 (in)</td>
</tr>
<tr>
<td>Runoff Coefficient, ( C )</td>
<td>Per Ch. 106</td>
</tr>
</tbody>
</table>

\[
TIV = \frac{A \times P \times C}{12} \quad (\text{ft}^3) \quad \text{Using Equation 2.1}
\]

**Step 2: Calculate the Required Bioretention cell Footprint Area**

\( TIV \) (from Step 1) \( (\text{ft}^3) \)

| Depth of Ponded Water, \( P_a \) | (in) | Maximum of 8 inches |
| Design Infiltration Rate, \( I_D \) (or \( I \), see Subsection 2.1.2.c) | (in/hr) | 1.0 for engineered soils |

\[
A = \frac{TIV \times 12}{P_a (0.26 + I_{25})} \quad \text{(ft}^2) \quad \text{Using Equation 2.2}
\]

Approximate Width, \( W_a \)

\[
W_a = A / L_{app} \quad (\text{ft})
\]

Approximate Length, \( L_{app} \)

\[
L_{app} = A / W_a \quad (\text{ft})
\]

**Step 3: Approximate Bioretention cell Depth, with Subdrain**

\( P_a \) (From Step 2) \( (\text{in}) \)

Freeboard Depth, \( F_a \) \( \text{(in)} \)

Depth of Engineered Soils, \( E_g \) \( (\text{ft}) \)

Minimum Subdrain Depth, \( S_D \) \( (\text{ft}) \)

\( L_{app} \) (From Step 3) \( (\text{ft}) \)

\[
D_{app} = \frac{P_a + F_a}{12} + E_g + S_D + 0.005 \times L_{app} \quad (\text{ft}) \quad \text{Using Equation 2.3}
\]

Note: *See Appendix C for guidance on selecting a value for \( I \)
Step 1 – Calculate the Target Infiltration Volume
This step is based on Equation 2.1 presented in Subsection 2.1.2.a above, and requires the independent calculation of the runoff coefficient per Chapter 106.

Step 2 – Calculate the Bioretention cell Footprint
This step involves the application of Equation 2.2 presented in Subsection 2.1.2.c. In this step, the designer must also approximate the length and width values to represent the geometry of the bioretention cell. The product of these numbers should be approximately equal to the calculated footprint area.

Step 3 – Approximate Garden Depth
Step 3 involves the application of Equation 2.3, presented in Subsection 2.1.2.g., to determine the approximate depth of the bioretention cell.

Once the site evaluation and preliminary design have been completed, the final design can be conducted.

2.1.3 Final Design – Bioretention cells
In order to develop a final bioretention cell design based on the results of the preliminary design, there are several basic factors that must be addressed. Addressing these factors requires some basic understanding of engineering and hydraulic principles. At a minimum, each of the factors discussed in the subsections below should be considered during final design.

2.1.3.a Specifying the Engineered Soils
The engineered soils mixture is a critical component in a bioretention cell design. The recommended soil mixture for bioretention cell applications is a mixture of 60 to 65% loamy sand mixed with 35 to 40% compost. An alternative recommended soil mixture consists of 20% to 30% topsoil (sandy loam), 50% to 60% coarse sand, and 20% to 30% compost (or peat). The soil mix should be uniform and free of stones, stumps, roots or other similar material greater than 2 inches in diameter.

2.1.3.b Specifying Bioretention cell Plants
Bioretention cell plants will assist in the storm water treatment process and contribute to the aesthetic value of the garden. The rain garden or bioswale should be planted with native, perennial vegetation only. There are a wide variety of plants available for use in a bioretention cell. For large plant orders, coordinate with nurseries early to assure an adequate supply will be available. Generally speaking, the selected plants should be tolerant to a wide variety of moisture and salinity conditions, and should not interfere with utilities in the area. A list of suitable plants recommended by the Arkansas Native Plant Society for the Springdale area is provided in Appendix B. This list is a good starting point for plant materials; see the Additional References for more information.
2.1.3.c Subdrain System Design

Note: Subdrain systems are required in all Bioretention cells in Springdale.

The subdrain in a bioretention cell performs the important task of removing treated water from the garden soils and transporting it to the storm drain system or outfall. The subdrain system consists of three main components: a subdrain pipe, drain rock, and an aggregate filter blanket. Each of these components is discussed separately below.

The subdrain pipe should be constructed out of slotted polyvinyl chloride (PVC) pipe. The slots should be approximately 0.05 inches wide and 0.25 inches apart. The slots should be arranged in four rows spaced on 45-degree centers, and cover 50% of the circumference of the pipe. The minimum diameter of the drainpipe should be 8 inches and the minimum slope should be 0.5%. The number of subdrains within a bioretention cell should be adequate to handle the full ponding depth discharge rate of the bioretention cell according to Manning’s equation.

The subdrain pipe is placed on a layer of drain rock that is a minimum of 3 feet wide and 3 inches thick. A 6-inch thick layer of drain rock should be placed above the drainpipe. The recommended gradation for the drain rock is provided below:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ inch</td>
<td>100</td>
</tr>
<tr>
<td>¼ inch</td>
<td>30–60</td>
</tr>
<tr>
<td>US No. 8</td>
<td>20–50</td>
</tr>
<tr>
<td>US No. 50</td>
<td>3–12</td>
</tr>
<tr>
<td>US No. 200</td>
<td>0–1</td>
</tr>
</tbody>
</table>

An aggregate filter blanket diaphragm (pea gravel) will reduce the likelihood of clogging when placed in a 4-inch layer above the drain rock. Pea gravel should be washed and be 0.25 to 0.5 inches in diameter.

2.1.3.d Bottom Grading

In order for the underdrain system to function properly, the bottom of the bioretention cell must be graded to allow the treated water to flow towards the subdrain. The minimum acceptable bottom slope for providing drainage to the subdrain is 0.5%.
2.1.3.e Specifying the Bioretention cell Impermeable Liner

An impermeable liner is not a requirement for all bioretention cells. However, liners are required if minimum separation distances from building foundations, road subgrades, or water sources cannot be achieved.

2.1.3.f Overflow Bypass

Overflow bypass structures are important for the proper design of bioretention cells. An overflow structure can take many forms. Examples include stand pipes discharging to an underground storm drain network, and broad-crested grassed weirs discharging to grassed ditches. All bioretention cells must include some form of overflow bypass sufficient to transmit runoff from a 100-year, 24-hour duration storm event without overtopping the bioretention cell. Overtopping shall be allowed in cases where discharge due to overtopping is provided a clear, safe, non-destructive path to a conveyance system.

2.1.3.g Pretreatment

Pretreatment for bioretention cells can significantly reduce the amount of maintenance associated with sediment deposition. Filter strips, as described in Section 4, are suitable for providing pretreatment. Where site conditions allow, pretreatment devices are recommended for bioretention cells receiving runoff from parking areas and other areas known to have high sediment loads.

2.2 Bioretention Cell Construction and Maintenance

2.2.1 Construction Considerations – Bioretention cells

In addition to the minimum construction considerations discussed in Subsection 1.5, consideration should be given to the placement of engineered soils. Onsite mixing and/or placement of engineered soils should not be performed when the soil or ground is saturated. The engineered soils should be placed and graded by excavators and/or backhoes operating adjacent to the bioretention cell. If machinery must operate in the bioretention cell for excavation, lightweight, low ground contact pressure equipment should be used. The engineered soils should be placed in 12-inch lifts. Compaction of engineered soils should be allowed to occur through natural settlement over time rather than through mechanical means. To speed settling, each lift can be watered to the saturation point.

The minimum considerations presented in this manual do not include some typical engineering considerations such as resolving utility conflicts, and are not a substitute for sound engineering judgment.
2.2.2 Maintenance Considerations – Bioretention cells

In order to function properly over long periods of time, bioretention cells must be maintained properly and regularly. The following are general considerations that should be addressed when developing a maintenance agreement as required by this policy.

2.2.2.a Watering

Because the plants selected for bioretention cell applications are to be suitable for a wide range of soil moisture conditions, watering will generally not be required after the plants are well established. However, during the first 2 to 3 years, watering will be required to nurture the young plants. Watering may also be required during prolonged dry periods after plants are established (PSAT, 2003).

2.2.2.b Plant Material

Depending on the aesthetic requirements of the bioretention cell, occasional pruning and removal of dead plants may be necessary. Periodic weeding will be necessary for the first 2 to 3 years, until the plants are well established (PSAT, 2003). As the garden matures, it may be necessary to prune, thin, or split plants to avoid an overgrown appearance and maintain plant health.

2.2.2.c Mulch

If mulch is used in a bioretention cell, it should be replaced annually if heavy metal deposition or heavy sedimentation is likely (e.g., if runoff comes from parking lots and roads). If heavy metal deposition and/or sedimentation is not a major concern, the mulch should be amended at least once every 2 years to maintain a 2 to 5-inch depth. If mulch is used, allow for additional depth to account for the thickness of the mulch layer.

2.2.2.d Soil

In bioretention cells where heavy metals deposition is likely, it is recommended that the engineered soil be removed and replaced once every 20 years. Replacing soil in bioretention cells will provide a prolonged service life.

2.2.2.e Inspection and Trash Removal

Bioretention cells should be inspected following large rain events. If ponded water persists for more than 24 hours after a rain event, the first six inches of soil may need to be removed and replaced or amended to restore infiltration. This task must be performed carefully to limit damage to established plants. Because of the aesthetic value of bioretention cells, trash should be regularly removed.

2.2.3 Bioretention cell Conceptual Design Example

A conceptual design example for a bioretention cell is provided in Appendix D of this manual.
3 Infiltration Trenches

An infiltration trench is a rectangular excavation lined with a geotextile filter fabric and filled with coarse stone aggregate. These trenches serve as underground infiltration reservoirs. Storm water runoff directed to these trenches infiltrates into the surrounding soils from the bottom and sides of the trench. Infiltration trenches require pretreatment of storm water runoff to remove large sediments. Pretreatment for infiltration trenches is typically accomplished with the use of filter strips. Trench depths generally range between 2.5 and 10 feet. They can be covered with grating, stone, gabions, sand, or a grassed area with surface inlets. A conceptual drawing of an infiltration trench is provided in Figure 2.

An infiltration trench is a good choice to treat and infiltrate runoff from impervious parking lots, high- and low-density housing developments, and recreation areas. Infiltration trenches can be difficult to use in high-density urban applications due to the amount of area they require for pretreatment, and the potential hazard they pose to adjacent foundations. Infiltration trenches are intended to remove fine suspended solids and other pollutants such as copper, lead, zinc, phosphorous, nitrogen, and bacteria.

In order for infiltration trenches to be effective, they must be located in areas where the local soil is appropriate for infiltration and they must be designed accordingly. The process for developing an appropriate infiltration trench design based on local site constraints is presented in the following sections. Infiltration trenches must have a subdrain.

3.1 The Infiltration Trench Design Process

The infiltration trench design process involves preliminary site evaluation, preliminary and final design, and the basic site evaluation considerations discussed in Subsection 1.3.
Figure 2 – Infiltration Trench Conceptual Drawing
3.1.1 Preliminary Site Evaluation – Infiltration Trench

The following subsections present the minimum site-specific factors, in addition to those discussed in Subsection 1.3, that are to be considered when evaluating a site for the potential use of an infiltration trench to treat storm water runoff. The minimum considerations presented below do not include some typical engineering considerations such as resolving utility conflicts, and are not a substitute for sound engineering judgment.

3.1.1a Runoff Source

Infiltration trenches are intended to treat runoff from urban and suburban drainage areas where pollutant loads are related primarily to parking lot and road surface runoff. Infiltration trenches are not appropriate to receive runoff from industrial facilities where runoff is likely to contain industrial pollutants.

3.1.1b Contributing Area

In the past, infiltration trenches have been designed to accommodate large drainage areas. However, long term monitoring suggests that large-scale infiltration is not feasible. The main factor being that infiltration of storm water from a large area into a relatively small area does not reflect the natural hydrologic cycle and generally leads to problems such as groundwater mounding, soil clogging, and soil compaction. It is recommended that the contributing area to an infiltration trench be limited to 3 acres or less.

3.1.1c Slope of Available Area for Infiltration Trench

Infiltration trenches are generally difficult to construct on steep sites because the bottom and top surfaces of the trench must be completely level. The design of filter strips to provide pretreatment to runoff is also more problematic on steep sites. For these reasons, the maximum recommended slope of a site being considered for use of an infiltration trench is 5%.

