



AGENDA
WATAUGA CITY COUNCIL
REGULAR MEETING
MONDAY, MAY 13, 2024
CITY HALL COUNCIL CHAMBER, 7105 WHITLEY ROAD
6:30 PM

This notice is posted pursuant to the Texas Open Meetings Act. Notice is hereby given that a **Regular City Council Meeting** of the City of Watauga, Texas will be held at which time the following subjects will be discussed and may be acted upon.

CALL TO ORDER (Council Members, City Staff, Members of the Public - when speaking during the meeting please speak directly into the microphones on the dais or podium)

ROLL CALL

INVOCATION

PLEDGE OF ALLEGIANCE United States and Texas Flags

ANNOUNCEMENTS

1. Gone But Not Forgotten - Tommy Anderson Jr.

PRESENTATIONS

1. Presentation from Joe Don Bobbit, Executive Director & Chief Appraiser, Tarrant Appraisal District
2. Presentation of Employee of the Month Award for the month of May
3. Presentation of Service Awards for the City of Watauga Employees celebrating a Milestone Anniversary during the month of May

PUBLIC COMMENT If speaking for an organization or group, the speaker should identify the group represented. If speaking during Public Comment (for matters not posted on that particular meeting's agenda), members of the City Council and Staff may only provide a statement of factual information in response to the inquiry or recite existing policy in response (e.g., to correct a factual misstatement made by the citizen or provide factual information requested by the citizen). Any deliberation of or decision about the subject of the inquiry shall be limited to a proposal to place the subject on the agenda for a future meeting. If necessary, the Chair will task the City Manager to respond to the citizen and report back to the City Council as soon as practicable. Such report to the City Council shall not constitute a meeting called by the City Council nor shall it constitute deliberation or formal action. Individual citizens addressing the City Council during Public Comment shall not exceed three (3) minutes in their comments; however, the Chair may extend or reduce the speaker's allotted time in order to conduct an efficient and effective public meeting. The time allotted shall not be donated to others desiring to speak. Public Comment is not established to engage in a conversation with the Council and no formal Council action will be taken.

PUBLIC TESTIMONY FOR ACTION ITEMS Only those persons who submit a completed Request to Speak form prior to the agenda item being introduced by the Chair will be allowed to speak on agenda items set for action (this doesn't include presentations or reports). The Chair shall ask each person requesting to speak to approach the podium when called to speak. Speakers time shall generally not exceed three (3) minutes in their comments and all comments must be germane to the specific agenda item being discussed; however, the Chair may extend or reduce the speaker's allotted time. Speakers shall not be permitted to donate their time to other speakers. Members of the City Council may ask questions or discuss the item directly with the citizen during the citizen's testimony if necessary. Any discussion between a Council member and the citizen will not count toward the time limit and Council Members are encouraged not to speak until the citizen has first utilized their allocated time.

REPORTS

CONSENT AGENDA All of the items on the consent agenda are considered to be self-explanatory by the Council and will be enacted with one motion, one second, and one vote. There will be no separate discussion of these items.

1. Consider approval of the minutes from the April 8, 2023, Workshop and Regular City Council Meetings.
Linda Proskey, City Secretary
2. Consider action to ratify and confirm the City Manager's appointment of Randy Barkley to Fire Chief
Sandra Gibson, Director of Finance
3. Consider action to approve the Monthly Financial Report for the period ending March 31, 2024

Sandra Gibson, Director of Finance

4. Consideration and approval of the Quarterly Investment Report for the period ending March 31, 2024

Sandra Gibson, Director of Finance

5. Consider action to approve renewal of the audit services agreement with Weaver & Tidwell LLP

Deby Woodard, Assistant Director of Finance

6. Consider action on an ordinance of the City of Watauga, Texas, amending Chapter 105 and Chapter 113 of the Code of Ordinances of the City of Watauga, Texas; amending the design criteria for Stormwater Construction; providing for repeal; providing for severability; and providing an effective date

Paul Hackleman, Director of Public Works

7. Consider the appointment of Darlene Chavious to Place 5 on the Parks Advisory Board and to Place 5 on the Planning and Zoning Commission.

Arthur Miner, Mayor

PUBLIC HEARINGS

1. Public Hearing on Proposed Fee Schedule Changes

Sandra Gibson, Director of Finance

ACTION ITEMS

1. Consider action on an ordinance of the City of Watauga, Texas, amending Chapter 12 of the Code of Ordinances of the City of Watauga, Texas; amending various rates and fees in Sections 12-2, 12-4, 12-6, 12-10, 12-22, 12-30, 12-42, 12-101, 12-103, 12-111, 12-113, and 12-115 of Chapter 12; providing a repealing clause; providing a savings clause, providing for severability; and providing an effective date

Sandra Gibson, Director of Finance

2. Discuss and consider action to appoint a Mayor Pro Tem per the City of Watauga Home Rule Charter, Section 3.06 (f)

Arthur Miner, Mayor

EXECUTIVE SESSION The City Council will recess its open meeting and reconvene in executive session to discuss the following items pursuant to the below referenced section(s) of the Texas Government Code:

RECONVENE The City Council will return to open session in the City Council Chamber for possible discussion and action as a result of the Executive Session.

ITEMS OF EXECUTIVE SESSION DELIBERATION

ITEMS FOR FUTURE AGENDAS

ADJOURNMENT

Meeting Notices and Reservation of Rights

The City Council may retire to executive session any time between the meeting's opening and adjournment for the purpose of consultation with legal counsel pursuant to Chapter 551.071 of the Texas Government Code; discussion of personnel matters pursuant to Chapter 551.074 of the Texas Government Code if the requisite information is otherwise posted; deliberation regarding real property pursuant to Chapter 551.072 of the Texas Government Code; deliberation regarding economic development negotiations pursuant to Chapter 551.087 of the Texas Government Code; and/or deliberation regarding the deployment, or specific occasions for implementation of security personnel or devices pursuant to Chapter 551.076 of the Texas Government Code (as applicable) when determined necessary by the [City Council/Board/Commission/Committee] to address a subject matter on the agenda. Action, if any, will be taken in open session.

Attendance by Other Elected or Appointed Officials: It is anticipated that members of other governmental bodies, and/or city council, boards, commissions and/or committees may attend the meeting in numbers that may constitute a quorum of the body, board, commission and/or committee. Notice is hereby given that the meeting, to the extent required by law, is also noticed as a possible meeting of the other body, board, commission and/or committee, whose members may be in attendance, if such numbers constitute a quorum. The members of the city council, boards, commissions and/or committees may be permitted to participate in discussions on the same items listed on the agenda, which occur at the meeting, but no action will be taken by such in attendance unless such item and action is specifically provided for on an agenda for that city council, body, board, commission or committee subject to the Texas Open Meetings Act.

NOTICE

THIS FACILITY IS WHEELCHAIR ACCESSIBLE AND ACCESSIBLE PARKING SPACES ARE AVAILABLE. REQUESTS FOR ACCOMMODATIONS OR INTERPRETIVE SERVICES MUST BE MADE 48 HOURS PRIOR TO THIS MEETING. PLEASE CONTACT THE CITY SECRETARY'S OFFICE AT (817) 514-5825, OR FAX (817) 514-3625.

I, Linda Proskey, City Secretary for the City of Watauga, hereby certify that this agenda was posted on the bulletin boards at City Hall, 7105 Whitley Road, Watauga, Texas, on May 10, 2024, before 5:00 p.m., in accordance with Chapter 551 of the Texas Government Code.

/S/ Linda Proskey
City Secretary





AGENDA MEMORANDUM

DATE: April 30, 2024
TO: Honorable City Council Members
FROM:
THROUGH:
SUBJECT: Presentation of Employee of the Month Award for the month of May

BACKGROUND/INFORMATION:

FINANCIAL IMPLICATIONS:

RECOMMENDATION/ACTION DESIRED:

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Employee of the Month - May 2024

REVIEWED BY:

Juliet Rodriguez, Human Resources and Civil Service Director Approved - 5/2/2024

Linda Proskey, City Secretary

Final Approval - 5/3/2024

Approved as to form for inclusion on Agenda



May 2024

Employee of the Month

Guadalupe Calvillo





AGENDA MEMORANDUM

DATE: April 30, 2024
TO: Honorable City Council Members
FROM:
THROUGH:
SUBJECT: Presentation of Service Awards for the City of Watauga Employees celebrating a Milestone Anniversary during the month of May

BACKGROUND/INFORMATION:

FINANCIAL IMPLICATIONS:

RECOMMENDATION/ACTION DESIRED:

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Employee Service Awards - May 2024

REVIEWED BY:

Juliet Rodriguez, Human Resources and Civil Service Director Approved - 5/2/2024

Linda Proskey, City Secretary

Final Approval - 5/3/2024

Approved as to form for inclusion on Agenda



Employee Service Awards

May 2024

Justin Morris

Firefighter / Paramedic

15 Years of Service

*Thank
You*



AGENDA MEMORANDUM

DATE: April 10, 2024
TO: Honorable City Council Members
FROM: Linda Proskey, City Secretary
THROUGH: Linda Proskey, City Secretary
SUBJECT: Consider approval of the minutes from the April 8, 2023, Workshop and Regular City Council Meetings.

BACKGROUND/INFORMATION:

April 8, 2024 City Council Regular meeting minutes

FINANCIAL IMPLICATIONS:

None

RECOMMENDATION/ACTION DESIRED:

Respectfully recommend the Council review and take action on the item presented.

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. April 8, 2024 Regular CC Meeting - Draft Minutes
2. 4.8.2024 WORKSHOP Meeting - Draft Minutes on agenda 4.8.2024

REVIEWED BY:

Joshua Jones, City Manager

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 4/11/2024

Final Approval - 4/11/2024



**MINUTES
WATAUGA CITY COUNCIL
REGULAR MEETING
CITY HALL COUNCIL CHAMBER,
7105 WHITLEY ROAD,
APRIL 8, 2024
6:30 PM**

CALL TO ORDER

Mayor Arthur Miner called the meeting to order at 6:30 p.m.