3.1.1d Available Area

The area that is required for an infiltration trench can be as much as 15 to 35% of the total contributing area. The most efficient sites are ones in which the contributing area dimensions are nearly square and the infiltration trench can be constructed along one side of the square. Infiltration trenches can be designed to receive runoff from sites with length to width ratios as low as 3:1 with moderate increases in the percentage of the relative area required for the trench. During the site evaluation process, it can be assumed that the area required for the infiltration trench and filter strip(s) is 35% of the total contributing area.
3.1.1.e Down Gradient Slope

The slope of adjacent properties that are down gradient of the site is important to consider the possibility of seepage from the subgrade to the ground surface at lower elevations. For this reason, infiltration trenches should not be used when the average slope of an adjacent down gradient property is 12% or greater.

In order to assist designers in the evaluation of sites for use of an infiltration trench, a checklist of each of the above considerations, as well as those discussed in Subsection 1.3, is provided in Table 4. A site must meet all of the requirements discussed in these subsections to be a candidate for the use of an infiltration trench.

3.1.2 Preliminary Design Considerations – Infiltration Trench

If the preliminary site evaluation indicates that the site is a good candidate for the use of an infiltration trench to treat storm water, the preliminary design can be carried out to establish the approximate dimensions of the trench and pretreatment area. Knowing the required dimensions of the infiltration trench will allow for further evaluation of whether or not there is adequate space within the site to accommodate the trench and pretreatment area. There are several important considerations to be made when performing a preliminary design of an infiltration trench. Descriptions of the recommended preliminary design considerations are provided in the subsections below.
### Table 4 – Infiltration Trench – Preliminary Site Evaluation Checklist

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Requirement/Recommendation</th>
<th>Site Conditions/Notes</th>
<th>Pass/Fail</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Infiltration</td>
<td>Measured soil infiltration rate must be between 0.3 and 8 in/hr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to Surface Waters</td>
<td>Trench should be located at least 100 feet from surface waters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth to Seasonal High Groundwater Level</td>
<td>Must be 4 feet or more below the bottom of the trench.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth To Bedrock</td>
<td>Bedrock must be 3 feet or more below the bottom of the trench.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to Building Foundations</td>
<td>Trench must be located outside of the zone of influence or at least 20 feet from building foundations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to Road Subgrades</td>
<td>Trench must be located at least 20 feet from road subgrades.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runoff Source</td>
<td>Infiltration trench is not to receive runoff containing industrial pollutants.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributing Area</td>
<td>The contributing area must be less than 3 acres.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available Area Slope</td>
<td>Available area slope must be less than or equal to 5%.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available Area</td>
<td>The area available for treatment must be at least 15% of the total catchment area.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down Gradient Slope</td>
<td>Average slope of adjacent down gradient property must be less than 12%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.1.2.a Target Treatment Volume

The target treatment volume will ultimately determine the area of the infiltration trench. The target treatment volume is referred to in this manual as the Target Infiltration Volume. This volume is a function of the contributing area, runoff coefficient, and target precipitation. The equation relating the three variables, presented for the first time in Subsection 2.1.2.a, is presented again below.

\[
TIV = \frac{A \times P \times C}{12}
\]

*TIV = Target Infiltration Volume (feet\(^3\))
A = Contributing Area (feet\(^2\))
P = Target Precipitation (inches), 1.1 for the 1-Year, 24-Hour Storm
C = Runoff Coefficient per Chapter 106

3.1.2.b Void Ratio

The function of an infiltration trench is reliant on not only the infiltration rate of the surrounding soil but also on the trench's ability to temporarily retain water. The storm water is retained within the void spaces of the storage media. The ratio of the volume of the space between individual particles of the storage media over the volume of the storage media particles is known as the void ratio. Infiltration trench storage media should consist of clean aggregate ranging from 1.5 to 3 inches in diameter. For the sake of calculation in this manual, assume a void ratio of 0.4.

3.1.2.c Detention Time

The retention time associated with an infiltration trench is the amount of time it takes for the full trench to discharge to the surrounding soil through the subdrain. In order to provide adequate treatment, the acceptable range for detention time is 24 to 48 hours.

3.1.2.d Trench Depth

The trench depth is the depth of the trench from the top surface to the bottom of the excavated area. Trench depth is a function of the design infiltration rate; the storage media void space, and the retention time. The trench depth should be between 4 and 10 feet. A minimum depth of 4 feet allows for the bottom of the trench to be at or below the frost line. Shallower depths may be permitted in non-frost susceptible soils. The equation for determining trench depth is provided below.
\[ D_l = \frac{t \times l}{n_x \times 12} + 1 \]  

*Equation 3.1*

\( D_l \) = Trench Depth (feet), must be 4 to 10 feet  
\( l \) = Design Infiltration Rate (inches/hour), between 0.3 and 1 inch/hour  
\( t \) = Retention Time (hours), 24 to 48 hours  
\( n_x \) = Storage Media Void Ratio, 0.4 typical for 1.5 to 3-inch stones

The additional one foot added to the equation above is to allow for the use of a 6-inch layer of sand in the bottom of the trench and a 6-inch top layer. The sand acts to distribute flow and to reduce localized compaction when placing the storage media during construction.

### 3.1.2.e Trench Footprint

The trench footprint is the plan view area of the trench and is a function of the design infiltration rate, the retention time, and the target infiltration volume. The equation for determining the trench footprint is provided below.

\[ A_l = \frac{TIV \times 0.66}{n_x \times (D_l - 1)} \]  

*Equation 3.2*

\( A_l \) = Trench Footprint (feet²)  
\( TIV \) = Target Infiltration Volume (feet³)  
\( n_x \) = Storage Media Void Ratio, 0.4 typical for 3-inch stones  
\( D_l \) = Trench Depth (feet), between 4 and 10 feet

### 3.1.2.f Trench Width

The width of a trench can be adjusted to meet site constraints as long as the necessary footprint area is maintained. The minimum suggested length to width ratio to be applied to an infiltration trench design is 3:1. The maximum allowable trench width, parallel to flow, is 25 feet.

### 3.1.3 Pretreatment

Infiltration trenches require pretreatment to remove large particulates. Grass filter strips are generally used to provide pretreatment for runoff entering an infiltration trench although other pretreatment devices may be used including vegetated swales, ponds, etc. At the preliminary design stage, the designer may assume a 20-foot filter strip width. For additional information on sizing filter strips for pretreatment, refer to Subsection 5.1 of this manual.
In order to assist designers in the preliminary design on an infiltration trench, a sample calculation sheet has been developed and is included in Table 5. The calculation sheet covers the above considerations and equations in six steps.

**Step 1 - Calculate the Target Infiltration Volume**
This step is based on Equation 2.1 presented in Subsection 3.1.2.a above, and requires the independent calculation of the runoff coefficient per Chapter 106.

**Step 2 - Calculate the Depth of the Trench**
This step is based on Equation 3.1 presented in Subsection 3.1.2.d above. The depth can be adjusted by adjusting the drawdown time. However, it should be noted that reductions in depth will result in increases in area.

**Step 3 - Calculate the Footprint of the Trench**
This step is based on Equation 3.2 presented in Subsection 3.1.2.e above.

**Step 4 - Establish the Trench Length and Width**
In this step, the designer may choose to set either the trench length or width to meet particular site requirements. Note that the maximum allowable trench width is 25 feet and the maximum recommended length to width ratio is 3:1.

**Step 5 - Account for Pretreatment**
This step involves determining the total width of the infiltration trench and associated filter strips. Note that if the site only drains to one side of an infiltration trench, only a single filter strip on that side is necessary.

**Step 6 - Required Length and Width for Trench and Filter Strip**
This step involves summarizing the preliminary design values for length and width established in Steps 4 and 5.
### Table 5 – Infiltration Trench Preliminary Design

<table>
<thead>
<tr>
<th>Site Location:</th>
<th>Evaluated by:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date:</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Step 1: Calculate the Target Infiltration Volume**

<table>
<thead>
<tr>
<th>Contributing Area, A</th>
<th>(ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Infiltration Rainfall, P</td>
<td>(in)</td>
</tr>
<tr>
<td>Runoff Coefficient, C</td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{TIV} = A \cdot P \cdot C / 12 \]  
(Using Equation 2.1)

**Step 2: Calculate the Depth of the Trench**

<table>
<thead>
<tr>
<th>Void Ratio, ſ</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Infiltration Rate, I</td>
<td>(in/hr)</td>
</tr>
<tr>
<td>Detention Time, t</td>
<td>(hr)</td>
</tr>
</tbody>
</table>

\[ D_t = (1 + I)(\sigma, t) + 1 \]  
(Using Equation 3.1)

**Step 3: Calculate the Footprint of the Trench**

<table>
<thead>
<tr>
<th>TIV (from Step 1)</th>
<th>(ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ſ, (from Step 2)</td>
<td></td>
</tr>
<tr>
<td>D, (from Step 2)</td>
<td>(ft)</td>
</tr>
</tbody>
</table>

\[ A_t = \left( \text{TIV} + 0.66 \right) / \left( \sigma, t \right) \]  
(Using Equation 3.2)

**Step 4: Establish the Trench Length and Width**

<table>
<thead>
<tr>
<th>Set Trench Length, Lₛ</th>
<th>(ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trench Width, Wₛ</td>
<td>(ft)</td>
</tr>
</tbody>
</table>

Then Calculate Either

\[ Wₛ = A_t / Lₛ \]  
(Using Equation 3.2)

| Lₛ = A_t / Wₛ | (ft) |

**Step 5: Account for Pretreatment**

Filter Strip Width, Wₛ

If Receiving Flow From Both Sides

\[ \text{Total Width} = Wₛ + 2 \cdot Wₛ \]  
(Using Equation 3.2)

Or, If Receiving Flow From One Side

\[ \text{Total Width} = Wₛ + Wₛ \]  
(Using Equation 3.2)

**Step 6: Required Length and Width for Trench and Filter Strip**

Lₛ (from Step 4) = (ft)

Appropriate Total Width (from Step 5) = (ft)
Once the site evaluation and preliminary design have been completed, the final design can be performed.

3.1.4 Final Design Considerations – Infiltration Trench

In order to develop a final infiltration trench design based on the results of the preliminary design, there are several basic factors that must be addressed. Addressing these factors requires some basic understanding of engineering and hydraulic principles. At a minimum, each of the factors discussed in the subsections below should be considered during final design.

3.1.4.a Filter Fabric

Filter fabric selection and placement are important to both the effectiveness and the service life of an infiltration trench. Filter fabric should be selected that matches the infiltrative capacity of the soil in the trench to prevent clogging and piping. The fabric should be placed so that it lines the bottom and sides of the trench. Overlap between separate pieces of fabric should be a minimum of one foot. Filter fabric should also be placed below the top layer of the infiltration trench to reduce maintenance costs, since the top fabric can be cleaned or replaced much more easily than the fabric lining the bottom and sides when fine particles clog the trench.

3.1.4.b Overflow Structure

Overflow structures are important for the proper design of infiltration trenches. An overflow structure can take many forms. Examples include stand pipes discharging to an underground storm drain network, and broad crested weirs discharging to grassed ditches. No matter what kind of overflow structure is selected, it must be capable of safely transmitting runoff from the 100-year, 24-hour duration storm event so that the infiltration trench does not overtop. Overtopping may be allowed in cases where discharge due to overtopping is provided an unobstructed, safe, and non-destructive path to a conveyance system.

Any portion of an overflow structure that lies within the subgrade of an infiltration trench will reduce the volume of storm water that can be held by the trench. The trench footprint must be adjusted accordingly to account for the lost storage volume.

3.1.4.c Top Layer

Infiltration trenches can be covered with a variety of different materials. The top layer is intended to provide cover for the first layer of filter fabric and to provide a level surface that can be easily traversed. An additional benefit of the top layer is improvement of aesthetics. The top layer of an infiltration trench should consist of a minimum of 6 inches of one of the following: clean 0.5 to 1-inch crushed stone, pea gravel, or other pervious media. Due to the need for periodic maintenance, infiltration trenches should not be covered with concrete or asphalt.
3.1.4.d Bottom Layer

The bottom layer of an infiltration trench consists of 6 inches of clean sand or fine gravel. The purpose of the bottom layer is to evenly distribute flows along the bottom of the trench and to protect the underlying soil from localized compaction during placement of the storage media.

3.1.4.e Grading

Site grading is one of the most critical factors in the final design of an infiltration trench. The site must be graded so that runoff is directed to the infiltration trench evenly across the surface of the filter strips. The site must also be graded so that both the top surface and the bottom of the infiltration trench are completely level.

3.1.4.f Observation Well

An observation well is to be installed in each infiltration trench. An additional observation well shall be installed for every 50 linear feet of infiltration trench. Observation wells allow drawdown times to be monitored within the trench, and will allow maintenance crews to identify when the trench has become clogged and is in need of repair. The wells should be placed to the full depth of the trench and be secured to a footing plate. The observation well should be a minimum of 6 inches in diameter and have a waterproof locking cap at the surface.