ROLL CALL

The meeting convened with the following members present:

Arthur L. Miner
Jan Hill
Pat Shelbourne
Tom Snyder
Lovie Downey
Andrew Neal
Malissa Minucci
Mark Taylor

Mayor
Mayor Pro Tem/Council Member Place 7
Council Member Place 1
Council Member Place 2
Council Member Place 3
Council Member Place 4
Council Member Place 5
Council Member Place 6

and

Joshua Jones
Linda Proskey
David Berman
Sandra Gibson
Timothy Hamilton
Deby Woodard
Paul Hackleman
Randy Richards
Jeannette Garcia

City Manager
City Secretary
City Attorney
Finance Director
Director of Parks and Community Services
Assistant Finance Director
Public Works Director
Assistant Public Works Director
Planner I

INVOCATION

Pastor Dennis Serratt First Baptist Church of Watauga and police chaplain gave the invocation.

PLEDGE OF ALLEGIANCE

Mayor Miner led the Pledge of Allegiance.

ANNOUNCEMENTS

Councilmember Neal announced that the Watauga Fest is May 17- 19. Friends of the Library will hold a book sale on April 20 and May 4, election day, and ask people to go to the animal shelter and adopt a pet.

Councilmember Hill announced that May 4 is also the opening day of the splash pad.

Mayor Miner announced that AAA will hold an impact driving workshop on April 16 from 6:30 to 7:30 at Foster Village Park.

PRESENTATIONS

1. Proclamation for Child Abuse Prevention Month.

Mayor Miner presented the proclamation to Emma Garcia with Alliance for Children.

2. Presentation of Service Awards for the City of Watauga Employees celebrating a Milestone Anniversary during the month of February

Joshua Jones, City Manager, presented Sara Gianoli-Nyhus with the milestone awards for ten years with the Watauga City Library.

3. Presentation of City of Watauga Employee of the Month award for the month of February 2024.

Joshua Jones, City Manager, presented the Employee of the Month award to Ngoc Hillman.

4. Public Input Meeting planned for Wednesday, April 24, 2024 in the City Council Chambers from 5:30 PM until 6:30 PM for the Hightower Drive Capital Improvement Plan Project.

Paul Hackleman, the Public Works Director, announced that they will hold a public input meeting to discuss the Hightower Drive CIP project.

PUBLIC COMMENT

No requests for public testimony were received.

PUBLIC TESTIMONY FOR ACTION ITEMS

No requests for public testimony were received.

CONSENT AGENDA

1. Consider action to approve a resolution amending the ARPA Spending Plan Framework.

- 2. Adopt an Ordinance approving the Drought Contingency Plan as required by the State of Texas under the Texas Commission for Environmental Quality (TCEQ) Regulations.**

AN ORDINANCE BY THE CITY COUNCIL OF THE CITY OF WATAUGA, TEXAS ADOPTING THE CITY OF WATAUGA DROUGHT CONTINGENCY PLAN WITH AN EFFECTIVE DATE OF MAY 1, 2024; AMENDING CHAPTER 42, ARTICLE III, SECTION 42-147 OF THE CODE OF ORDINANCES OF THE CITY OF WATAUGA, TEXAS ESTABLISHING A DROUGHT CONTINGENCY PLAN; PROVIDING THAT THE DROUGHT CONTINGENCY PLAN WITH AN EFFECTIVE DATE OF MAY 1, 2024 IS ADOPTED; PROVIDING THAT ALL ORDINANCES IN CONFLICT HERewith ARE HEREBY REPEALED TO THE EXTENT THEY ARE IN CONFLICT; PROVIDING A SAVINGS CLAUSE; PROVIDING AN EFFECTIVE DATE.

- 3. Adopt an Ordinance approving the Water Conservation Plan as required by the State of Texas under the Texas Commission for Environmental Quality (TCEQ) Regulations.**

AN ORDINANCE BY THE CITY COUNCIL OF THE CITY OF WATAUGA, TEXAS ADOPTING THE CITY OF WATAUGA WATER CONSERVATION PLAN WITH AN EFFECTIVE DATE OF MAY 1, 2024; AMENDING CHAPTER 42, ARTICLE III, SECTION 42-145 OF THE CODE OF ORDINANCES OF THE CITY OF WATAUGA, TEXAS ESTABLISHING A WATER CONSERVATION PLAN; PROVIDING THAT THE WATER CONSERVATION PLAN WITH AN EFFECTIVE DATE OF MAY 1, 2024 IS ADOPTED; PROVIDING THAT ALL ORDINANCES IN CONFLICT HERewith ARE HEREBY REPEALED TO THE EXTENT THEY ARE IN CONFLICT; PROVIDING A SAVINGS CLAUSE; PROVIDING AN EFFECTIVE DATE.

- 4. Consider action to approve a resolution amending the Comprehensive Financial Management Policy Statements.**
- 5. Consider approval of the March 11, 2024, Council Workshop Minutes.**
- 6. Consider approval of the meeting minutes from the March 11, 2024, Regular City Council Meeting.**
- 7. Consider approval of the minutes from the February 12, 2024, Regular City Council Meeting.**
- 8. Consider action on approval of the Monthly Financial Report for the period ending February 29, 2024.**
- 9. Consider action to approve a resolution amending Policy 13.01 Purchasing Policy and Procedures of the Personnel, Administration and Financial Policies**

Manual.

10. **Consider action to adopt an Ordinance by the City Council of the City of Watauga, Texas appointing J. Stewart Bass pursuant to Section 30.00006 of the Texas Government Code, Section 8.02 of the Watauga City Charter, and Sections 24-29, 24-30, 24-31, and 24-32 of the Watauga Code of Ordinances, to serve a Municipal Court Judge of the Municipal Court of Record for the City of Watauga; providing that all ordinances in conflict herewith are hereby repealed to the extent that they are in conflict; providing a savings clause; providing an effective date.**

AN ORDINANCE BY THE CITY COUNCIL OF THE CITY OF WATAUGA, TEXAS APPOINTING AN INDIVIDUAL PURSUANT TO SECTION 30.00006 OF THE TEXAS GOVERNMENT CODE, SECTION 8.02 OF THE WATAUGA CITY CHARTER, AND SECTIONS 24-29, 24-30, 24-31, AND 24-32 OF THE WATAUGA CODE OF ORDINANCES, TO SERVE AS MUNICIPAL COURT JUDGE OF THE MUNICIPAL COURT OF RECORD FOR THE CITY OF WATAUGA; PROVIDING THAT ALL ORDINANCES IN CONFLICT HEREWITH ARE HEREBY REPEALED TO THE EXTENT THAT THEY ARE IN CONFLICT; PROVIDING A SAVINGS CLAUSE; PROVIDING AN EFFECTIVE DATE

11. **Consider action to adopt an Ordinance by the City Council of the City of Watauga, Texas appointing Lorraine Irby pursuant to section 30.00006 and 30.00008 of the Texas Government Code to serve the Alternate Municipal Court Judge of the Municipal Court of Record for the City of Watauga; providing that all ordinances in conflict herewith are hereby repealed to the extent that they are in conflict; providing a savings clause; providing an effective date.**

AN ORDINANCE BY THE CITY COUNCIL OF THE CITY OF WATAUGA, TEXAS APPOINTING LORRAINE IRBY PURSUANT TO SECTION 30.00006 AND 30.00008 OF THE TEXAS GOVERNMENT CODE, TO SERVE AS THE ALTERNATE MUNICIPAL COURT JUDGE OF THE MUNICIPAL COURT OF RECORD FOR THE CITY OF WATAUGA; PROVIDING THAT ALL ORDINANCES IN CONFLICT HEREWITH ARE HEREBY REPEALED TO THE EXTENT THAT THEY ARE IN CONFLICT; PROVIDING A SAVINGS CLAUSE; PROVIDING AN EFFECTIVE DATE

Mayor Miner called for a Motion. Councilmember Neal made a motion to accept the consent agenda as presented. Mayor Pro Tem Hill seconded the motion. Mayor Miner called for a vote.

Motion carried 7-0-0-0.

Ayes, Shelbourne, Snyder, Downey, Neal, Minucci, Taylor, Hill

Nays: None

Abstain: None

Absent: None

PUBLIC HEARINGS

1. **Conduct a public hearing to receive input on community needs and project selection relative to funds to be received in the 50th Year of Tarrant County's Community Development Block Grant (CDBG) Program.**

Paul Hackleman, Public Works Director, presented three different CDBG areas within the city. He said that, traditionally, the city has done water and sewer work, but this is to get the citizens' input on what they would like to see. He stated that the project that they submitted was Bunker Hill, which would be about 1200 feet of waterline to reduce the number of main breaks and other issues there. The estimated cost of engineering and construction is about 445,000, and the grant is 170,000.

Mayor Miner opened the public hearing at 6:48 pm

There was no request to speak.

Mayor Miner closed the public hearing at 6:48 pm.

2. **SUP.24-02: Public hearing to receive comments for or against a request for a specific use permit at the property commonly known as Lot 5, Block 5 of the I J Schellinger Subdivision, to allow for a pet grooming service in a Local Business (LB) zoning district. The subject property is located north of Watauga Road, east of Denton Highway and west of Johnnie Street. Owner: Rafael Gregorio. Applicant/Agent: Luis Perez**

Jeannette Garcia, Planner I, presented the item. The public hearing is to receive comments for or against this request for a specific use permit to allow for a pet grooming service. She stated that no medical or boarding will take place on the property.

Mayor Miner opened the public hearing at 6:54 pm.

There was no request to speak.

Mayor Miner closed the public hearing at 6:54 pm.

ACTION ITEMS

1. **SUP.24-02: Consideration of a request for a specific use permit at the property commonly known as 5625 Watauga Road Suite #100, Lot 5, Block 5 of the I J Schellinger Subdivision, to allow for a pet grooming service in a Local Business (LB) zoning district. Owner: Rafael Gregorio. Applicant/Agent: Luis Perez.**

Councilmember Shelbourne made a motion to approve as presented. Mayor Pro Tem Hill seconded the motion. Mayor Miner called for a vote.

Motion carried 7-0-0-0.

Ayes, Shelbourne, Snyder, Downey, Neal, Minucci, Taylor, Hill

Nays: None

Abstain: None

Absent: None

EXECUTIVE SESSION

The City Council went into executive session at 6:56 pm to discuss the following items:

1. **Pursuant to Section 551.074 of the Texas Government Code, to deliberate the appointment, employment, evaluation, reassignment, duties, discipline, or dismissal of a public officer or employee: Resignation of the Interim City Manager**
2. **Pursuant to Section 551.074 of the Texas Government Code, to deliberate the appointment, employment, evaluation, reassignment, duties, discipline, or dismissal of a public officer or employee: Appointment of an Interim City Manager.**

RECONVENE

The City Council returned to open session at 7:29 pm

EXECUTIVE SESSION DELIBERATION

1. **Pursuant to Section 551.074 of the Texas Government Code, to deliberate the appointment, employment, evaluation, reassignment, duties, discipline, or dismissal of a public officer or employee: Resignation of the Interim City Manager**

Mayor Miner asked for a motion. Councilmember Neal made a motion to accept the resignation of the Interim City Manager with an effective date of April 19, 2024. Councilmember Minucci seconded the motion. Mayor Miner called for a vote.

Motion carried 7-0-0-0

Ayes, Shelbourne, Snyder, Downey, Neal, Minucci, Taylor, Hill

Nays: None

Abstain: None

Absent: None

2. **Pursuant to Section 551.074 of the Texas Government Code, to deliberate the appointment, employment, evaluation, reassignment, duties, discipline, or dismissal of a public officer or employee: Appointment of an Interim City Manager.**

Mayor Miner asked for a motion. Councilmember Neal made a motion to appoint the current Finance Director, Sandra Gibson, to Interim City Manager. Mayor Pro Tem Hill seconded the motion. Mayor Miner called for a vote.

Motion carried 7-0-0-0

Ayes, Shelbourne, Snyder, Downey, Neal, Minucci, Taylor, Hill

Nays: None

Abstain: None

Absent: None

ITEMS FOR FUTURE AGENDAS

Mayor Pro Tem Hill asked that the city attorney draft the wording developed by the Animal Services Committee for the TNR program into an ordinance so that they can vote on it as quickly as possible. She said it is breeding season for kittens, and the people

who want to do this need to be able to this spring. Councilmember Downey seconded the motion.

ADJOURNMENT

Mayor Miner adjourned the meeting at 7:33 pm

Approved: this _____ day of _____, 2024

Signed: this _____ day of _____, 2024

APPROVED:

ATTEST:

Arthur L. Miner, Mayor

Linda Proskey, City Secretary



**MINUTES
WATAUGA CITY COUNCIL
WORKSHOP MEETING
CITY HALL COUNCIL CHAMBER,
7105 WHITLEY ROAD,
APRIL 8, 2024
5:30 PM**

CALL TO ORDER

Mayor Arthur Miner called the meeting to order at 5:32 p.m.

ROLL CALL

The meeting convened with the following members present:

Arthur L. Miner
Jan Hill
Pat Shelbourne
Tom Snyder
Lovie Downey
Andrew Neal
Malissa Minucci
Mark Taylor

Mayor
Mayor Pro Tem/Council Member Place 7
Council Member Place 1
Council Member Place 2
Council Member Place 3
Council Member Place 4
Council Member Place 5
Council Member Place 6

and

Joshua Jones
Linda Proskey
David Berman
Sandra Gibson
Paul Hackleman
Randy Richards
Jeannette Garcia

City Manager
City Secretary
City Attorney
Director of Finance
Director of Public Works
Assistant Director of Public Works
Planner 1

ANNOUNCEMENTS

No announcements were made.

PRESENTATIONS

1. Presentation on Chapter 12 Fee Schedule Proposed Changes

April 8, 2024 Workshop Minutes-page 1

Sandra Gibson, Director of Finance, went over the proposed fee changes. She said that some of the proposed changes are being made due to legislative changes. Other fees were adjusted up or down to the nearest 5 dollars to make it easier for staff to have change on hand, and some were to clarify language only.

Randy Richards, Assistant Public Works Director, reviewed the changes that the public works department needed to make primarily because of legislative changes and the cost of staff time.

Timothy Hamilton, Director of Parks and Community Services, presented the fee changes for the community center, which mainly included increases for non-residents.

Councilmember Hill asked about the fees related to the toddler's programs and why the charges were the same between residents and non-residents.

Timothy Hamilton said they could look into changing that for next year, but the feedback he received from staff recommended leaving it as it was in the past. There are only 12 slots in each class, and traditionally, they have been filled primarily with residents. Their goal is 100% cost recovery.

Councilmember Neal asked about the non-resident passes and one-day passes; he feels the fee is relatively high. He also asked about the percentage of Seniors who come from outside of Watauga. He wondered about the wastewater processing fees and what the rate would need to be to recover the complete cost. He also thinks the fencing fees should be lowered.

Timothy Hamilton said that about 50 percent of the Seniors who attend come from outside Watauga.

Sandra Gibson said that the wastewater fee increase would need to be doubled to cover the complete rate increase.

Randy Richards stated that the fence fees are the average of what the citizens are currently paying. He said that they do not charge a fee if the resident is replacing a small portion of the fence. He is not opposed to looking at a lower fee for smaller projects.

ADJOURNMENT

Mayor Miner adjourned the meeting at 6:12 pm

Approved: this _____ day of _____, 2024

Signed: this _____ day of _____, 2024

APPROVED:

ATTEST:

Arthur L. Miner, Mayor

Linda Proskey, City Secretary

April 8, 2024 Workshop Minutes-page 2



AGENDA MEMORANDUM

DATE: April 16, 2024
TO: Honorable City Council Members
FROM: Sandra Gibson, Director of Finance
THROUGH:
SUBJECT: Consider action to ratify and confirm the City Manager's appointment of Randy Barkley to Fire Chief

BACKGROUND/INFORMATION:

Randy Barkley has served the City of Watauga for 24 years in the capacity of Emergency Management Coordinator, Battalion Chief, Assistant Fire Chief, and as Acting/Interim Fire Chief at various times in his career to date. Most recently, he served as Interim Fire Chief after Chief Shawn Fannan retired at the end of February.

Chief Barkley's competence and experience, as well as his high level of professionalism merit his appointment to Fire Chief.

FINANCIAL IMPLICATIONS:

N/A

RECOMMENDATION/ACTION DESIRED:

Recommend ratification/confirmation of Randy Barkley's appointment to Fire Chief

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

None

REVIEWED BY:

Sandra Gibson, Director of Finance

David Berman, City Attorney

Juliet Rodriguez, Human Resources and Civil Service Director

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 5/2/2024

Approved - 5/2/2024

Approved - 5/2/2024

Final Approval - 5/3/2024



AGENDA MEMORANDUM

DATE: April 16, 2024
TO: Honorable City Council Members
FROM: Sandra Gibson, Director of Finance
THROUGH:
SUBJECT: Consider action to approve the Monthly Financial Report for the period ending March 31, 2024

BACKGROUND/INFORMATION:

The Monthly Financial Report for the period ending March 31, 2024 is attached for Council review and approval.

FINANCIAL IMPLICATIONS:

N/A

RECOMMENDATION/ACTION DESIRED:

Staff recommends approval of the Monthly Financial Report for the period ending March 31, 2024.

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Council Report - March 2024 to Council May 13, 2024

REVIEWED BY:

Sandra Gibson, Director of Finance
Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 5/3/2024
Final Approval - 5/4/2024



Monthly Financial Report Fiscal 2023-2024 For the period ending March 31, 2024

Sales Tax

Sales tax receipts from the State Comptroller received in the month of April 2024 (reflecting February 2024 sales receipts) increased in total to 3.6%

Sales Tax Receipts	Feb-24	Feb-23	% change
City 1%	\$ 274,135	\$ 264,506	3.6%
City 1/4% effective 10/1/2021*	\$ 68,534	\$ 66,127	3.6%
Street Maint 1/4%**	\$ -	\$ -	0.0%
CCD 1/2%	\$ 136,328	\$ 131,840	3.4%
EDC 1/4%	\$ 68,534	\$ 66,127	3.6%
Totals	\$ 547,531	\$ 528,600	3.6%

*approved by voters May, 2021 for effective date of 10/1/2021

**abolished January, 2021

compared to the same time last year. This amount includes prior period adjustments, future period adjustments and audit collections.