The perforated portion of the observation well shall be between the top and bottom layers of filter fabric. Where the observation well passes through the top layer of filter fabric, the filter fabric shall be sealed around the un-perforated section of the well. This will limit the intrusion of sediments collected by the upper filter fabric into the lower portion of the well, where they are more difficult to remove.

The above list does not include every possible final design consideration. However, for most infiltration trench designs, each of the above design considerations will be necessary. Additional engineering considerations, such as the depth and location of utilities within and adjacent to the site, will be required depending on the site specific conditions.

3.2 Infiltration Trench Construction and Maintenance

3.2.1 Construction Considerations – Infiltration Trench

In addition to the minimum general considerations, discussed in Subsection 1.5, the construction of an infiltration trench requires care in the placement of the storage media. Storage media should be placed without causing compaction of the subsoil. This can be
accomplished by placing the storage media in 6-inch lifts. The storage media should not be compacted.

The minimum considerations presented in this manual do not include some typical engineering considerations such as resolving utility conflicts, and are not a substitute for sound engineering judgment.

3.2.2 Maintenance Considerations – Infiltration Trench

In order to function properly over long periods of time, infiltration trenches must be maintained properly and regularly. The following are general considerations that should be addressed when developing a maintenance agreement as required by Chapter 106.

3.2.2.a Watering and Weeding

If a top layer of grass (with inlets) is used, periodic watering will be required in the first year to help the grass become established. Watering may also be required during prolonged dry periods. Weeding should be performed as necessary to maintain a healthy grassed top layer.

3.2.2.b Filter Fabric

The top layer of filter fabric in an infiltration trench will require periodic cleaning or replacement. The observation well(s) can be used to establish which portion of the filter fabric is in need of replacement. If standing water persists in the infiltration trench longer than the designed detention time, the observation well(s) should be checked. If the observation wells are empty, then the top layer of filter fabric will need to be cleaned or replaced to remove accumulated sediments. If the observation wells are full of standing water, then the storage media will need to be removed and washed, and the layer of filter fabric along the trench sides and bottom will need to be cleaned or replaced.

3.2.2.c Routine Post-Storm Inspection

Infiltration trenches and filter strips should be inspected after large rain events. The filter strips and the top layer of the infiltration trench should be inspected for evidence of erosion (which is unlikely in properly designed systems). Any visible trash accumulated on top of the infiltration trench or on the filter strip should be removed.

3.2.3 Infiltration Trench Conceptual Design Example

A conceptual design example for an infiltration trench is provided in Appendix E of this manual.
4 Pervious Pavements

One approach to lowering the overall imperviousness of an area, while retaining necessary surfaces for fire lanes, shoulders, sidewalks, etc., is the use of porous pavement technologies. Some porous pavement technologies are not applicable in areas where sanding is common. However, other types of porous pavement can be used when adequate underdrainage, such as a sand or gravel bed, is provided. Porous pavement types suitable for application in Springdale are discussed below.

4.1 Types of Pervious Pavements

Open-Jointed Paving Blocks or Interlocking Concrete Pavements – These are modular paving units that allow infiltration between individual units. They are typically built over an open-graded or rapid-draining crushed stone base; with less than 3% fines passing the No. 200 sieve (see Figure 3). Perforated drainage pipes can provide drainage in heavy overflow conditions, or provide secondary drainage if the base loses some of its capacity over time. For installations where slow-draining subgrade soils are present, perforated pipes can drain excess runoff and alleviate potential for frost heaving.

Figure 3 – Open-Jointed Paving Block

Concrete Grids – These are perforated concrete units installed over a compacted soil subgrade, which overlies a dense-graded base of compacted crushed stone, which in turn overlies 1 to 1½ inch thick bedding sand (see Figure 4). The openings in the grids are filled with either topsoil and grass or aggregate.
Plastic Lattices (Geocells) — These are interlocking, high-strength blocks made from plastic materials. They provide vehicular and pedestrian load support over grass areas while protecting the grass from the harmful effects of traffic. The system is comprised of base support soil beneath the lattice unit, which is then filled with selected topsoil, and seeded with selected vegetation.

4.2 Benefits and Disadvantages

The benefits of porous pavement technologies include the following:

- Porous pavements provide a pervious, load-bearing surface with minimal increases in imperviousness.
- Application of pervious pavement technologies can reduce site runoff and limit the degree of complexity required for storm drain design and analysis.
under Chapter 106.

- In some cases, construction costs of porous pavements can be less than conventional pavements.
- Soil–enhanced turf systems are advantageous for sports and recreation fields because they resist compaction, promote infiltration, and provide a soft playing surface.

Though porous pavement technologies have a number of potential applications and benefits, there are some limitations that bear consideration. These limitations include the following:

- Sand and salt in snowmelt runoff can cause clogging of porous pavements. However, studies suggest that permeable surfaces can be used successfully, especially if they are installed properly (backfilled with clean gravel), and maintained through semi–annual vacuum cleaning.
- Construction costs of porous pavements can be higher in some cases than conventional pavement, depending on the application, and maintenance costs are usually higher.
- Most porous pavements limit wheelchair access and do not meet Americans with Disabilities Act standards, thus limiting their applicability in foot traffic areas.

Some design considerations for porous pavement are listed below.

- Assessment of site soil infiltration capacity is required to assure proper functioning of the porous pavement, which should not be installed on clayey soils or in areas of high groundwater.
- Subdrains are required for adequate drainage.
- Plant with drought tolerant turf grass (such as fescue) rather than less drought tolerant strains such as bluegrass.

4.3 Design Methods for Permeable Interlocking Concrete Pavements

For design examples, equations, and additional guidance, use the following resources:

- *Permeable Interlocking Concrete Pavements* – David R. Smith
  Fifth Edition, Published by the Interlocking Concrete Pavement Institute
- *Permeable Interlocking Concrete Pavement – ASCE Standard 68-18*
  Published by the American Society of Civil Engineers
5 Additional LID Elements for Consideration

5.1 Filter Strips

Filter strips are gently sloped, vegetated areas designed to decelerate and filter sheet flow runoff. Existing areas of dense, healthy vegetation that are capable of dispersing runoff and have experienced relatively little site disturbance or soil compaction often provide the most desirable areas for use as filter strips. These LID elements also treat total suspended solids (TSS), but they can also reduce concentrations of hydrocarbons, heavy metals, and nutrients. Filter strips remove pollutants via sedimentation, filtration, absorption, infiltration, biological uptake, and microbial activity. Depending on site characteristics such as soil type, vegetative cover, slope, and available area, filter strips can provide a modest reduction in runoff volume due to infiltration. In addition to their value as storm water treatment devices, filter strips can serve as attractive landscaping features that may incorporate a variety of trees, shrubs, and native vegetation. The simplest and often most effective filter strips are those that incorporate undisturbed existing vegetation.

The size and character of contributing drainage areas largely dictate the size and location of filter strips, since filter strips perform effectively only under sheet flow conditions, and flows tend to concentrate and have higher velocities over large or impervious drainage areas. A conceptual drawing of a filter strip is presented in Figure 6.

The advantages of filter strips include removal of sediment and insoluble contaminants from runoff, and increased infiltration of soluble nutrients and pesticides. The tall, dense vegetation of filter strips can provide a visual barrier between roads and recreation sites. Filter strips work particularly well in residential areas, providing open spaces for recreation and maintaining riparian zones along streams, which can reduce erosion and enhance animal habitats and aquatic life. In general, filter strips are simple and inexpensive to install, and have relatively few maintenance requirements. In order for filter strips to be effective, they must be properly graded to limit erosive velocities.
Figure 6 – Filter Strip Conceptual Plan and Profile
5.2 Filter Strips for Pretreatment

Filter strips are commonly used for pretreatment in association with other LID elements such as bioretention cells and infiltration trenches. Table 6 presents design guidance for slopes and lengths (parallel to flow) of pretreatment filter strips based on the slopes, dimensions, and surface characteristics of the contributing drainage areas.

Table 6 - Pretreatment Filter Strip Design Guidance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Land Cover in Contributing Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impervious Areas</td>
</tr>
<tr>
<td>Maximum Inflow Approach Length (ft)</td>
<td>35</td>
</tr>
<tr>
<td>Filter Strip Slope (Maximum = 6%)</td>
<td>≤ 2%</td>
</tr>
<tr>
<td>Minimum Filter Strip Length (ft)</td>
<td>10</td>
</tr>
</tbody>
</table>

5.3 The Filter Strip Design Process

The filter strip design process involves preliminary site evaluation, preliminary and final design. The following subsections present the minimum site-specific factors that are to be considered when evaluating a site for the potential use of a filter strip as primary LID elements discharging to storm water conveyance systems, natural areas, or receiving waters. These sections include a site evaluation checklist and preliminary design calculation table to guide readers through design processes for filter strips.

5.3.1 Preliminary Site Evaluation – Filter Strips

The minimum preliminary site evaluation considerations presented below do not include some typical engineering considerations such as resolving utility conflicts and are not a substitute for sound engineering judgment.

Runoff Source

Filter strips are intended to treat runoff from urban and suburban drainage areas where pollutant loads come from residential, parking, and road surface runoff. Filter strips are not appropriate to receive runoff from industrial facilities or from areas where runoff is likely to contain industrial pollutants.

Contributing Area

Filter strips are suitable to treat small drainage areas, generally one acre or less in size. It is possible to treat runoff from large areas if multiple filter strips are used. For effective performance, runoff must enter the filter strip as sheet flow. Runoff tends to concentrate within 75 feet along impervious surfaces and within 150 feet
along pervious surfaces. Longer flow paths upstream of filter strips are acceptable, but require special consideration to ensure design flows are spread evenly across the surface of the filter strips.

**Slope of the Contributing Area and Filter Strip**

The contributing drainage area slopes should be less than 10% for effective performance. Steeper slopes require additional energy dissipation to promote the dispersion of storm water evenly across the length of the filter strips and to prevent erosion. Slopes parallel to the flow path across filter strips should be between 1 and 6%.

**Available Area**

For a given site, filter strip length, parallel to the direction of flow, is dependent on slope, vegetative cover, and soil type. Generally, filter strips should extend a minimum of 15 feet in the direction of flow, with 25 feet preferred if space is available. Filter strip width, perpendicular to the direction of flow, should be equal to the width of the contributing drainage area. When filter strips are the primary LID element providing storm water treatment, the ratio of contributing area to filter strip area should not exceed 6:1.

To assist designers in the evaluation of sites for use of a filter strip, a checklist of each of the above considerations is provided in Table 9. A site must meet all of the requirements discussed in the subsections above to be a candidate for the use of a filter strip.

**5.3.2 Preliminary Design – Filter Strips**

If the preliminary site evaluation indicates that a site is a good candidate for the use of filter strips to treat storm water, the preliminary design can proceed to establish approximate filter strip dimensions. Determining the dimensions of filter strips during preliminary design is an iterative process. There are several important considerations to be made when performing the preliminary design of a filter strip. Descriptions of the recommended preliminary design considerations are provided in the subsections below.

**5.3.2.1 Filter Strip Slope**

Filter strip slopes should generally range from 1% to 6% for effective performance. Slopes at the top and toe of filter strips should be as flat as possible to encourage sheet flow and prevent erosion. The maximum allowable lateral slope (perpendicular to the direction of flow) for filter strips should not exceed 1%.
### Table 7 – Filter Strips – Preliminary Site Evaluation Checklist

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Requirement/Recommendation</th>
<th>Site Conditions/Notes</th>
<th>Pass/Fail</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runoff Source</td>
<td>The filter strip is not to receive runoff containing industrial pollutants.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributing Area</td>
<td>The contributing area must be less than 1 acre.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope of the</td>
<td>Slope of the contributing area must be less than 10%.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributing Area</td>
<td>The available area for the filter strip shall generally extend the full width of the contributing area and allow for a length (parallel to flow) of 15 to 25 feet.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available Area</td>
<td>The ratio of total contributing area to the total available area must not exceed 6:1.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 5.3.2.2 Filter Strip Flow Depths

Flow depths on filter strip surfaces should not exceed 0.5 inches. At depths greater than 0.5 inches, treatment through infiltration is reduced as deeper flows tend to push filter strip grasses parallel to the ground.