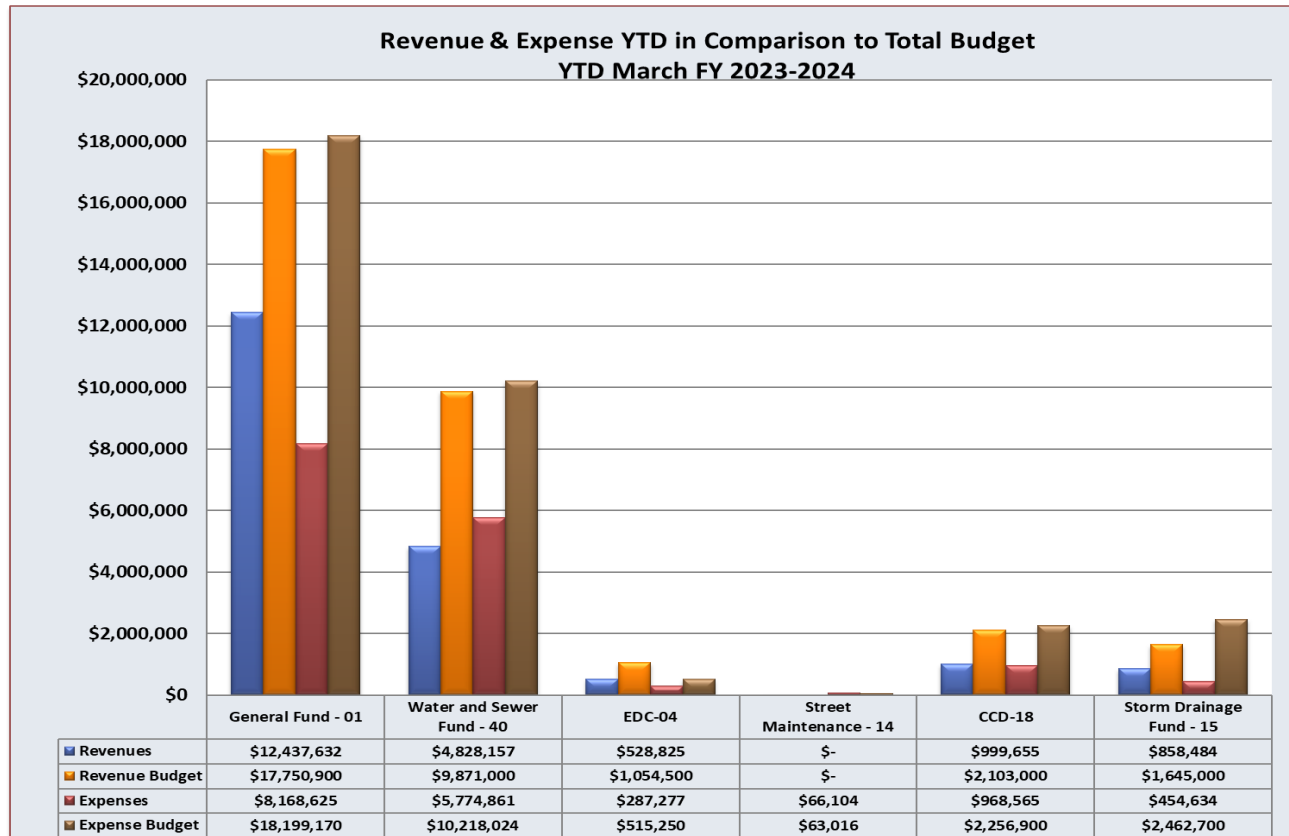
A comparison of February 2024 sales tax receipts for Watauga's and surrounding cities are shown below: These figures do not include Special District sales tax receipts.

SALES TAX RECEIPTS COMPARISONS February 2023 vs. February 2024 RECEIVED FROM COMPTROLLER - April FISCAL YEAR 2023-2024						
Sales Tax Receipts for the Month:						
City	February 2024 Sales		February 2023 Sales		\$ Change	% Change
Richland Hills	\$	716,902.96	\$	515,197.86	\$ 201,705.10	39.15%
Keller	\$	1,324,232.70	\$	1,120,363.44	\$ 203,869.26	18.20%
Grapevine	\$	4,751,068.30	\$	4,145,803.23	\$ 605,265.07	14.60%
Bedford	\$	1,286,340.43	\$	1,141,988.76	\$ 144,351.67	12.64%
Haltom City	\$	1,328,958.40	\$	1,262,413.69	\$ 66,544.71	5.27%
Colleyville	\$	555,697.31	\$	529,971.97	\$ 25,725.34	4.85%
Watauga	\$	411,202.87	\$	396,759.24	\$ 14,443.63	3.64%
N. Richland Hills	\$	1,453,085.44	\$	1,406,840.93	\$ 46,244.51	3.29%
Southlake	\$	2,752,818.60	\$	2,710,604.87	\$ 42,213.73	1.56%
Euless	\$	1,754,603.55	\$	1,732,074.39	\$ 22,529.16	1.30%
Fort Worth	\$	17,457,554.53	\$	17,445,628.04	\$ 11,926.49	0.07%
Saginaw	\$	582,611.92	\$	582,909.62	\$ (297.70)	-0.05%
Hurst	\$	1,324,232.70	\$	1,395,576.00	\$ (71,343.30)	-5.11%
Roanoke	\$	1,357,447.52	\$	1,560,463.86	\$ (203,016.34)	-13.01%
Source: State Comptroller						
City Collections only - not Special Purpose Districts or Transit						

The City will receive the distribution for March 2024 sales tax receipts on May 10, 2024. Sales tax revenues have been estimated for the March reporting period.

Financial Highlights

The City is 50% through the fiscal year 2023-2024. Revenue and expenses are reflected in the chart below and details of each fund's revenues and expenditures are attached. For example, the Police Department budget and expenditures are combined for two funds in which expenditures are reported (General Fund and Crime Control). The Consolidated Departmental Budget Report does not include capital outlay or debt service expenditures.



General Fund

Revenues – Year-to-date revenues represent 70.1% of budget collected, or \$12,437,632.

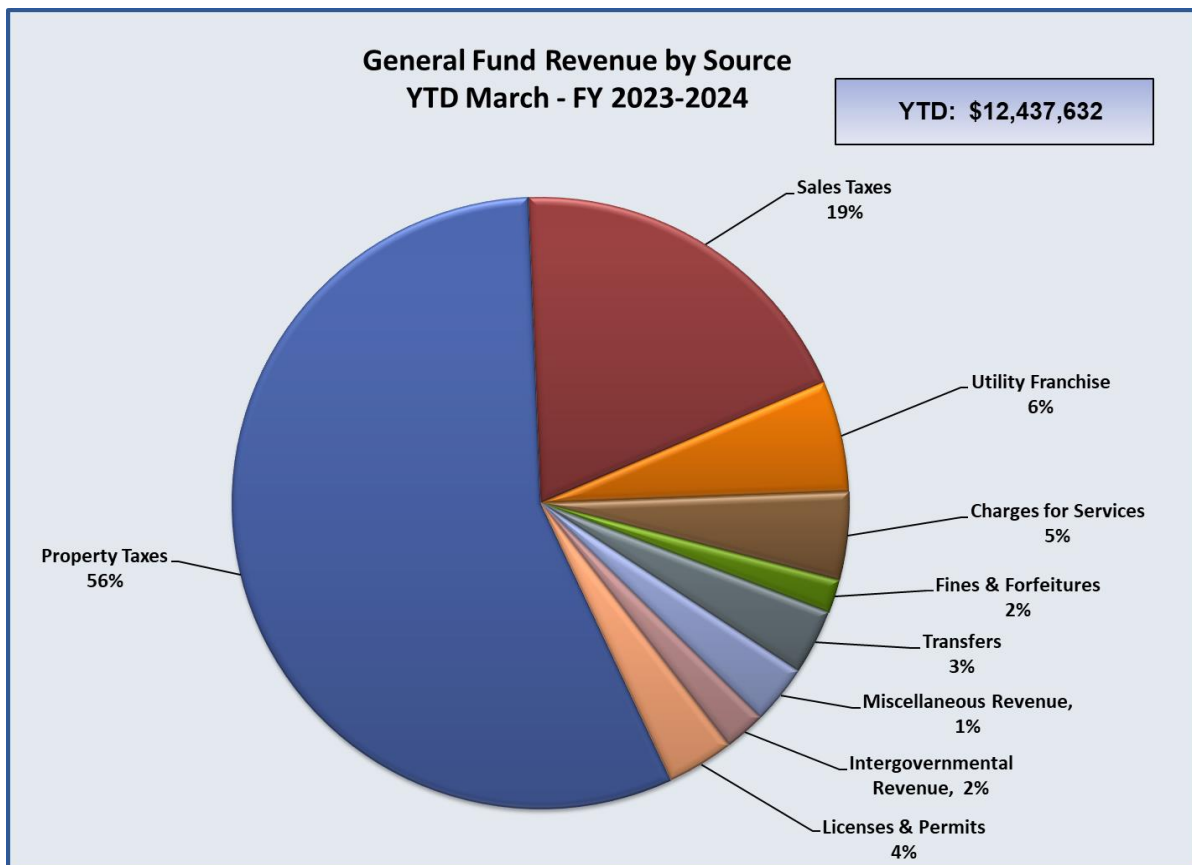
Property Tax – As of March 31, 2024, the City has received 97.7% of budgeted property taxes and receipts are in line with expectations at this time. The majority of property tax revenues are received in December and January.

Utility Franchise Revenue - The majority of franchise receipts are received on a quarterly basis. The City has received \$727,785, or 81.8% in budgeted franchise fee revenues through March 2024. Electric and gas franchise receipts were received in March. The City is anticipating receiving \$889,500 in franchise fee revenues in fiscal year 2023-2024.

Sales Tax – Sales tax receipts for the General Fund continue to remain marginally volatile. Budget expectations are trending slightly lower at 47.4% of the budget through March 2024.

Licenses and Permits - License and permit fees are at 57.1% of budget collected with revenue received at \$435,162; an increase of \$88,988 from prior year.

Charges for Services - Charges for Services revenues are at 48% of budget collected. Charges for services include recreation fees, ambulance services, garbage collection fees and animal adoption fees.

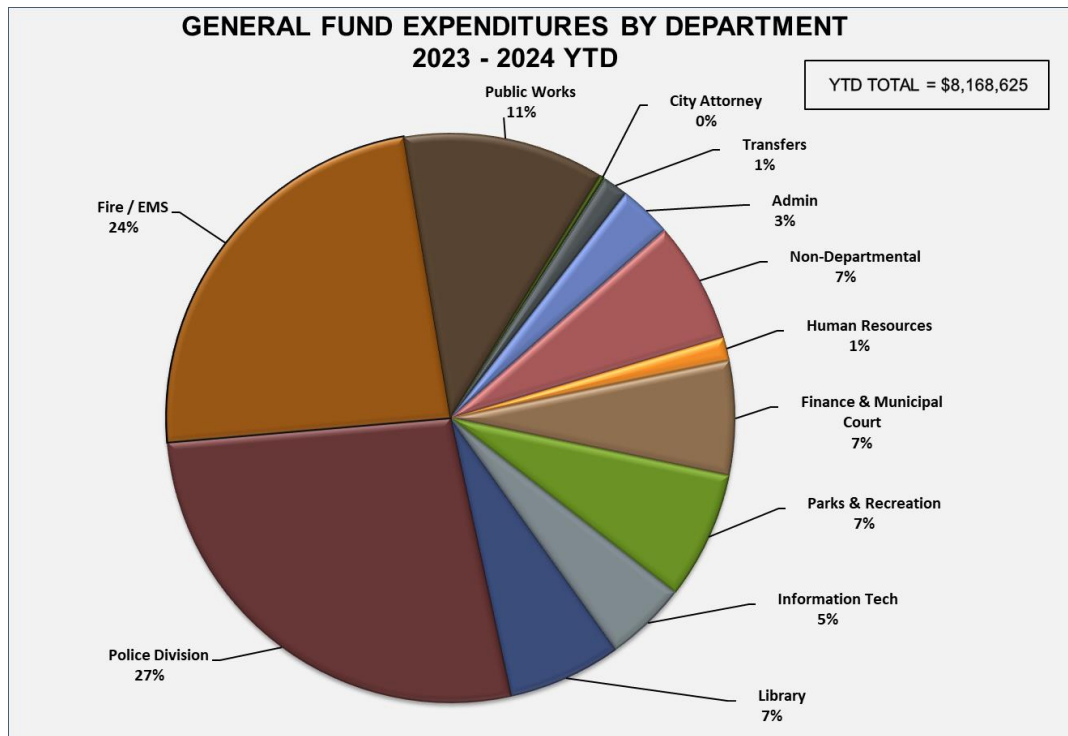


Fines and Forfeitures - Fines and Forfeitures are at 39.3% of budget which is \$25,779, or 10.5% lower than last year's collections. Citations issued are continuing to trend lower for the fiscal year due to staffing shortages.