#### 5.3.2.3 Maximum Discharge Loading

The maximum discharge load represents the maximum flow rate that can cross the threshold of a filter strip without compromising the filter strip performance. The maximum discharge loading refers to the flow entering the filter strip. The calculation of maximum discharge loading per foot width along the filter strip is based on Manning’s equation, as shown below.

\[
q = \frac{1.49}{n} \left( \frac{Y}{12} \right)^{\frac{5}{3}} \times S^{\frac{1}{2}}
\]

Equation 5.1

\( q = \text{Volumetric Discharge per Foot Width (feet}^3\text{/second-foot)} \)
\( Y = \text{Maximum Allowable Depth of Flow (inches), 0.5} \)
\( S = \text{Slope of Filter Strip (feet/foot), between 1% and 6%} \)
\( n = \text{Manning’s “n” Roughness Coefficient, Equal to 0.2 for mowed grass and 0.25 for unmowed grass} \)
5.3.2.4 Maximum Allowable Design Velocity

The maximum allowable design velocity is the minimum allowable velocity along the filter strip under normal design conditions. The maximum allowable velocity for filter strips is 0.9 feet per second. This is based on the calculated volumetric discharge per foot width and the design flow depth. The maximum allowable design flow depth is 0.5 inches. The design velocity can be calculated using the following formula.

\[ V = \frac{q}{y/12} \]

*Equation 5.2*

\[ V = \text{Velocity (feet/second), 0.9 feet/second maximum} \]
\[ q = \text{Volumetric Discharge per Foot Width (feet}^3/\text{second-foot)} \]
\[ y = \text{Maximum Allowable Depth of Flow (inches), 0.5 inches maximum} \]

5.3.2.5 Minimum Allowable Filter Strip Width

The minimum width (W_f) of a filter strip, which is the dimension perpendicular to flow, is a function of flow rate entering and exiting the filter strip, according to the equation shown below.

\[ W_f = \frac{A_s\cdot C\cdot 0.5}{q} \]

*Equation 5.3*

\[ W_f = \text{Width of Filter Strip Perpendicular to Flow Path (feet)} \]
\[ A_s = \text{Area (acres)} \]
\[ C = \text{Runoff Coefficient per Chapter 106} \]
\[ q = \text{Volumetric Discharge per Foot Width (feet}^3/\text{second-foot)} \]

5.3.2.6 Filter Strip Length

Filter strip length is the dimension parallel to flow. Filter strip length should be calculated for a travel time of 5 to 9 minutes according to the Soil Conservation Service (SCS) Technical Release 55 (TR-55) travel time equation (SCS, 1986) shown below.

\[ L_f = \frac{T_{1.25}^{0.625} \cdot (S+100)^{0.5}}{3.34+n} \]

*Equation 5.4*

\[ L_f = \text{Length of Filter Strip Parallel to Flow Path (feet), 15 to 25 feet} \]
\[ T_1 = \text{Travel Time through Filter Strip (minutes), 5 minutes minimum} \]
\[ P = \text{Precipitation (inches) (SCS parameter used to calibrate this equation); 3.9" for the 2-Year, 24-Hour Storm} \]
\[ S = \text{Slope of Filter Strip (ft/ft), 0.01 to 0.06 ft/ft} \]
\( n = \text{Manning's 'n' Roughness Coefficient, Equal to 0.2 for mowed grass and 0.25 for unmowed grass} \)

To assist designers in the preliminary design of a filter strip, a sample calculation sheet has been developed and is presented as Table 10. The calculation sheet covers the above considerations and equations in 4 steps.

**Step 1 – Calculate the Maximum Discharge Loading**
This step is based on guidance provided in Subsection 5.2.2.a and Equation 5.1 presented in Subsection 5.2.2.c above.

**Step 2 – Check Velocity**
This step is based on Equation 5.2 and guidance provided in Subsection 5.2.2.d.

**Step 3 – Calculate the Minimum Allowable Filter Strip Width**
This step is based on Equation 5.3 and guidance provided in Subsection 5.2.2.e above.

**Step 4 – Calculate the Minimum Allowable Filter Strip Length**
This step is based on Equation 5.4 and guidance provided in Subsection 5.2.2.f above.

Once the site evaluation and preliminary design have been completed the final design can be conducted.

**5.3.3 Final Design – Filter Strips**

To develop a final filter strip design based on the results of the preliminary design, there are several basic factors that must be addressed. Addressing these factors requires some basic understanding of engineering and hydraulic principles. At a minimum, each of the factors discussed in the subsections below should be considered during final design.
### Table 8 – Filter Strip Preliminary Design

<table>
<thead>
<tr>
<th>Step 1: Calculate the Maximum Discharge Loading, ( q )</th>
<th>Evaluated by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Allowable Depth of flow, ( Y ) (in)</td>
<td>Maximum is 0.5 inches</td>
</tr>
<tr>
<td>Slope of Filter Strip, ( S ) (ft/ft)</td>
<td>Between 0.01 and 0.06</td>
</tr>
<tr>
<td>Manning’s “n”</td>
<td></td>
</tr>
</tbody>
</table>

\[
q = (1.49/n) \cdot (Y/12)^{0.5} \cdot S \cdot (0.7)^{0.8} \quad \text{(ft}^3/\text{sec} \cdot \text{ft})
\]

- Using Equation 5.1

<table>
<thead>
<tr>
<th>Step 2: Check Velocity, ( V )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( q ) (from Step 1) (ft(^3)/sec)</td>
<td>Maximum Allowable is 0.9 ft/sec</td>
</tr>
<tr>
<td>( Y ) (from Step 1) (in)</td>
<td></td>
</tr>
</tbody>
</table>

\[
V = q \cdot (Y/12) \quad \text{(ft/sec)}
\]

- Using Equation 5.2

<table>
<thead>
<tr>
<th>Step 3: Calculate the Minimum Allowable Filter Strip Width, ( W_p )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>( q ) (from Step 1) (ft(^3)/sec)</td>
<td></td>
</tr>
<tr>
<td>Contributing Area, ( A_c ) (acres)</td>
<td></td>
</tr>
<tr>
<td>Runoff Coefficient, ( C )</td>
<td>Per Ch. 106</td>
</tr>
</tbody>
</table>

\[
W_p = (A_c \cdot C \cdot 0.5)/q \quad \text{(ft)}
\]

- Using Equation 5.3

<table>
<thead>
<tr>
<th>Step 4: Calculate the Minimum Allowable Filter Strip Length, ( L_f )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Time Through Filter Strip, ( T ) (mm)</td>
<td>Between 5 and 9</td>
</tr>
<tr>
<td>Calibration Precipitation, ( P )</td>
<td></td>
</tr>
<tr>
<td>( S ) (from Step 1) (in)</td>
<td>1.3 inches</td>
</tr>
<tr>
<td>( \alpha ) (from Step 1) (ft/ft)</td>
<td></td>
</tr>
</tbody>
</table>

\[
L_f = \left[ C_1 \cdot 10^{-4} \cdot e^{0.625} \cdot 2.5 \cdot 100 \right]^{0.34} \cdot \alpha \quad \text{(ft)}
\]

- Using Equation 5.4

#### 5.3.3.1 Overall Site Integration

Site designs should incorporate filter strips as elements in the overall site plan. Filter strips can outfall to a variety of features, such as natural buffer areas, vegetated swales, curb and gutter systems, or natural drainage features.

#### 5.3.3.2 Filter Strip Cover

Filter strip cover may consist of existing vegetation, hearty native vegetation, planted turf grasses, or a mixture of grasses and shrub vegetation. Optimal vegetation arrangements incorporate plants with dense growth patterns, fibrous root systems for stability, and adaptability to local soil and climatic conditions. Filter strips can also incorporate vegetation including sedges and flowers.
5.3.3.3 Level Spreading Devices

Level spreading devices installed upstream of filter strips produce uniform sheet flow conditions along the entire leading edge of the filter strip, and help prevent concentration of flows that create erosive conditions. Level spreaders have a number of different configurations with one common function — to spread concentrated flow into sheet flow upstream of filter strips. The following examples describe common features and applications of two types of level spreading devices.

Level Spreading Trench

This device consists of a gravel-filled trench installed along the entire leading edge of a filter strip. Gravel can range in size from pea gravel, as specified by ASTM D 448, to shoulder ballast for roadways. Level spreading trenches typically have widths of 12 inches and depths of 24 to 36 inches, and they typically use nonwoven geotextile linings. A 1-inch to 2-inch drop between the adjacent impervious surface and the edge of the trench inhibits the formation of an initial deposition barrier. In addition to acting as a level spreader, these trenches also act as pretreatment devices, allowing sediment to settle out before reaching the filter strip.

Natural Berms

Shaping and grading of the area immediately upslope of a filter strip into a berm can also promote uniform sheet flow conditions. This method has a more natural appearance, though the berms can fail more readily than other devices due to irregularities in berm elevation and density of vegetation that may grow over time.

5.4 Filter Strip Construction and Maintenance

5.4.1 Construction Considerations – Filter Strips

The following subsections summarize the minimum considerations to be made during construction to enhance the effectiveness and function of filter strips. These construction considerations are not all necessarily applicable when using existing undisturbed areas as filter strips.

5.4.1.1 Filter Strip Installation

Before beginning construction, install temporary erosion and sediment control measures and ensure that upgradient sites have stabilized slopes. Install the filter strips during a time of year when successful establishment of vegetation can occur with little or no irrigation, and use temporary irrigation during dry periods. Clear and grub the site as necessary for filter strips that incorporate planted rather than native vegetation. During installation, disturb as little existing vegetation as possible and avoid soil compaction.
5.4.1.2 Grading and Level Spreader Installation

Accurate grading must occur during the construction of filter strips, because even small departures from design slopes can affect sheet flow conditions and decrease filter strip effectiveness. Use the lightest, least disruptive equipment when rough grading slopes to avoid excessive compaction and land disturbance. Following the rough grading, install level spreading devices at the upgradient edges of filter strips. If using a gravel trench, do not compact the subgrade and follow the construction sequence for infiltration trenches.

5.4.1.3 Vegetation Establishment

Seeding should be performed immediately after grading. Simultaneously stabilize seeded filter strips with temporary techniques such as erosion control matting or blankets. Maintain erosion control for seeded filter strips for at least 75 days following the first storm event of the season.

5.4.2 Maintenance Considerations – Filter Strips

The application of regular maintenance procedures enables filter strips to function properly over long periods of time. The following subsections outline suggestions for consideration when developing a maintenance plan and schedule as required by this policy.

5.4.2.1 Soil

In areas where heavy metals deposition is likely, it is recommended that soils should be removed and replaced once every 20 years. Replacing soil in filter strips is likely to provide a prolonged service life. When replacing soil in filter strips, refer to recommendations for engineered soils in bioretention cells provided in Appendix C of this manual.

5.4.2.2 Watering and Weeding

Periodic watering is required in the first year to help grass become established. Watering may also be required during prolonged dry periods. Weeding should be performed as necessary to maintain a healthy grassed top layer.

5.4.2.3 Routine Post–Storm Inspection

Filter strips should be inspected after large rain events and should be inspected for evidence of erosion, which is not likely in properly designed systems. Any visible trash accumulated on the filter strips should be removed.

5.4.2.4 Vegetation Maintenance

Basic maintenance of filter strips involves normal landscaping maintenance activities such as mowing, trimming, removal of invasive species, and replanting when necessary. Filter strips receiving large amounts of sediment may require
periodic regrading and reseeding of their upslope edges. If a high volume of sediment builds up, creating concentrated flows and channels, filter strips may require reworking or replanting. Grass should be maintained at a length of 3 to 8 inches. Allowing grass to grow taller can cause thinning, which compromises the effectiveness of the vegetative cover. The removal of clippings and regular maintenance promotes vegetation growth and pollutant uptake.

5.4.3 Filter Strip Conceptual Design Example

A conceptual design example for a filter strip is provided in Appendix E of this manual.
6 Glossary of Selected Terms

Freeboard – The vertical distance between the level water surface and the lowest point along the top of a structure, such as a berm, that impounds or restrains the water.

Zone of Influence – The zone of influence refers to the area of the surrounding subgrade that is critical to proper function and support of the overlying and/or adjacent foundation or road subgrade. Generally, the zone of influence can be defined as the area bounded within a 3-dimensional surface extending at a 1:1 slope down and away from the outer edge of a foundation or road subgrade.

Catchment Area – In this document, catchment area refers to the total area contributing storm water runoff to a particular LID element.

Cleanout – A cleanout is an access point in a buried storm drain conveyance to allow periodic removal of any collected sediment or debris.

Keyed In – The phrase “keyed in” refers to the condition in which the top edge of a geotextile (impervious or pervious) is folded into the surrounding soil to keep the material from slipping downward over time.

Foot Plate – A foot plate is a plate that can be round or rectangular, and is fixed to the bottom of an observation well. The intent of the foot plate is to provide a foundation for the observation well and prevent any vertical movement. Generally, foot plates should be either plastic or metal with the shortest dimension being twice the length of the diameter of the observation well.

Hydrologic Soil Group D – Soils with a very low rate of water transmission (less than 0.06 in/hr) (NRCS, 2007).

Runoff Coefficient – Rational Method Runoff Coefficient calculated according to guidance contained in Chapter 106.

Subdrain – A system of underground perforated pipes which are used to collect water that has infiltrated through the soil in a bioretention cell and transmit it to an underground conveyance.