Miscellaneous Revenue - Miscellaneous revenues include interest earnings, rental of recreational facilities, bingo, and other revenue. These receipts total \$387,718, or 52.4% of budgeted revenues.

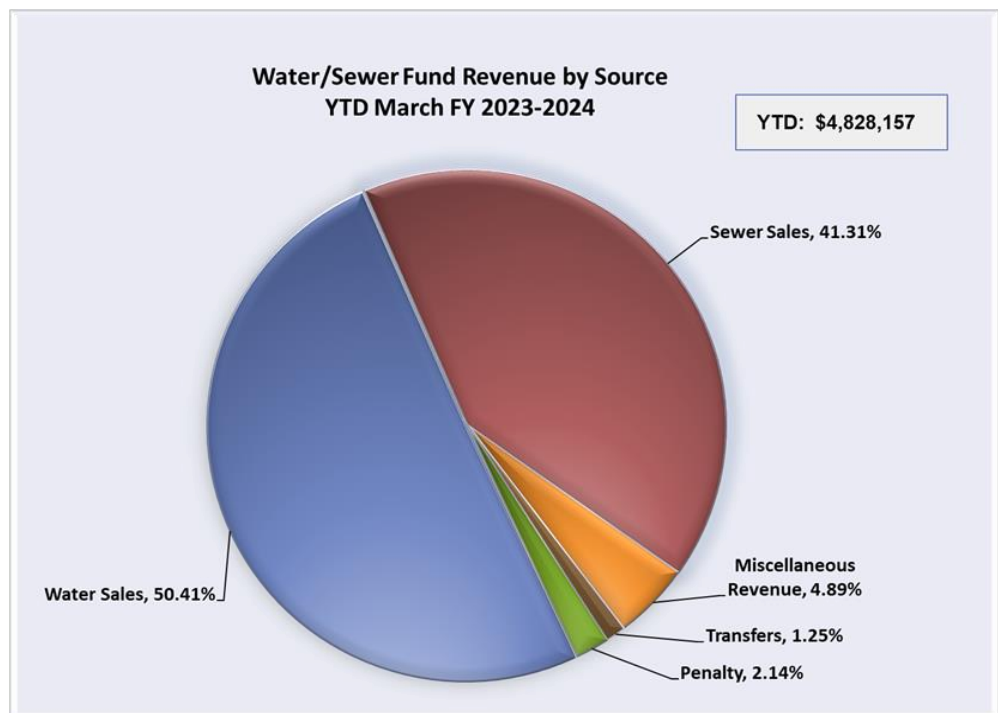
Intergovernmental Revenue and Transfers - Intergovernmental Revenue includes transfers from other funds for services the general fund provides and payments in lieu of taxes from the enterprise funds. Currently these revenues are on target with Intergovernmental at 53.9% of budget and Transfers at 49.8% of budget.

Expenses – General fund expenses are at 44.9% of budget expended and total \$8,168,625 for the year.



Water and Sewer Fund

Total water and sewer revenues are slightly below target and are currently at 48.91% of budgeted revenues through March 2024. Water sales are 49.2% of budgeted revenues and wastewater revenues are at 45.8% of budget. Water consumption varies due to seasonal fluctuations.

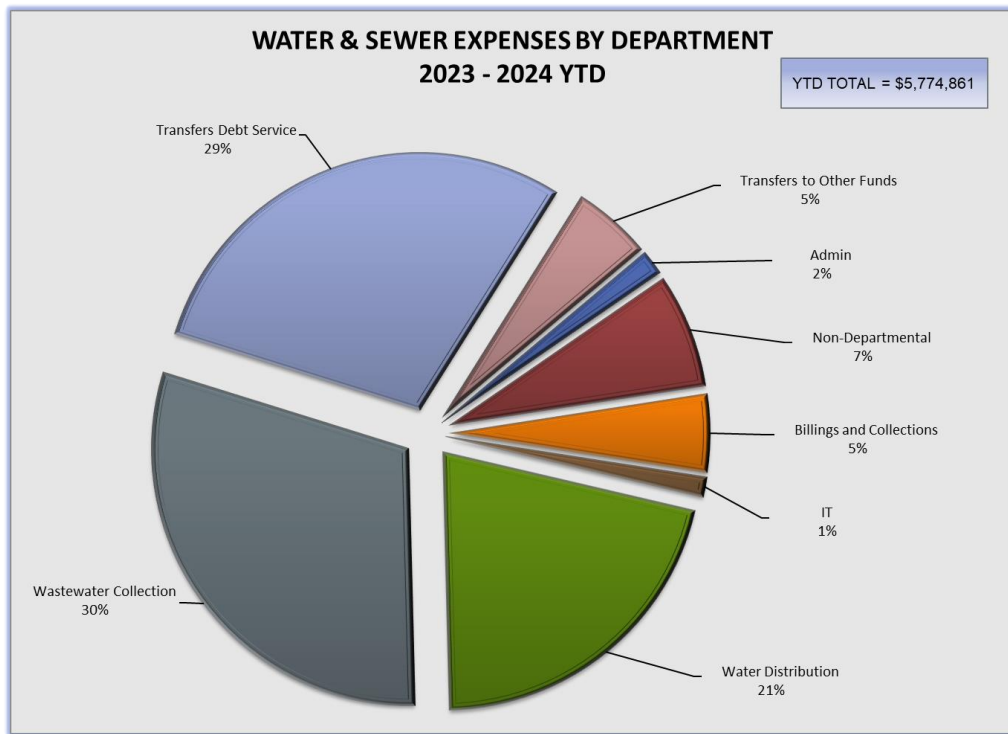


Miscellaneous

Sales and Penalties- Miscellaneous sales include penalty revenue, EPA revenue,

service charges, returned check fees, and damaged/tampering fees. This category of revenue is at 53.7% of budget collected.

Expenses – Year-to-date expenses in the Water/Sewer fund are 56.5% of budget. Transfers to debt service are at 84% of budget due to payments processed February 1, 2024, which make up a significant portion of expenses. The remaining debt service payments are due on August 1, 2024. Wastewater expenditures are up \$273,606 or 18.6% from last year.



Storm Drain Fund – Revenues represent 52.2% of budget collected. Expenses are at 18.5% of budget in this fund through March 2024. Capital projects budgeted in FY2023-2024 include Whitley Road and other storm drain improvements.

Special Revenue Funds

- **Street Maintenance Fund** expenses are at 104.9% of budget. Projects are being funded using reserves.
- **Crime Control and Prevention District** revenues collected are at 47.5% of budget and expenditures are at 42.9% of budget.
- **The Economic Development Corporation Fund** has collected 47.6% of sales tax revenues and expenditures are at 55.8% of budget expended through March 2024.

QUARTERLY REPORTS

AMERICAN RESCUE ACT PLAN EXPENDITURE REPORT

The ARPA Grant expenditures through 03/31/2024 are shown below. The City's largest portion of projects remaining are the infrastructure projects that are scheduled to begin this Fiscal Year.

		American Rescue Plan Act Fiscal Recovery Spending Plan			
March 1, 2021 to December 31, 2026		BUDGET	AMOUNT EXPENDED	AMOUNT ENCUMBERED NOT SPENT	Funds remaining
Grant Distribution (Revenues)					
	Grant Funds August, 2021 (received)	\$ 3,033,024			
	Additional Allocation March, 2022 (received)	\$ 5,994			
	Grant Funds September 2022 (received)	\$ 3,039,018			
	TOTAL ALLOCATION	\$ 6,078,036			
Proposed Programs/Expenditures					
Project Overview and Identified Need					
Category: Infrastructure					
1. Water and Wastewater Projects	Provides additional funding for projects (group 3 in City's CIP) for Summertime Lane paving, drainage, water and sanitary sewer improvements. (Funding covers anticipated inflationary gap to complete project)	\$ 1,609,049	\$ -	\$ -	\$ 1,609,049
2. Park Vista Stormwater Rehabilitation	Program to extend culvert within Park Vista Park and better manage stormwater	\$ 807,520	\$ 25,164	\$ 80,836	\$ 701,520
3. Lead Pipe Identification	Funding to locate and identify water service pipe materials throughout the City.	\$ 800,000	\$ 41,465	\$ 758,535	\$ -
	Infrastructure Total	\$ 3,216,569	\$ 66,629	\$ 839,371	\$ 2,310,569
Category: Personnel					
1. Restoring positions	1 remaining Public Works position 2023-2024	\$ 300,200	\$ 258,471	\$ -	\$ 41,729
2. Leave bank liability reduction	Addresses budgetary issue and supports leave reduction plan	\$ 1,334,400	\$ 1,333,178	\$ -	\$ 1,222
3. Appreciation Pay	Funding to assist with retention of staff issue in order to provide continued services to citizens.	\$ 375,000	\$ 374,700	\$ -	\$ 300
4. Position Funding	Provides funding for 1/2 Finance Grant position to manage ARPA Grant and Human Resources position to manage additional reporting requirements and HR duties.	\$ 194,255	\$ 142,162	\$ -	\$ 52,093
5. Police Special Unit Program	Funding to provide additional development opportunities to police officers to help with retention. Program provides funding for officers being equipped and trained on Special Weapons and Tactics Team (SWAT).	\$ 60,000		\$ -	\$ 60,000
6 Recruitment and retention incentives	Addresses recruitment issues for various departments	\$ 51,544	\$ 18,180	\$ 7,325	\$ 26,039
	Personnel Total	\$ 2,315,399	\$ 2,126,691	\$ 7,325.00	\$ 181,383
Category: Equipment					
1. Public Works Generator	Replace and upgrade existing backup generator and build housing for weather protection	\$ 300,000		\$ 285,121	\$ 14,879
2. Personal Protective Equipment	Personal Protective Equipment for Fire Personnel to better equip and protect emergency service workers	\$ 115,475	\$ 115,450		\$ 25
3. Remote Access Devices	Provides for additional devices for checkout/remote devices	\$ 10,500	\$ 10,328	\$ -	\$ 172
	Equipment Total	\$ 425,975	\$ 125,778	\$ 285,121	\$ 15,077
Category: Supplies/Contractual Services					
1. Cybersecurity enhancements/software	Enhanced protection of City network	\$ 69,200	\$ 23,791	\$ -	\$ 45,409
2. Single Audit and software for grant compliance	Grant Compliance tools	\$ 32,750	\$ 22,750		\$ 10,000
3. Municipal Court Software Enhancements	Software to enhance efficiency in court operations	\$ 15,375	\$ 6,610		\$ 8,765
4. City Wide sanitizer stations		\$ 2,768	\$ 2,450		\$ 318
	Supplies/Services Total	\$ 120,093	\$ 55,601	\$ -	\$ 64,492
		BUDGET	EXPENDED	ENCUMBERED	UNSPENT
	TOTALS	\$ 6,078,036	\$ 2,374,698.73	\$ 1,131,816.60	\$ 2,571,520.58

Certificates of Obligation Expenditures

Attached is an expenditure and project listing for debt proceeds that have not been fully expended as of 03/31/2024. Below is a summary of the Certificates of Obligation issuances and their designated use.

- ❖ The \$7.5 million **2017** Certificates of Obligation proceeds were received in June, 2017 and are 95% expended. These proceeds were used to fund water and wastewater infrastructure improvements to include Whitley Road Phase One-Four water and sewer projects, Starnes Road Water Main, and Meadowlark East and the Sanitary Sewer Evaluation. Whitley Four is the final project and construction began in March, 2023.
- ❖ The \$7.0 million **2018** Certificates of Obligation proceeds were received in September, 2018 and are 89% expended. Various vehicles and equipment were funded by the proceeds that are completed or in progress. Projects include partial funding for the Splashpad Project (EDC funded), the Whites Branch Creek Trail, Branding Signs (EDC funded), Whitley Road Four, and various parks projects such as the lighting replacement at Capp Smith. Whitley Road 4, street overlays, and various park projects are partially expended and will continue through 2023-2024.
- ❖ The \$8.850 million **2019** Certificates of Obligation proceeds were received in September, 2019 and are 43% expended. These funds are reserved for water and wastewater projects, parks projects, and capital outlay to include vehicles and equipment for various departments. A listing of funded items is attached that include completed and in progress projects and equipment. Group 1 and Group 4 have been bid and construction has begun. Group 3 and 4 will be bid later in the fiscal year. Group 3 is partially funded by ARPA funds.
- ❖ The \$3.0 million **2020** Certificates of Obligation proceeds were received in September, 2020 and are 48% expended. These funds are reserved for the Whitley Road 4 street project, the Capp Smith Food Business Park (funded by the Watauga Economic Development Corporation), library and parks building improvements, and vehicles and equipment.
- ❖ The \$4.70 million **2021** Certificates of Obligation proceeds were received in September, 2021 and are 35% expended. These funds are reserved for Street projects and Capital Outlay equipment, vehicles, and technology identified in the 5-year plans. 78% of these funds are reserved for the Whitley Road 5 Street Project that is currently in the engineering phase.
- ❖ The \$5.00 million **2022** Certificates of Obligation proceeds were received in September, 2022. These funds are reserved for Hightower, Phase I street project engineering, the fleet building expansion, foster village park, playground equipment at various parks, and vehicles and technology identified in the 5-year plans. 56% of these funds have been expended at this time.
- ❖ The \$8.950 million **2023** Certificates of Obligation proceeds were received in October, 2023. These funds are reserved for Hightower, Phase I street project construction, Watauga Road engineering, and a replacement ambulance.

Fund Detail Report

MARCH 2024

**CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending: March 31, 2024 (2nd FY Qtr.)**

GENERAL FUND - 01

REVENUE:	ORIGINAL BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
TAXES							
AD VALOREM	7,135,000	6,972,899	97.73%	2.27%	6,388,418	584,481	9.15%
Delinquent	30,000	13,223	44.08%	55.92%	(1,955)	15,178	776.45%
Penalty & Interest	29,500	18,494	62.69%	37.31%	17,120	1,374	8.03%
SALES TAX	5,038,000	2,385,621	47.35%	52.65%	2,432,028	(46,406)	-1.91%
UTILITY FRANCHISE	889,500	727,785	81.82%	18.18%	759,734	(31,949)	-4.21%
LICENSES & PERMITS	762,700	435,162	57.06%	42.94%	346,173	88,988	25.71%
INTERGOVERNMENTAL REVENUE	503,000	271,165	53.91%	46.09%	268,273	2,892	1.08%
CHARGES FOR SERVICES	1,203,000	576,886	47.95%	52.05%	536,390	40,496	7.55%
FINES & FORFEITURES	559,500	220,140	39.35%	60.65%	245,920	(25,779)	-10.48%
MISCELLANEOUS INCOME	739,700	387,718	52.42%	47.58%	312,401	75,317	24.11%
OPERATING TRANSFERS IN	861,000	428,539	49.77%	50.23%	420,090	8,449	2.01%
TOTAL REVENUE	\$17,750,900	\$12,437,632	70.07%	29.93%	\$11,724,592	\$713,040	6.08%
ADMINISTRATION	562,480	245,053	43.57%	56.43%	223,250	21,802	9.77%
HUMAN RESOURCES	248,030	108,583	43.78%	56.22%	93,007	15,576	16.75%
BUILDINGS - PW	1,069,900	446,449	41.73%	58.27%	434,128	12,321	2.84%
FINANCE	603,210	326,209	54.08%	45.92%	327,608	(1,399)	-0.43%
MUNICIPAL COURT - FIN	456,110	202,455	44.39%	55.61%	195,685	6,770	3.46%
DEVELOPMENTAL SERVICES - PW	291,860	113,293	38.82%	61.18%	103,671	9,622	9.28%
LIBRARY	1,175,200	528,836	45.00%	55.00%	476,202	52,634	11.05%
PARKS AND RECREATION	1,648,305	593,161	35.99%	64.01%	430,308	162,853	37.85%
POLICE	5,073,500	2,209,405	43.55%	56.45%	2,347,727	(138,323)	-5.89%
FIRE/EMS	4,096,490	1,937,860	47.31%	52.69%	1,615,132	322,728	19.98%
PUBLIC WORKS - STREETS	719,780	268,164	37.26%	62.74%	298,939	(30,774)	-10.29%
FLEET MANAGEMENT - PW	361,650	108,608	30.03%	69.97%	112,740	(4,131)	-3.66%
NON-DEPARTMENTAL	879,415	562,737	63.99%	36.01%	538,639	24,098	4.47%
INFORMATION TECHNOLOGY	683,240	376,163	55.06%	44.94%	350,225	25,938	7.41%
ECONOMIC DEVELOPMENT	-	-	-	-	-	-	-
CITY ATTORNEY	95,000	24,150	25.42%	74.58%	24,435	(285)	-1.17%
TRANSFERS TO OTHER FUNDS	235,000	117,500	50.00%	50.00%	242,500	(125,000)	-51.55%
TOTAL EXPENDITURES	\$18,199,170	\$8,168,625	44.88%	55.12%	\$7,814,194	\$354,431	4.54%
EXCESS REVENUE OVER (UNDER) EXPENDITURES	(\$448,270)	\$4,269,007			\$3,910,398	\$358,609	

CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending: March 31, 2024 (2nd FY Qtr.)

DEBT SERVICE FUND - 03

REVENUE:	CURRENT BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
TAXES							
AD VALOREM	4,149,000	4,078,063	98.29%	1.71%	3,320,135	\$757,929	22.83%
Delinquent	11,000	6,873	62.48%	37.52%	-914	\$7,787	-851.78%
Penalty & Interest	11,000	8,487	77.15%	22.85%	7,032	\$1,455	20.69%
INTEREST EARNINGS	40,000	33,886	84.72%	15.29%	17,628	\$16,258	92.22%
OTHER FINANCING SOURCES	-	-	-	-	-	-	-
OPERATING TRANSFERS IN	149,000	74,500	50.00%	50.00%	76,600	(\$2,100)	-2.74%
TOTAL REVENUE	\$4,360,000	\$4,201,809	96.37%	3.63%	\$3,420,480	\$781,329	22.84%
 Contractual & Sundry	 4,150,768	 3,687,549	 88.84%	 11.16%	 3,286,548	 \$401,001	 12.20%
TOTAL EXPENDITURES	\$4,150,768	\$3,687,549	88.84%	11.16%	3,286,548	\$401,001	0.00%
 EXCESS REVENUE OVER (UNDER) EXPENDITURES	 \$209,232	 \$514,260			 \$133,932	 \$380,328	

CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending: March 31, 2024 (2nd FY Qtr.)