Underground Conveyance – This term refers to a system of underground storm drain pipes which convey storm water, such as pipes within the existing municipal separate storm sewer system.
Annotated Bibliography and Additional References


Additional References


Appendix A
Equations
Equation 2.1: Target Treatment Volumes for Bioretention cells

\[ TIV = \frac{A + P + C}{12} \]  \hspace{1cm} \text{Equation 2.1}\\

\( TIV \) = Target Infiltration Volume (feet\(^3\))
\( A \) = Contributing Area (feet\(^2\))
\( P \) = Target Precipitation (inches)
\( C \) = Runoff Coefficient per Chapter 106

Equation 2.2: Bioretention cell Footprint

\[ A_r = \left( \frac{12 \times TIV}{P_d} \right) + \left( 0.26 \times I_e^{-0.53} \right) \]  \hspace{1cm} \text{Equation 2.2}\\

\( A_r \) = Bioretention cell Footprint (feet\(^2\))
\( TIV \) = Target Infiltration Volume (feet\(^3\))
\( P_d \) = Depth of Ponded Water (inches)
\( I_e \) = Infiltration Rate of Engineered Soils (inches/hour)

Equation 2.3: Total Depth for Bioretention cells

\[ D_{rs} = \frac{P_d + F_d}{12} + E_d + S_d + 0.005 \times L_r \]  \hspace{1cm} \text{Equation 2.3}\\

\( D_{rs} \) = Total Depth of Bioretention cell with Subdrain (feet)
\( P_d \) = Depth of Ponded Water (inches)
\( F_d \) = Freeboard (inches)
\( E_d \) = Depth of the Engineered Soils (feet)
\( S_d \) = Depth Required for Subdrain Diameter and Drain Rock (feet)
\( L_r \) = Approximate Length of Bioretention cell Along the Axis of the Subdrain (feet)
Equation 3.1: Trench Depth

\[ D_t = \frac{I \cdot t}{n_s \cdot 12} + 1 \]

\( D_t \) = Trench Depth (feet)
\( I \) = Design Infiltration Rate (inches/hour)
\( t \) = Retention Time (hours)
\( n_s \) = Storage Media Void Ratio

Equation 3.2: Trench Footprint

\[ A_t = \frac{TIV \cdot 0.66}{n_s \cdot (D_t - 1)} \]

\( A_t \) = Trench Footprint (feet²)
\( TIV \) = Target Infiltration Volume (feet³)
\( n_s \) = Storage Media Void Ratio
\( D_t \) = Trench Depth (feet)

Equation 5.1: Filter Strip Maximum Discharge Loading

\[ q = \frac{1.49}{n} \cdot \left( \frac{Y}{12} \right)^{\frac{5}{3}} \cdot S^\frac{1}{2} \]

\( q \) = Volumetric Discharge per Foot Width (feet³/second-foot)
\( Y \) = Allowable Depth of Flow (inches)
\( S \) = Slope of Filter Strip (feet/foot)
\( n \) = Manning’s “n” Roughness Coefficient

Equation 5.2: Maximum Allowable Design Velocity

\[ V = \frac{q}{\sqrt[3]{12}} \]

\( V \) = Velocity (feet/second)
\( q \) = Volumetric Discharge per Foot Width (feet³/second-foot)
\( Y \) = Maximum Allowable Depth of Flow (inches)
Equation 5.3: Minimum Allowable Filter Strip Width

\[ W_{fp} = \frac{A_s \times C 	imes 0.5}{q} \]

\( W_{fp} \) = Width of Filter Strip Perpendicular to Flow Path (feet)
\( A_s \) = Area (acres)
\( C \) = Runoff Coefficient per Chapter 106
\( q \) = Volumetric Discharge per Foot Width (feet\(^3\)/second-foot)

Equation 5.4: Filter Strip Length

\[ L_f = \frac{T_1^{1.25} \times P^{0.625} \times (S+100)^{0.5}}{3.34+n} \]

\( L_f \) = Length of Filter Strip Parallel to Flow Path (feet)
\( T_1 \) = Travel Time through Filter Strip (minutes)
\( P \) = Target Precipitation (inches)
\( S \) = Slope of Filter Strip (feet/ft)
\( n \) = Manning’s “n” Roughness Coefficient

Equation D.1: Weir Equation for Flow into Standpipe or Riser

\[ Q = N_s \times G \times C_w \times P_s \times H^{3/2} \]

\( Q \) = Flow Rate, (feet\(^3\)/second)
\( N_s \) = Number of Outfall Structures
\( G \) = Grate Reduction Factor
\( C_w \) = Weir Coefficient
\( P_s \) = Perimeter of the Stand Pipe (feet)
\( H \) = Head (feet)

For the design of LID elements in this manual, the weir coefficient can be assumed as 3.3. Grate reduction factors are available from various grate manufacturers. For preliminary planning purposes, a value of 0.5 may be used.
Appendix B
Additional Specifications for Bioretention Cells
Table B.1 – Vegetation Suitable for Bioretention cells in Springdale

Native perennial flowers, grasses, and shrubs that prefer or tolerate moist soils should thrive in a rain garden or bioswale. They'll also entice butterflies, hummingbirds, and other nectar and berry feeders to visit. These local plants tend to be well-adapted to a range of regional temperature and moisture conditions and will flourish without chemical fertilizers and pesticides.

**Perrenials and Herbaceous Plants**

- Amsonia, *Amsonia sp.*
- Bushy Aster, *Aster dumosus*
- Heath Aster, *Aster ericoides*
- New England Aster, *Aster novae-anglia*
- Beardtongue, *Penstemon digitalis 'Huskers Red'*
- Black-eyed Susan, *Rudbeckia fulgida 'Goldstrum'*
- Blazing Star, *Liatris spicata 'Kobold'*
- Narrowleaf Blue Star, *Amsonia hubrichtii*
- Cardinal Flower, *Lobelia pectiose*
- Carolina Lovegrass, *Eragrostis pectinacea*
- Catmint, *Nepeta cataria 'Walker's Low'*
- Wild Columbine, *Aquilegia canadensis*
- Christmas Fern, *Polystichum acrostichoides*
- Northern Maidenhair Fern, *Adiantum Pedatum*
- Sensitive Fern, *Onoclea sensibilis*
- Rough Goldenrod, *Solidago rugosa*
- Hypericum, *Hypericum prolificum*
- Hyssop, *Agastache rupestris*
- Blue Flag Iris, *Iris versicolor*
- Jack-in-the-pulpit, *Arisaema triphyllum*
- Sweet Joe-Pye Weed, *Eupatorium Purpureum*
- Milkweed, *Asclepias*
- Torrey's Mountain Mint, *Pycnanthemum Virginianum*
- Obedient Plant, *Physostegia virginiana*
- Ornamental Grass, *Miscanthus sinensis 'Adagio' and 'Little Kittens'*
- Ponytail Grass, *Stipa tenacissima*
- Striped Rush, *Baumea rebiginos 'Variegata'*
- Russian Sage, *Perovskia atriplicifolia*
- Golden Tickseed, *Coreopsis tinctoria*

**Shrubs and Vines**

- American Arborvitae, *Thuja occidentalis*
- Rosebud Azalea, *Rhododendron periclymenoides*
- Northern Bayberry, *Myrica pensylvanica*
- Highbush Blueberry, *Vaccinium corymbosum*
Late Lowbush Blueberry, *Vaccinium angustifolium*
Butterfly Bush, *Buddleia davidii*
Red Chokeberry, *Aronia arbutifolia*
Black Chokeberry, *Aronia melanocarpa*
Red Twig Dogwood, *Cornus sericea*
Elderberry, *Sambucus Canadensis*
American Holly, *Ilex opaca*
Winterberry Holly, *Ilex verticillata*
Trumpet Honeysuckle, *Lonicera sempervirens*
Black Huckleberry, *Gaylussacia baccata*
Inkberry, *Ilex glabra*
Mountain Laurel, *Kalmia latifolia*
Nannyberry, *Viburnum lentago*
Sweet Pepperbush, *Clethra alnifolia*
Northern spicebush, *Lindera benzoin*
Bluebeard Spirea, *Caryopteris x Clandonensis*
Shining Sumac, *Rhus copallinum*
Virginia Creeper, *Parthenocissus quinquefolia*
Prairie Willow, *Salix humilis*

**Trees**

Green Ash, *Fraxinus pennsylvanica*
White Ash, *Fraxinus Americana*
Gray Birch, *Betula populifolia*
River Birch, *Betula nigra*
Blackgum, *Nyssa sylvatica*
Red Cedar, *Juniperus virginiana*
Red-Paniced Dogwood, *Cornus racemose*
Elm, *Ulmus glabra 'Camperdownii'*
American Hop Hornbeam, *Ostrya virginiana*
Sweet Bay Magnolia, *Magnolia virginiana*
Red Maple, *Acer rubrum*
Pawpaw, *Asimina spp.*
Pin Oak, *Quercus palustris*
Red Oak, *Quercus rubra*
Redbud, *Cercis canadensis 'Oklahoma'*
Sassafras, *Sassafras albidum*
Serviceberry, *Amelanchier arborea*
American Sweetgum, *Liquidambar styraciflua*
Tupelo, *Nyssa sylvatica*
Witch Hazel, *Hamamelis virginiana*
Swamp White Oak, *Quercus bicolor*
Dwarf Yaupon Holly, *Ilex vomitoria 'Nana'*
Additional Guidance for the Specification of Engineered Soils for Bioretention cells

The following bulleted list is intended to assist designers in specifying an engineered soil mix for use in a bioretention cell. Soil specifications may vary slightly depending on site characteristics and related design considerations.

- The final soil mix (including compost and soil) should have a long-term hydraulic conductivity of approximately 1.0 inch/hour according to ASTM Designation D 2434 (Standard Test Method for Permeability of Granular Soils) at 80% compaction per ASTM Designation D 1557 (Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort). Note that infiltration rate and hydraulic conductivity are assumed to be approximately the same in a uniform mix soil.

- The final soil mixture should have a minimum organic content of 10% by dry weight per ASTM Designation D 2974 (Standard Test Method for Moisture, Ash and Organic Matter of Peat and Other Organic Soils).

- The final soil mixture should be tested by an independent laboratory prior to installation for fertility, micronutrient analysis, and organic material content. Soil amendments per laboratory recommendations (if any) should be uniformly incorporated for optimum plant establishment and early growth.

- The clay content of the final soil mix should be less than 5%.

- The pH for the soil mix should be between 5.5 and 7.0. If the pH falls outside of the acceptable range, it may be modified with lime to increase the pH or iron sulfate plus sulfur to lower the pH. The lime or iron sulfate must be mixed uniformly into the soil prior to use in the bioretention cell.

- Soil mix should be uniform and free of stones, stumps, roots, or other similar material greater than 2 inches in diameter.

Unless laboratory analysis indicates otherwise, engineered soils are to be assigned a design infiltration rate of 1.0 inches/hour during design efforts. This value is consistent with a moderately high saturated hydraulic conductivity.
Appendix C
Bioretention Cell Design Example
C. Design Example – Bioretention cell

This section presents the design process for a bioretention cell to treat runoff from the parking area of the site described below.

Site Description – A 1.8-acre lot in midtown Anchorage is to be redeveloped. The existing lot contains an old warehouse and a large parking area. The redeveloped lot will include a three-story office building, a landscaped garden, and a parking area. The new parking lot will contain approximately 0.75 acres of paved surface. Bioretention cells have been identified as a good alternative for treating runoff from the parking area, since a bioretention cell can be designed to serve as the required site landscaping as well. The preliminary site design has included an area within the center of the parking facility to place the bioretention cell.

In the following subsections a preliminary site evaluation and a preliminary design are presented for the design of a bioretention cell for this site. Following these sections, a final design is discussed and a conceptual drawing of the final design is presented.

C.1 Example Preliminary Site Evaluation – Bioretention cell

To conduct the preliminary site evaluation, the preliminary site evaluation checklist (Table 2) provided in Section 2 has been used. To fill out the preliminary site evaluation checklist, the following reference materials were required:

- The draft preliminary site plans,
- Springdale stormwater network maps
- Local topographic maps, and
- The site geotechnical report.

Prior to conducting the preliminary site evaluation, it was noted that due to the close proximity of the bioretention cell to the parking lot subgrade, the use of a 30-mil polyethylene liner is required. This information was incorporated into the preliminary site evaluation.

The completed preliminary site evaluation checklist is presented as Table C.1. The information presented in Table C.1 indicates that the site is likely suitable for the use of a bioretention cell to treat parking lot runoff. However, review of the geotechnical report indicates that the groundwater table is located at a depth of 9 feet below grade. Based on the site evaluation, it was not certain that it would be possible to maintain the minimum separation distance between the bottom of the lined bioretention cell and the groundwater table (2 feet for lined bioretention cells). The groundwater table would limit the total depth of the bioretention cell to no more than 7 feet. This has been noted and is to be addressed during the preliminary design.
<table>
<thead>
<tr>
<th><strong>Table C.1 – Bioretention cell – Preliminary Site Evaluation Checklist</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site Location:</strong> 112 W 100th Street</td>
</tr>
<tr>
<td><strong>Date:</strong> 8/24/2013</td>
</tr>
<tr>
<td><strong>Considerations</strong></td>
</tr>
<tr>
<td><strong>Soil Infiltration</strong></td>
</tr>
<tr>
<td><strong>Proximity to Surface Waters</strong></td>
</tr>
<tr>
<td><strong>Depth to Seasonal High Groundwater Level</strong></td>
</tr>
<tr>
<td><strong>Depth To Bedrock</strong></td>
</tr>
<tr>
<td><strong>Proximity to Building Foundations</strong></td>
</tr>
<tr>
<td><strong>Proximity to Road Subgrades</strong></td>
</tr>
<tr>
<td><strong>Runoff Source</strong></td>
</tr>
<tr>
<td><strong>Contributing Area</strong></td>
</tr>
<tr>
<td><strong>Available Area Slope</strong></td>
</tr>
<tr>
<td><strong>Available Area</strong></td>
</tr>
<tr>
<td><strong>Down Gradient Slope</strong></td>
</tr>
</tbody>
</table>
C.2 Example Preliminary Design – Bioretention cell

During the preliminary design process the minimum design considerations presented in Subsection 2.1.2 must be addressed. In order to conduct the preliminary bioretention cell design, the preliminary design calculation table (Table 3) presented in Section 2 has been used. The completed preliminary design calculations are presented in Table C.2.

In Step 1 of the preliminary design calculations, the runoff coefficient has been obtained from Chapter 106. The slope of the parking lot is less than 2% resulting in a runoff coefficient of 0.85. The calculation in Step 1 indicates that the bioretention cell will need to accommodate a volume of approximately 2,546 feet$^3$ of runoff.

In Step 2 of the preliminary design calculations the maximum ponding depth is selected to limit the amount of required area for the bioretention cell. Also the minimum horizontal to vertical side slope is used to minimize the area required for the bioretention cell. The resulting area required to contain the bioretention cell is 993 feet$^2$. It was determined by the design team that a square garden placed in the center of the parking lot would be preferable. Thus, in Step 2 the dimensions of the bioretention cell were calculated to be approximately 32 feet by 32 feet.

In Step 3, use Equation 2.3 to estimate the depth of the bioretention cell. The minimum ponded depth and minimum soil depth were both assumed to limit the total depth of the bioretention cell. The depth required for the subdrain was assumed to be 1.75 feet. This accounts for a 3-inch layer of drain rock under the subdrain, an 8-inch diameter subdrain, a 6-inch layer of drain rock above the subdrain, and a 4-inch layer of pea gravel above the drain rock. The resulting estimated total depth of the bioretention cell is 5.2 feet.
Table C.2 – Bioretention cell Preliminary Design

<table>
<thead>
<tr>
<th>Site Location:  112 W 10th Street</th>
<th>Evaluated by: Don Sheldon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: 6/24/2012</td>
<td></td>
</tr>
</tbody>
</table>

### Step 1: Calculate the Target infiltration Volume, TV

<table>
<thead>
<tr>
<th>Contribution Area, A</th>
<th>31620 (ft²)</th>
<th>Approximate Parking Lot Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target infiltration Rainfall, P</td>
<td>1.1 (in)</td>
<td>Set Value</td>
</tr>
<tr>
<td>Runoff Coefficient, C</td>
<td>0.85</td>
<td>Per Ch. 106</td>
</tr>
</tbody>
</table>

\[
TIV = A \times P \times C/12 = 2546 \text{ (ft}^3\text{)} \quad \text{Using Equation 2.1}
\]

### Step 2: Calculate the Required Bioretention cell Footprint Area

<table>
<thead>
<tr>
<th>TIV (from Step 1)</th>
<th>2546 (ft³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of Ponded Water, Pd</td>
<td>8.0 (in)</td>
</tr>
<tr>
<td>Design Infiltration Rate, I (or I, see Subsection 2.1.2.c)</td>
<td>1.0 (in/hr)</td>
</tr>
</tbody>
</table>

\[
A_v = \left(\frac{TIV \times 12}{P_d \times (0.26 + I)}\right)^{1/3} = 993 \text{ (ft}^2\text{)} \quad \text{Using Equation 2.2}
\]

<table>
<thead>
<tr>
<th>Approximate Width, W</th>
<th>32 (ft)</th>
<th>Assume a Square Garden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Length, L</td>
<td>32 (ft)</td>
<td></td>
</tr>
</tbody>
</table>

### Step 3: Approximate Bioretention cell Depth

<table>
<thead>
<tr>
<th>P (From Step 2)</th>
<th>8.0 (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeboard Depth, F_d</td>
<td>2 (in)</td>
</tr>
<tr>
<td>Depth of Engineered Soils, E_s</td>
<td>2.5 (ft)</td>
</tr>
<tr>
<td>Minimum Subdrain Depth, S_d</td>
<td>1.75 (ft)</td>
</tr>
<tr>
<td>L (From Step 3)</td>
<td>32 (ft)</td>
</tr>
</tbody>
</table>

\[
D_u = (P \times F_d)/12 + E_s + S_d(0.005 \times L) = 5.2 \text{ (ft) \quad Using Equation 2.3}
\]

Note: *See Appendix C for guidance on selecting a value for I.*
The results of the preliminary site evaluation and the preliminary design indicate that the site is a suitable candidate for the use of a bioretention cell to treat storm water runoff from the parking lot. Thus, final design efforts are warranted.

C.3 Example Final Design – Bioretention cell

To develop the final design based on the dimensions calculated in the preliminary design, the minimum factors presented in Subsection 2.1.3 were addressed. In real world applications, the final design of a bioretention cell is likely to include slight adjustments in geometry and will likely include site related engineering considerations specific to the particular project. For the sake of this example, the dimensions calculated in the preliminary design have been directly applied to the final design.

**Engineered Soils** – The specifications for the engineered soils are based on the requirements presented in Subsection 2.1.3.a, the guidance provided in Appendix C, and the geotechnical investigation for the site. The geotechnical investigation for the site indicates that the native soils are primarily loamy sand. Thus, approximately 60% of the excavated native soil will be set aside and mixed with compost to provide engineered soil for the bioretention cell.

**Bioretention cell Plants** – The specification for the bioretention cell plants is based on the guidance provided in Subsection 2.1.3.b and the listing of suggested bioretention cell plants provided in Appendix C. The interior of the garden is to be planted with Red Twig Dogwood and Willow. The interior of the garden will also be planted with Native Sedge grass.

**Subdrain System** – The subdrain system has been designed according to the guidance provided in Subsection 2.1.3.c. The subdrain system includes a branched network of 8-inch slotted PVC pipes. The PVC drainpipe sits atop a 3-foot wide bed of drain rock that is 3 inches thick. The drainpipe is overlaid with drain rock to a depth of 6 inches above the pipe. The drain rock is covered with 4 inches of pea gravel to reduce the likelihood of clogging. Note that backflow preventers have been included to keep the bioretention cell subsoil from becoming saturated when the storm drains become surcharged.

**Bioretention cell Liner** – The bioretention cell is lined with 30-mil polyethylene plastic with welded joints. The liner is keyed into the sides of the bioretention cell to prevent it from slipping downward over the course of time.

**Overflow Structure** – The overflow structure selected for the bioretention cell consists of two standpipes located along the center axis of the bioretention cell. The standpipes are connected to an underground storm drain that has been sized for the 100-year, 24-hour storm according to the Rational Method and guidance in Chapter 106. In this case, a 100-year peak flow rate of 0.7 feet³/second was estimated based on a time of concentration of 15 minutes, an intensity of 1.1 inches per hour, and a weighted C value of 0.85 inch. The standpipes were initially sized to meet the diameter of the underground conveyance system for the
sake of convenience. The standpipe sizes were then checked for the maximum overtopping depth of 2 inches using the following inlet weir equation below.

\[ Q = N_S \times G \times C_w \times P_S \times H^{3/2} \]  

\textit{Equation C.1}

\begin{itemize}
\item $Q$ = Flow Rate, (feet$^3$/second)
\item $N_S$ = Number of Structures, 2
\item $G$ = Grate Reduction Factor, 0.5
\item $C_w$ = Weir Coefficient, 3.3
\item $P_S$ = Perimeter of the Stand Pipe (feet), 7.85
\item $H$ = Head (feet), 0.167
\end{itemize}

Thus, when the ponded depth of the bioretention cell is 2 inches above the top of the standpipes, the standpipes will be conveying 1.8 feet$^3$/second of runoff. This exceeds the peak runoff from the 100-year 24-hour storm. The 30-inch diameter standpipes are adequately sized for flood control according to Chapter 106.

A conceptual drawing of the bioretention cell resulting from this design effort is presented in Figure C.1.

This bioretention cell will significantly reduce the runoff peak that exits the site during large rain events. It also provides treatment for the full TIV.
Figure C.1 – Bioretention cell Design Example
Page 1
Figure C.1 – Bioretention cell Design Example
Appendix D
Infiltration Trench Design Example
D  Design Example – Infiltration Trench

This section presents the design process for an infiltration trench to infiltrate parking lot runoff from a portion of the site described below.

Site Description: An 8-acre tract of relatively flat land is to be developed into an apartment complex. The complex will include four separate three-story apartment buildings each containing 12 two-bedroom apartments. The development will include a 32 space parking lot for each building as well as open green space to be used for landscaping and recreation. The developer would like to incorporate LID elements to infiltrate runoff from the base 2-year, 24-hour storm event. Infiltration trenches have been identified as a potential option to infiltrate runoff from the parking areas. Each parking lot is approximately 65 feet by 140 feet. The available space for an infiltration trench at each parking lot is approximately 40 by 65 feet.

In the following subsections, a preliminary site evaluation and a preliminary design are presented for an infiltration trench for a single parking lot. Following these sections, a final design is discussed and a conceptual drawing of the final design is presented.

D.1  Example Site Evaluation – Infiltration Trench

In order to conduct the preliminary site evaluation, the preliminary site evaluation checklist (Table 4) provided in Section 3 has been used. To fill out the preliminary site evaluation checklist, the following reference materials were required:

- The draft preliminary site plans,
- Water and Wastewater Utility Maps,
- Local topographic maps, and
- The site geotechnical report.

The completed preliminary site evaluation checklist is presented as Table D.1. The information presented in Table D.1 indicates that the site is likely suitable for the use of an infiltration trench to treat parking lot runoff. However, review of the preliminary site plan indicates that the infiltration trenches will be limited to a length of no more than 65 feet due to the parking lot layout. The preliminary site evaluation also indicates that groundwater is at a depth of 8 feet, thus limiting the allowable depth of an infiltration trench to no more than 4 feet.

Other than these considerations, the site is a good candidate for the use of an infiltration trench to treat runoff from the parking lot. The limitations in the possible trench dimensions have been noted and are addressed during the preliminary design.
### Table D.1 – Infiltration Trench – Preliminary Site Evaluation Checklist

<table>
<thead>
<tr>
<th>Site Location:</th>
<th>Evaluated by: Leonhard Seppala</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Date: 8/24/2010</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Requirement/Recommendation</th>
<th>Site Conditions/Notes</th>
<th>Pass/Fail</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Infiltration Rate</td>
<td>Measured soil infiltration rate must be between 0.3 and 8 in/hr.</td>
<td>The lowest soil percolation rate in the area being considered for the trench is 0.3 in/hr.</td>
<td>Pass</td>
<td>Geotechnical Report</td>
</tr>
<tr>
<td>Proximity to Surface Waters</td>
<td>Trench should be located at least 190 feet from surface waters.</td>
<td>There are no open surface waters within 200 feet of the site.</td>
<td>Pass</td>
<td>Topo Map</td>
</tr>
<tr>
<td>Depth to Seasonal High Groundwater Level</td>
<td>Groundwater must be 4 feet or more below the bottom of the trench.</td>
<td>Groundwater is 8 feet below the surface. Need to know how deep trench will be.</td>
<td>Investigate Further</td>
<td>Geotechnical Report</td>
</tr>
<tr>
<td>Depth To Bedrock</td>
<td>Bedrock must be 3 feet or more below the bottom of the trench.</td>
<td>Bedrock is at a depth of 10 ft. Need to know how deep the trench will be.</td>
<td>Investigate Further</td>
<td>Geotechnical Report</td>
</tr>
<tr>
<td>Proximity to Building Foundations</td>
<td>Trench must be located outside of the zone of influence or at least 20 feet from building foundations</td>
<td>Trenches will be located more than 20 feet from building foundations</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Proximity to Road Subgrades</td>
<td>Trench must be located at least 20 feet from road subgrades.</td>
<td>It is anticipated that there will be adequate room to place the trenches a minimum of 20 feet from road subgrades.</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Runoff Source</td>
<td>Infiltration trench is not to receive runoff containing industrial pollutants.</td>
<td>Parking Area</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Contributing Area</td>
<td>The contributing area must be less than 3 acres.</td>
<td>The approximate contributing area is 0.2 acres.</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Available Area Slope</td>
<td>Available area slope must be less than or equal to 5%.</td>
<td>The average slope of the contributing area is 0.5%.</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Available Area</td>
<td>The area available for treatment must be at least 20% of the total catchment area.</td>
<td>Approximately 40% of the total site area will consist of open space for lawns and landscaping.</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Down Gradient Slope</td>
<td>Down gradient slope must be less than 12%.</td>
<td>The adjacent properties are also gently sloping.</td>
<td>Pass</td>
<td>Site Visit/Topo Map</td>
</tr>
</tbody>
</table>
D.2 Example Preliminary Design – Infiltration Trench

In order to conduct the preliminary infiltration trench design, the table (Table 5) presented in Section 3 has been used. The completed preliminary design calculations are presented in Table E.2.