WATER & SEWER - 40

	CURRENT BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
REVENUE:							
WATER SALES	4,950,000	2,433,810	49.17%	50.83%	2,375,896	57,914	2.44%
SEWER SALES	4,350,000	1,994,407	45.85%	54.15%	2,019,238	(24,831)	-1.23%
MISCELLANEOUS	276,000	148,211	53.70%	46.30%	140,160	8,051	5.74%
PENALTY	175,000	103,389	59.08%	40.92%	90,634	12,755	14.07%
INTEREST	110,000	72,084	65.53%	34.47%	58,378	13,706	23.48%
TRANSFERS	10,000	60,390	0.00%	0.00%	8,986	51,403	572.02%
TAP FEES	-	15,866	-	-	10,050	5,816	57.87%
SALE OF ASSETS	-	-	-	-	-	-	-
TOTAL REVENUE	\$9,871,000	\$4,828,157	48.91%	51.09%	\$4,703,343	\$124,815	2.65%
ADMINISTRATIVE	185,200	88,544	47.81%	52.19%	82,160	6,384	7.77%
NON-DEPARTMENTAL	794,980	413,310	51.99%	48.01%	429,405	(16,095)	-3.75%
BILLING & COLLECTIONS	615,410	279,834	45.47%	54.53%	276,519	3,315	1.20%
MGT. INFO SYSTEMS	126,990	70,970	55.89%	44.11%	61,926	9,044	14.61%
WATER DISTRIBUTION	2,865,830	1,209,519	42.20%	57.80%	1,131,176	78,344	6.93%
WASTEWATER COLLECTION	3,284,614	1,743,898	53.09%	46.91%	1,470,291	273,606	18.61%
TRANSFERS	2,345,000	1,968,786	83.96%	16.04%	2,025,785	(56,999)	-2.81%
TOTAL EXPENDITURES	10,218,024	5,774,861	56.52%	43.48%	5,477,262	\$297,599	5.43%
EXCESS REVENUE OVER (UNDER) EXPENDITURES							
	(\$347,024)	(\$946,703)			(\$773,919)	(\$172,784)	

CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending: March 31, 2024 (2nd FY Qtr.)

STORM DRAIN FUND - 15

	CURRENT BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
REVENUE:							
USERS FEE	1,485,000	744,996	50.17%	49.83%	741,436	3,561	0.48%
OTHER REVENUE	-	-	-	-	-	-	-
INTEREST INCOME	160,000	113,488	70.93%	29.07%	77,625	35,863	46.20%
TOTAL REVENUE	\$1,645,000	\$858,484	52.19%	47.81%	\$819,060	\$39,424	4.81%
PERSONNEL	506,800	182,035	35.92%	64.08%	\$201,752	(19,717)	-9.77%
SUPPLIES	37,400	6,724	17.98%	82.02%	\$8,136	(1,412)	-17.36%
MAINTENANCE	37,000	2,397	6.48%	93.52%	\$6,865	(4,468)	-65.09%
CONTRACTUAL & SUNDRY	356,200	109,431	30.72%	69.28%	\$99,710	9,721	9.75%
CAPITAL	1,331,300	56,798	4.27%	95.73%	\$11,071	45,727	413.05%
TRANSFERS TO OTHER FUNDS	194,000	97,250	50.13%	49.87%	\$37,071	60,179	162.33%
TOTAL EXPENDITURES	\$2,462,700	\$454,634	18.46%	81.54%	\$364,604	\$90,030	24.69%
EXCESS REVENUE OVER (UNDER) EXPENDITURES	(\$817,700)	\$403,850			\$454,456	(\$50,605)	

**CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending: March 31, 2024 (2nd FY Qtr.)**

CRIME CONTROL DISTRICT - 18

	ORIGINAL BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
REVENUE:							
SALES TAX	1,977,000	893,741	45.21%	54.79%	961,174	(67,433)	-7.02%
INTEREST EARNING/OTHER	126,000	105,914	84.06%	15.94%	58,384	47,529	81.41%
TRANSFERS	-	-	-	-	-	-	-
TOTAL REVENUE	\$2,103,000	\$999,655	47.53%	52.47%	\$1,019,558	(\$19,904)	-1.95%
PERSONNEL SERVICES	1,301,400	506,501	38.92%	61.08%	\$586,346	(79,845)	-13.62%
SUPPLIES	170,500	81,848	48.00%	52.00%	\$58,068	23,781	40.95%
MAINTENANCE	268,700	137,175	51.05%	48.95%	\$156,538	(19,364)	-12.37%
CONTRACTUAL & SUNDRY	266,200	125,739	47.23%	52.77%	\$117,003	8,736	7.47%
TRANSFERS	38,000	17,874	47.04%	52.96%	\$18,817	(943)	-5.01%
CAPITAL OUTLAY	212,100	99,428	0.00%	0.00%	\$119,134	(19,706)	0.00%
TOTAL EXPENDITURES	2,256,900	968,565	42.92%	57.08%	\$1,055,905	(\$87,341)	-8.27%
EXCESS REVENUE OVER (UNDER) EXPENDITURES	(\$153,900)	\$31,090			(\$36,347)	\$67,437	

CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending **March 31, 2024 (2nd FY Qtr.)**

STREET MAINTENANCE FUND - 14

	ORIGINAL BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
REVENUE:							
SALES TAX	-	-	-	-	-	-	-
INTEREST EARNINGS	-	-	0.00%	100.00%	11,985	(11,985)	-100.00%
INTEREST/ESCROW	-	-	-	-	-	-	-
CONTRIBUTIONS/OTHER	-	-	-	-	-	-	-
TOTAL REVENUE	\$0	\$0	0.00%	100.00%	11,985	(\$11,985)	-100.00%
 MAINTENANCE	63,016	66,104	104.90%	-4.90%	41,753	24,351	58.32%
CONTRACTUAL & SUNDRY	-	-	0.00%	100.00%	2,965	(2,965)	-100.00%
CAPITAL OUTLAY	-	-	0.00%	100.00%	137,645	(137,645)	-100.00%
TOTAL EXPENDITURES	\$63,016	\$66,104	104.90%	-4.90%	\$182,364	(\$116,260)	-63.75%
 EXCESS REVENUE OVER (UNDER) EXPENDITURES	 (\$63,016)	 (\$66,104)			 -\$170,378	 \$104,275	

CITY OF WATAUGA
BUDGET TO ACTUAL COMPARISON
FISCAL YEAR 2024
For the period ending: March 31, 2024 (2nd FY Qtr.)

WATAUGA ECONOMIC DEVELOPMENT CORP - 04

	CURRENT BUDGET	3/31/2024 YTD ACTUAL	% USED	% REMAINING	3/31/2023 YTD ACTUAL	\$ CHG 24 vs 23	% CHG 24 vs 23
REVENUE:							
SALES TAX	996,000	473,762	47.57%	52.43%	482,761	(8,999)	-1.86%
INTEREST EARNINGS	55,000	53,601	97.46%	2.54%	31,079	22,522	72.47%
INTEREST/ESCROW	-	-	-	-	-	-	-
CONTRIBUTIONS/OTHER	3,500	1,463	41.79%	58.21%	875	588	67.14%
TOTAL REVENUE	\$1,054,500	\$528,825	50.15%	49.85%	\$514,715	\$14,110	2.74%
PERSONNEL SERVICES	-	-	-	-	-	-	0.00%
NON-DEPARTMENTAL	-	-	-	-	-	-	0.00%
SUPPLIES	1,000	330	33.03%	66.97%	-	330	0.00%
MAINTENANCE	1,000	-	0.00%	100.00%	-	-	0.00%
CONTRACTUAL & SUNDRY	85,250	72,947	85.57%	14.43%	42,146	30,801	73.08%
TRANSFERS	428,000	214,000	50.00%	50.00%	209,850	4,150	1.98%
CAPITAL OUTLAY	-	-	-	-	-	-	0.00%
TOTAL EXPENDITURES	\$515,250	\$287,277	55.75%	44.25%	\$251,996	\$35,282	14.00%
EXCESS REVENUE OVER (UNDER) EXPENDITURES	\$539,250	\$241,548			\$262,720	(\$21,172)	

DEPARTMENTAL CONSOLIDATED REPORT

MARCH 2024

Group Summary

Department	Original Total Budget	Current Total Budget	Period Activity	Fiscal Activity	Encumbrances	Variance Favorable (Unfavorable)	Percent Remaining
010 - CITY SECRETARY OFFICE	433450.00	433,450.00	43,791.28	190,072.17	0.00	243,377.83	56.15 %
011 - HUMAN RESOURCES	248030.00	248,030.00	21,579.28	108,582.82	30,924.53	108,522.65	43.75 %
013 - DEVELOPMENT SERVICES DIVISION	291860.00	291,860.00	23,971.46	113,293.01	500.00	178,066.99	61.01 %
015 - CITY MANAGER	314230.00	314,230.00	33,682.12	143,524.17	0.00	170,705.83	54.33 %
016 - BUSINESS RETENTION/EDC	6650.00	6,650.00	36,801.11	38,458.01	147.15	-31,955.16	-480.53 %
017 - BUSINESS ATTRACTION/EDC	24300.00	24,300.00	10,000.00	20,879.54	0.00	3,420.46	14.08 %
018 - GENERAL ADMINISTRATION/EDC	56300.00	56,300.00	309.45	13,939.69	0.00	42,360.31	75.24 %
020 - NON-DEPARTMENTAL	1764500.00	1,764,500.00	139,082.44	1,020,795.33	96,120.68	647,583.99	36.70 %
021 - CITY ATTORNEY	95000.00	95,000.00	6,475.87	24,149.59	0.00	70,850.41	74.58 %
030 - MUNICIPAL COURT DIVISION	456110.00	456,110.00	43,923.48	202,455.09	0.00	253,654.91	55.61 %
040 - FINANCE	694060.00	694,060.00	71,573.66	372,208.78	15,909.99	305,941.23	44.08 %
045 - BILLING & COLLECTIONS	615410.00	615,410.00	60,811.17	279,833.97	2,705.00	332,871.03	54.09 %
050 - INFORMATION TECHNOLOGY	810230.00	810,230.00	118,412.61	447,132.50	7,020.46	356,077.04	43.95 %
060 - LIBRARY	1185200.00	1,185,200.00	114,016.32	528,936.24	68,918.05	587,345.71	49.56 %
070 - RECREATION	700520.00	700,520.00	50,893.78	282,558.46	47,813.04	370,148.50	52.84 %
075 - PARKS DEPARTMENT	947785.00	947,785.00	64,275.06	310,602.67	146,022.16	491,160.17	51.82 %
080 - POLICE	7326400.00	7,326,400.00	648,279.55	3,160,095.36	115,288.80	4,051,015.84	55.29 %
085 - FIRE/MIS	4096490.00	4,096,490.00	455,767.50	1,937,859.99	43,381.59	2,115,248.42	51.64 %
090 - PUBLIC WORKS	1545200.00	1,545,200.00	101,066.51	513,790.57	194,859.96	836,549.47	54.14 %
093 - WATER DISTRIBUTION	2865830.00	2,865,830.00	212,172.16	1,209,519.20	21,748.11	1,634,562.69	57.04 %
094 - WASTEWATER COLLECTION	3284614.00	3,284,614.00	261,067.07	1,743,897.55	14,010.00	1,526,706.45	46.48 %
097 - FLEET MAINTENANCE	361650.00	361,650.00	7,787.42	108,608.26	74,073.46	178,968.28	49.49 %
098 - BUILDING MAINTENANCE	1069900.00	1,069,900.00	91,386.77	446,449.29	71,147.44	552,303.27	51.62 %
Report Total:	29,193,719.00	29,193,719.00	2,617,126.07	13,217,642.26	950,590.42	15,025,486.32	51.47 %