In Step 1 of the preliminary design calculations, the runoff coefficient, 0.85, has been obtained from Chapter 106. The calculation in Step 1 indicates that the infiltration trench will need to accommodate a volume of approximately 709 feet$^3$ of runoff.

In Step 2, the typical void ratio was assumed. A retention time of 48 hours was assumed. The resulting trench depth is 4 feet. This depth will still accommodate the minimum separation distance between the bottom of the infiltration trench and the groundwater table.

In Step 3, the bottom area of the trench is calculated based on values collected and calculated in Steps 1 and 2. The required bottom area of the trench is 390 feet$^2$.

In Step 4, the length and width of the trench is established. The infiltration trench will receive sheet flow from the parking lot along the side that is 35 feet long. Thus, the length of the infiltration trench has been set in Step 4 to be 35 feet. The resulting required width of the infiltration trench (not counting the pretreatment area) is 11.1 feet.

In Step 5, the width required for an infiltration trench receiving runoff from a single side and from both sides is calculated. Note that the infiltration trench will only receive runoff from one side. The resulting width is 31.1 feet.

In Step 6, the length selected in Step 4 is recorded with the width calculated in Step 5 for infiltration trench receiving runoff from one side. These values represent the required area for the infiltration trench.

The results of the preliminary site evaluation and the preliminary design indicate that the site is a suitable candidate for the use of an infiltration trench to treat storm water runoff. Thus, final design efforts are warranted.
### Table D.2 – Infiltration Trench Preliminary Design

<table>
<thead>
<tr>
<th>Step 1: Calculate the Target Infiltration Volume, TIV</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributing Area, A</td>
<td>9100 (ft²)</td>
</tr>
<tr>
<td>Target Infiltration Rainfall, P</td>
<td>1.1 (in)</td>
</tr>
<tr>
<td>Runoff Coefficient, C</td>
<td>0.85</td>
</tr>
</tbody>
</table>

\[ TIV = A \cdot P \cdot C / 12 = 709 \text{ (ft}^3\text{)} \] Using Equation 2.1

<table>
<thead>
<tr>
<th>Step 2: Calculate the Depth of the Trench, D</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Void Ratio, n</td>
<td>0.4</td>
</tr>
<tr>
<td>Design Infiltration Rate, I</td>
<td>0.3 (in/hr)</td>
</tr>
<tr>
<td>Detention Time, t</td>
<td>48 (hr)</td>
</tr>
</tbody>
</table>

\[ D = \left( 1 + \frac{I \cdot t}{n \cdot D} - 1 \right) \]

\[ D = \left( 1 + rac{(0.3) \cdot 48}{0.4 \cdot 4} - 1 \right) = 4 \text{ (ft)} \] Using Equation 3.1

<table>
<thead>
<tr>
<th>Step 3: Calculate the Bottom Footprint of the Trench</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIV (from Step 1)</td>
</tr>
<tr>
<td>n1 (from Step 2)</td>
</tr>
<tr>
<td>D1 (from Step 2)</td>
</tr>
</tbody>
</table>

\[ A_{1} = \frac{TIV \cdot 0.66}{n1 \cdot (D1 - 1)} = 390 \text{ (ft}^2\text{)} \] Using Equation 3.2

<table>
<thead>
<tr>
<th>Step 4: Establish the Trench Length and Width</th>
<th>Minimum Recommended Ratio is 3L:1W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Trench Length, L</td>
<td>35.0 (ft)</td>
</tr>
</tbody>
</table>

\[ L = A_{1} / W_{1} \]

\[ L = 390 / 11.1 = 35.0 \text{ (ft)} \]

| Set Trench Width, W | 11.1 (ft) | Maximum Width is 25 feet |

<table>
<thead>
<tr>
<th>Then Calculate Either</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ W = A_{1} / L ]</td>
</tr>
<tr>
<td>[ L = A_{1} / W ]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record Final L and W, Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 = 35.0 (ft)</td>
</tr>
<tr>
<td>W1 = 11.1 (ft)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 5: Account for Pretreatment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Strip Width, Wf</td>
<td>20.0 (ft)</td>
</tr>
</tbody>
</table>

- If Receiving Flow From Both Sides
  - Total Width (Wf, 0), Wf = W1 + 2*Wf = (ft)
- Or, If Receiving Flow From One Side
  - Total Width (Wf, 1), Wf = W1 + Wf = 31.1 (ft) Receiving flow from a single side

<table>
<thead>
<tr>
<th>Step 6: Required Length and Width for Trench and Filter Strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1, (from Step 4) = 35.0 (ft)</td>
</tr>
<tr>
<td>Appropriate Total Width (from Step 5) = 31.1 (ft) Receiving flow from a single side</td>
</tr>
</tbody>
</table>
D.3 Example of Final Design – Infiltration Trench

In order to develop the final design based on the dimensions calculated in the preliminary design, the minimum factors presented in Subsection 3.1.4 were addressed. In real world applications, the final design of an infiltration trench is likely to include slight adjustments in geometry as well as site related engineering considerations specific to the particular project.

**Filter Fabric** – To reduce the likelihood of clogging and piping, a filter fabric has been specified with a flow rate to closely match the surrounding soils’ infiltration rate of 0.3 feet/sec. The fabric is placed between the storage media and the trench walls and overlaps by 1-foot long seams. It is placed as a barrier beneath the 6 inches of top material. Filter fabric is placed between the top layer and the storage media. The fabric will be keyed into the sides of the trench walls.

**Design of the Overflow Structure** – The overflow structure of choice for this particular example is the use of standpipes at the trench boundaries. These structures are connected to a storm drain trunk line that runs down the adjacent road. The standpipes were initially sized to meet the diameter of the underground conveyance system (12 inches) for the sake of convenience. The standpipe sizes were then checked for an overflowing depth of 3 inches as depths greater than 3 inches would result in stormwater spilling beyond the limits of the trench and overflow structures.

\[
Q = N_s \times G \times C_w \times P_s \times H^2
\]

*Equation D.1*

- \(Q\) = Flow Rate, \(\text{feet}^3/\text{second}\)
- \(N_s\) = Number of Structures, 2
- \(G\) = Grate Reduction Factor, 0.5
- \(C_w\) = Weir Coefficient, 3.3
- \(P_s\) = Perimeter of the Stand Pipe (feet), 3.14
- \(H\) = Head (feet), 0.25

When the ponded depth of the infiltration trench is 3 inches above the top of the standpipes, the standpipes will be conveying 1.3 feet³/second of runoff. This exceeds the peak runoff from the 100–year 24–hour storm according to a rational calculation. The 12–inch diameter standpipes are therefore adequately sized for flood control according to Chapter 106.

**Top Layer** – The material selected for this application is washed pea gravel. The pea gravel will be laid in a 6–inch layer on top of the filter fabric that overlies the storage media.

**Bottom Layer** – The bottom layer consists of washed filter sand.
**Grading** – The site grading plan has been completed so that the parking lot will sheet drain across the filter strip to the infiltration trench. The trench has been graded to be completely level along the top and bottom.

**Observation Well** – The infiltration trench includes two 6 inch observation wells that can be seen in Figure D.1.

A drawing of the infiltration trench is presented as Figure D.1. Note that in this design, the area required for the structure is slightly larger than the area estimated using the preliminary design calculations. This is due to the use of overflow inlets on either end of the infiltration trench and the 3:1 (horizontal: vertical) side slope.
Figure D.1 – Infiltration Trench Design Example

INfiltration Trench Conceptual Design

Section A-A

FIGURE D.1
Appendix E
Filter Strip Design Examples
E. Filter Strip Design Example

This section presents the design process for a filter strip to infiltrate parking lot runoff from a portion of the site described below.

Site Description: A small commercial strip development will include a parking area to accommodate 20 vehicles. The site presently drains towards a frontage street into a curb and gutter storm drain system. The area available for the parking lot is 200 feet long by 65 feet wide. A filter strip is proposed to treat runoff from the parking area prior to discharge to the curb and gutter system along the frontage street. Making the assumption that the filter strip will be approximately 25 feet long (dimension parallel to flow) the parking area will be approximately 200 feet by 40 feet.

In the following subsection, the preliminary site evaluation and a preliminary design are presented for a filter strip for the parking lot. Following these sections, a final design is discussed and a conceptual drawing of the final design is presented.

E.1 Example Preliminary Site Evaluation – Filter Strips

In order to conduct the preliminary site evaluation, the preliminary site evaluation checklist (Table B) provided in Section 5 has been used. To fill out the preliminary site evaluation checklist, the draft preliminary site plans were required.

The completed preliminary site evaluation checklist is presented as Table E.1. The information presented in Table E.1 indicates that the site is suitable for the use of a filter strip to treat parking lot runoff.
<table>
<thead>
<tr>
<th>Considerations</th>
<th>Requirement/Recommendation</th>
<th>Site Conditions / Notes</th>
<th>Pass/Fail</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runoff Source</td>
<td>Filter strip is not to receive runoff containing industrial pollutants.</td>
<td>Runoff is from a parking lot.</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Contributing Area</td>
<td>The contributing area must be less than 1 acre.</td>
<td>Contributing area is approximately 0.18 acres.</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Slope of the Contributing Area</td>
<td>Slope of the contributing area must be less than 10%.</td>
<td>The parking lot will have a slope much less than 10%</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
<tr>
<td>Available Area</td>
<td>The available area for the filter strip shall generally extend the full width of the contributing area and allow for a length (parallel to flow) of 15 to 25 feet. The ratio of total contributing area to the total available area must not exceed 6:1.</td>
<td>Site provides adequate space for a filter strip. The available area for the filter strip (200 feet by 25 feet) is more than 1/6th the size of the contributing parking lot (200 feet by 40 feet).</td>
<td>Pass</td>
<td>Draft Preliminary Site Plans</td>
</tr>
</tbody>
</table>
E.2 Example Preliminary Design – Filter Strips

In order to conduct the preliminary filter strip design, the preliminary design calculation table (Table 8) presented in Section 5 has been used. The completed preliminary design calculations are presented in Table E.2.

In Step 1, of the preliminary design calculations, the maximum allowable depth of flow is assumed, the design slope is set to 3%, and a Manning’s “n” of 0.25 is selected for dense grass. The calculation in Step 1 indicates that the filter strip will be able to accommodate 0.005 feet³/sec runoff for every linear foot of width (the dimension perpendicular to flow).

In Step 2, the velocity along the filter strip is checked by dividing the maximum discharge loading by the design depth. According to the calculations in Step 2, the design velocity is 0.12 feet/second, which is equal to the maximum allowable velocity.

In Step 3, the minimum allowable filter strip width is calculated. The rational coefficient in this computation is selected based on guidance provided in Chapter 106. The results of the computation in Step 3 indicate that the minimum allowable width for the filter strip is 15.3 feet. This is much less than the available width of 200 feet. Therefore, the preliminary design proceeds to Step 4.

In Step 4, the minimum allowable filter strip length (dimension parallel to flow) is calculated. In this step, a travel time of 5.5 minutes was selected. According to the computations in Step 3, the minimum allowable filter strip length is 21.0 feet. This is approximately equal to the assumed length of 25 feet. Thus, final design efforts are warranted.
Table E.2 – Filter Strip Preliminary Design

<table>
<thead>
<tr>
<th>Step 1: Calculate the Maximum Discharge Loading, q</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Allowable Depth of Flow, Y</td>
<td>0.5 (in) Maximum is 0.5 inches</td>
</tr>
<tr>
<td>Slope of Filter Strip, S</td>
<td>0.03  (ft/ft) Between 0.01 and 0.06</td>
</tr>
<tr>
<td>Manning's &quot;n&quot;</td>
<td>0.25</td>
</tr>
<tr>
<td>( q = (1.49n)^*\left(\frac{Y}{12}\right)^{0.38} \times S^{0.5} )</td>
<td>0.005  (ft³/sec-ft) Using Equation 5.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Check Velocity, V</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>q (from Step 1)</td>
<td>0.005  (ft³/sec-ft) Maximum Allowable is 0.9 ft/sec</td>
</tr>
<tr>
<td>Y (from Step 1)</td>
<td>0.5   (in)</td>
</tr>
<tr>
<td>( V = \frac{q}{y(1/12)} )</td>
<td>0.12  (ft/sec) Using Equation 5.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3: Calculate the Minimum Allowable Filter Strip Width, ( W_p )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>q (from Step 1)</td>
<td>0.005  (ft³/sec-ft)</td>
</tr>
<tr>
<td>Contributing Area, ( A_p )</td>
<td>0.18  (acres)</td>
</tr>
<tr>
<td>Runoff Coefficient, C</td>
<td>0.86</td>
</tr>
<tr>
<td>( W_p = (A_p \times C \times 0.5)/q )</td>
<td>9.5   (ft) Using Equation 5.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4: Calculate the Minimum Allowable Filter Strip Length, ( L_p )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Time Through Filter Strip, ( T_1 )</td>
<td>5.5 (min) Between 5 and 9 Minutes</td>
</tr>
<tr>
<td>Target Precipitation, P</td>
<td>1.3   (in) 1.3 inches</td>
</tr>
<tr>
<td>S (from Step 1)</td>
<td>0.03  (ft/ft)</td>
</tr>
<tr>
<td>n (from Step 1)</td>
<td>0.25</td>
</tr>
<tr>
<td>( L_p = \left(\frac{T_1}{n}\right)^{0.5} \times 0.324 \times (S \times 100)^{0.36} \times 3.34 \times n )</td>
<td>21.0 (ft) Using Equation 5.4</td>
</tr>
</tbody>
</table>

---

E-4
E.3 Example Final Design – Filter Strips

In order to develop the final design based on the dimensions calculated in the preliminary design, the minimum factors presented in Subsection 5.2.3 were addressed. In real world applications, the final design of a filter strip is likely to include slight adjustments in geometry and will likely include site related engineering considerations specific to the particular project. For the sake of the example, the dimensions calculated in the preliminary design have been directly applied to the final design discussed below.

**Overall Site Integration** – The existing site did not offer the opportunity to use areas of existing vegetation as filter strips. The existing site offers enough space to meet the desired parking area with additional room for a well designed and constructed filter strip that can sheet drain to an existing curb and gutter system. The filter strip has been placed lengthwise between the frontage road and the new parking area. The parking area has been graded to sheet drain to the filter strip. However, because the parking spaces require parking stops, which will concentrate flows upstream of the filter strip, the design has incorporated a level spreading device.

**Filter Strip Cover** – The selected filter strip cover in this design is Schedule C seed mix. This grass will require little maintenance and will provide a natural appearance to the site. The application rate is 5 lbs/1,000 square feet.

**Level Spreading Devices** – As mentioned previously, a level spreading device is required in this design. The device selected is a gravel-filled trench. The trench is 12 inches wide by 24 inches deep. It is lined with a non-woven geotextile material and has a 1 inch drop along its leading edge.

A conceptual plan and profile drawing of the filter strip resulting from this design effort is presented in Figure E.1. This design will provide treatment for the first flush from rainfall events.
RESOLUTION NO. ______

A RESOLUTION EXPRESSING THE WILLINGNESS OF
THE CITY OF SPRINGDALE TO UTILIZE FEDERAL
FUNDING FOR THE FOLLOWING PROJECT: DEAN’S
TRAIL PHASE IIIA.

WHEREAS, the Arkansas Department of Transportation is accepting
applications for Transportation Alternatives Program (TAP) funds for projects at the
following Federal and City participating ratios, up to the maximum Federal-aid available:

<table>
<thead>
<tr>
<th>TYPE WORK</th>
<th>WORK PHASE</th>
<th>FEDERAL %</th>
<th>CITY %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of City Project</td>
<td>Project Design</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Right-of-Way</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Utilities</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Construction Engineering</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

WHEREAS, the currently approved funds are to be used for project construction,
and

WHEREAS, a maximum $125,000 city match is required with a maximum $500,000
ArDOT reimbursement, is currently budgeted in the Public Works 2021 budget.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF
SPRINGDALE, ARKANSAS, THAT:

SECTION I: The City will participate in accordance with its designated
responsibilities in this project.

SECTION II: The City pledges its full support and hereby authorizes the Arkansas
State Highway and Transportation Department to initiate action to implement this project.

PASSED AND APPROVED THIS 25TH DAY OF MAY, 2021

ATTEST:

Denise Pearce, City Clerk

APPROVED AS TO FORM:

Ernest Cate, City Attorney

Doug Sprouse, Mayor
RESOLUTION NO._______

A RESOLUTION AUTHORIZING THE EXECUTION OF A CONSTRUCTION CONTRACT AT THE SPRINGDALE MUNICIPAL AIRPORT FOR REGIONAL DETENTION

WHEREAS, sealed bids were received on May 4, 2021 at 2:30 p.m. for the construction of the Regional Detention at the Springdale Municipal Airport: and

WHEREAS, eight bids were received with Emery Sapp & Sons, Inc., being the low bidder for this project at $793,820.00;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that

Section 1. The Mayor and City Clerk are hereby authorized to execute a contract with Emery Sapp & Sons, Inc for construction of the regional detention at the Springdale Municipal Airport for $793,820.00.

Section 2. The Mayor is authorized to approve construction change orders as long as the cumulative total of the change orders does not exceed 10% of the original contract price.

PASSED AND APPROVED this 25th day of May, 2021.

__________________________________________
Doug Sprouse, Mayor

ATTEST:

__________________________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

__________________________________________
Ernest B. Cate, City Attorney

WMresairport052521
May 13, 2021

Brad Baldwin
Director of Engineering
269 E. Randall Wobbe Ln.
Springdale, AR 72764

RE: Recommendation of Award – Springdale Municipal Airport Regional Detention

Dear Brad:

Bids were received for Springdale Municipal Airport Regional Detention at the City of Springdale, Arkansas, in the 2nd Floor Multi-Purpose Room at the City Administration Building, 201 Spring Street, Springdale, Arkansas, 72764 at 2:30 p.m. on May 4, 2021 and publicly read aloud.

A total of eight bids were received with Emery Sapp & Sons, Inc. being the low bidder at $793,820.00. The Engineer's Opinion of probable cost was $1,086,050.00.

We believe that the bid submitted by Emery Sapp & Sons, Inc. in the amount of $793,820.00 represents a good value for the City of Springdale. We recommend that the construction contract for Springdale Municipal Airport Regional Detention be awarded to Emery Sapp & Sons, Inc.

Please contact me if you have any questions.

Sincerely,

Ryan Carr, Deputy Director of Engineering Operations
RESOLUTION NO.

A RESOLUTION AUTHORIZING THE EXECUTION
OF A CONSTRUCTION CONTRACT
FOR A TRAFFIC SIGNAL

WHEREAS, sealed bids were received on May 11, 2021 at 2:00 p.m. for the
construction of a traffic signal at the intersection of Ford Avenue and Butterfield
Coach Road; and

WHEREAS, All Service Electric, Inc. was the low bidder for this project at
$269,010.00;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL
FOR THE CITY OF SPRINGDALE, ARKANSAS, that

Section 1. The Mayor and City Clerk are hereby authorized to execute a
contract with All Service Electric, Inc. Inc. for construction of a traffic signal for
$269,010.00.

Section 2. The Mayor is authorized to approve construction change orders as
long as the cumulative total of the change orders does not exceed 10% of the
original contract price.

PASSED AND APPROVED this 25th day of May, 2021.

________________________
Doug Sprouse, Mayor

ATTEST:

________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

________________________
Ernest B. Cate, City Attorney
May 11, 2021

Ryan Carr
City of Springdale
269 E Randall Wobbe Ln
Springdale, AR 72764
rcarr@springdalear.gov

RE: Recommendation of Award - Ford Avenue and Butterfield Coach Road Signal – Springdale, Arkansas

Dear Ryan:

Bids were received for Butterfield Coach Road and Ford Avenue Traffic Signal at the City of Springdale, Arkansas, in the 2nd Floor Multi-Purpose Room at the City Administration Building, 201 Spring Street, Springdale, Arkansas, 72764, at 2:00 p.m. on May 11, 2021 and publicly read aloud.

A total of two bids were received with All Service Electric, Inc. the low bidder at $269,010.00. The bid has been checked for accuracy and for compliance with the contract documents. A tabulation of the bids received is enclosed with this letter. The engineer’s opinion of probably construction cost was $248,000.00. The difference in cost is attributed to recent fluctuations in material costs.

We believe that the bid submitted by All Service Electric, Inc. in the amount of $269,010.00 represents a good value for the City of Springdale. We recommend that the construction contract for Butterfield Coach Road and Ford Avenue Traffic Signal be awarded to All Service Electric, Inc.

Please contact me if you have any questions.

Sincerely,

Nathan Becknell, P.E., PTOE, PTP
Fayetteville Office Manager

NLB/nb
Enclosure
F-123
RESOLUTION NO._______

A RESOLUTION AUTHORIZING THE CHANGE IN STAFFING OF THE POLICE DEPARTMENT

WHEREAS, the Police Chief would like to fill the vacant position of Assistant Police Chief and reduce the number of captains by one; and

WHEREAS, Police Department budget has sufficient funds to cover the additional cost of $3,500;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that the City Council supports the filling of the position of Assistant Police Chief and hereby authorizes this change.

PASSED AND APPROVED this 25th day of May, 2021.

______________________________
Doug Sprouse, Mayor

ATTEST:

______________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

______________________________
Ernest B. Cate, City Attorney
Mayor Sprouse,

The Police Department has had the position of Assistant Chief of Police in our structure for as long as I can remember. The job description, pay grade, and civil service requirements are all in place.

The position was vacated with the retirement of our last Assistant Police Chief in 2007 and has not been filled since. In lieu of filling the Assistant Chief position we have overstaffed our Captain position.

I am requesting to reduce the number of Captains from four to three and to fill the Assistant Chief position. I have spoken with our Human Resources Director, our City Attorney and the Civil Service Commission, and none of them feel there are any issues with making this change.

Our salary account is well under budget, and I estimate the cost for the remainder of 2021 to be approximately $3,500.

I request that this item be put on the next committee agenda, and if you have any questions or concerns please let me know.

Sincerely,

Mike Peters
Chief of Police
RESOLUTION NO. ______

A RESOLUTION AUTHORIZING PAYMENT OF AN INVOICE
PROJECT NO. 18BPC1

WHEREAS, Springdale municipal code sec. 2-158 requires approval of the governing body before paying any bill that exceeds $1,000,000, and

WHEREAS, the City of Springdale has contracted with Milestone Construction Company, LLC to construct/renovate the Springdale Municipal Campus, and

WHEREAS, The City has received an invoice for $1,061,401.28 for construction expenses for April 2021.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF SPRINGDALE, ARKANSAS, that the Mayor and City Clerk are hereby authorized to pay Milestone Construction Company, LLC $1,061,401.28 from the 2018 Bond Construction Fund.

PASSED AND APPROVED this 25th day of May, 2021.

__________________________________________
Doug Sprouse, Mayor

ATTEST:

__________________________________________
Denise Pearce, City Clerk

APPROVED AS TO FORM:

__________________________________________
Ernest B. Cate, City Attorney
APPLICATION AND CERTIFICATE FOR PAYMENT

TO OWNER: City of Springfield
201 Spring Street
Springdale, AR 72764

FROM CONTRACTOR: Milestone Construction Company, LLC
2002 South 44th Street
Suite A
Springdale, AR 72762

APPLICATION AND CERTIFICATE FOR PAYMENT

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for payment were issued and payments received from the Owner, and that current payment shown herein is now due.

Contractor: Milestone Construction Company, LLC
By: [Signature]
Date: [Date]

State of: Arkansas
County of: Madison
Subscribed and sworn to before me this 27 day of [Month], 2023.
Notary Public:
My Commission expires: [Expiry Date]

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the above application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of Work is in accordance with the Contract Documents, and the Contractor is entitled to the payment of the AMOUNT CERTIFIED:

AMOUNT CERTIFIED: $1,061,401.28

[Attach explanation if amount certified differs from the amount applied for. Initial figures on this Application and on the Continuation Sheet that are changed to conform to the amount certified.]

ARCHITECT: Duvall Decker Architects, P.A.
By: [Signature]
Date: 05-11-21

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.