AGENDA MEMORANDUM

DATE: April 17, 2024

TO: Honorable City Council Members

FROM: Sandra Gibson, Director of Finance

THROUGH: Joshua Jones, City Manager

SUBJECT: Consideration and approval of the Quarterly Investment Report for the period ending March 31, 2024

BACKGROUND/INFORMATION:

The Quarterly Investment Report for the period ending March 31, 2024 is attached for Council review and approval.

The City is required to comply with Chapter 2256 of the Government Code, otherwise known as the Public Funds Investment Act. Provisions of that act require at a minimum quarterly reporting. The accompanying Quarterly Investment Report lists, in summary form and in detail, the investment position of the City of Watauga's investment portfolio as of March 31, 2024. The overall strategy of running the City's investment portfolios is governed by the City's Investment Policy and overseen by the City's investment committee. All investments are governed by state law and the City's Investment Policy, which dictates the following investment objectives, in order of priority:

Safety of Principal
Liquidity
Return on Investments

As of March 31, 2024, the City held money market accounts and investments with a combined book value of \$53,049,635. The City's fund portfolio consists of operating funds, construction funds, and debt service funds. Construction funds account for 53% of the investment portfolio and are dedicated to funding various capital improvement projects throughout the City. The City's portfolio has averaged a yield of 5.5% for the 2nd quarter of Fiscal Year 2024 and investment earnings for the quarter were \$735,324. During the quarter, the Federal Open Market Committee (FOMC) maintained the Fed Funds target range at 5.25% - 5.50%. The City Portfolio distribution is 6% in Certificates of Deposit, 64% in money market accounts, and 30% in pooled investment accounts.



AGENDA MEMORANDUM

The investment committee reviewed the Quarterly Investment Report. The Committee finds the report to be in compliance with the Public Funds Investment Act and recommends that the City Council receive and accept the report, as presented.

FINANCIAL IMPLICATIONS:

N/A

RECOMMENDATION/ACTION DESIRED:

Staff recommends approval of the Quarterly Investment Report for the period ending March 31, 2024

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Quarterly Investment Report Q2 FY2024

REVIEWED BY:

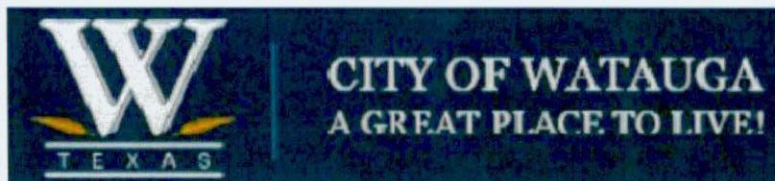
Sandra Gibson, Director of Finance

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 4/25/2024

Final Approval - 4/29/2024



QUARTERLY INVESTMENT REPORT

For the Quarter Ended

March 31, 2024

Prepared by

Valley View Consulting, L.L.C.

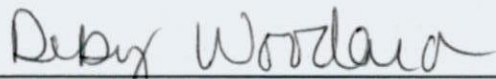
The investment portfolio of the City of Watauga is in compliance with the Public Funds Investment Act and the City of Watauga Investment Policy



City Manager



Director of Finance



Assistant Director of Finance

Disclaimer: These reports were compiled using information provided by the City of Watauga. No procedures were performed to test the accuracy or completeness of this information. The market values included in these reports were obtained by Valley View Consulting, L.L.C. from sources believed to be accurate and represent proprietary valuation. Due to market fluctuations these levels are not necessarily reflective of current liquidation values. Yield calculations are not determined using standard performance formulas, are not representative of total return yields and do not account for investment adviser fees.

Summary

Quarter End Results by Investment Category:

<u>Asset Type</u>	<u>December 31, 2023</u>		<u>March 31, 2024</u>		
	<u>Book Value</u>	<u>Market Value</u>	<u>Book Value</u>	<u>Market Value</u>	<u>Ave. Yield</u>
DDA/MMA/NOW	\$ 37,465,534	\$ 37,465,534	\$ 34,014,078	\$ 34,014,078	5.55%
Pools	15,851,871	15,851,871	15,818,623	15,818,623	5.33%
CD/Security	3,172,021	3,172,021	3,216,935	3,216,935	5.80%
Totals	\$ 56,489,425	\$ 56,489,425	\$ 53,049,635	\$ 53,049,635	5.50%

Current Quarter Portfolio Performance (1)

Average Quarterly Yield	5.50%
Rolling Three Month Treasury	5.46%
Rolling Six Month Treasury	5.37%
TexPool	5.32%

Fiscal Year-to-Date Portfolio Performance (2)

Average Quarter End Yield	5.54%
Rolling Three Month Treasury	5.49%
Rolling Six Month Treasury	5.43%
TexPool	5.34%

Interest Earnings (Approximate)

Quarterly Interest Earnings	\$ 735,324
Fiscal YTD Interest Earnings	\$ 1,446,891

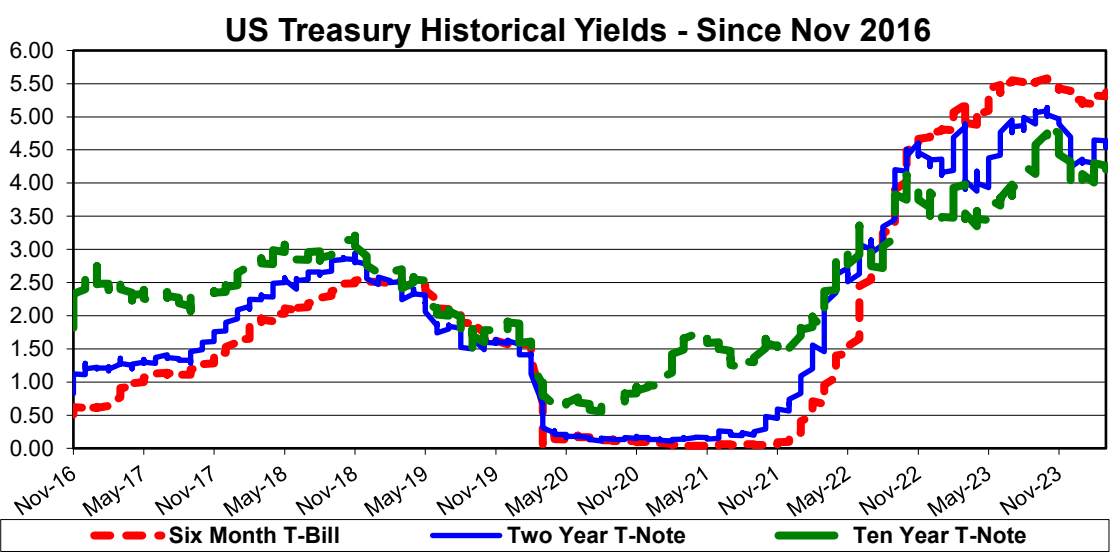
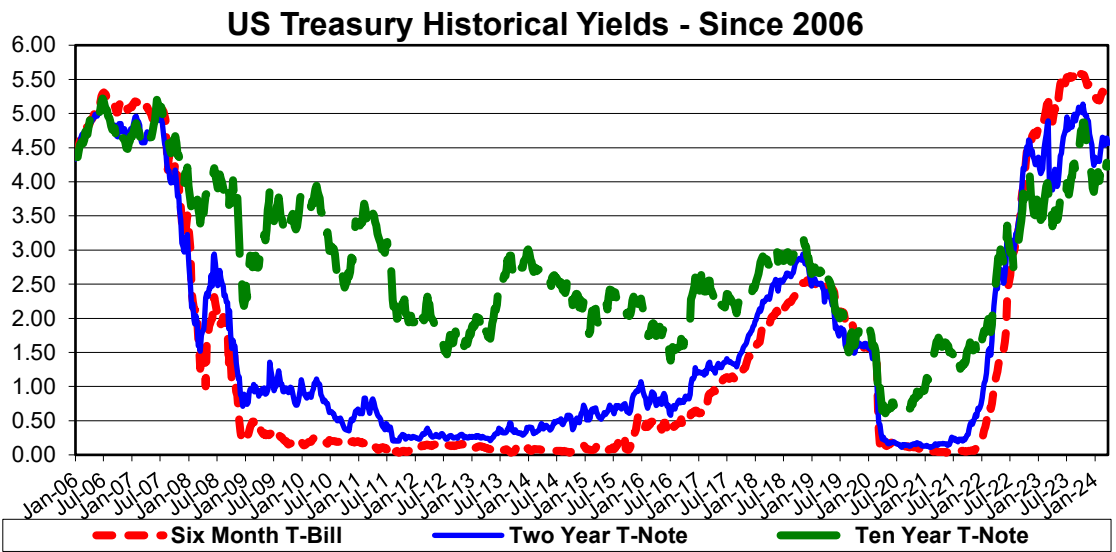
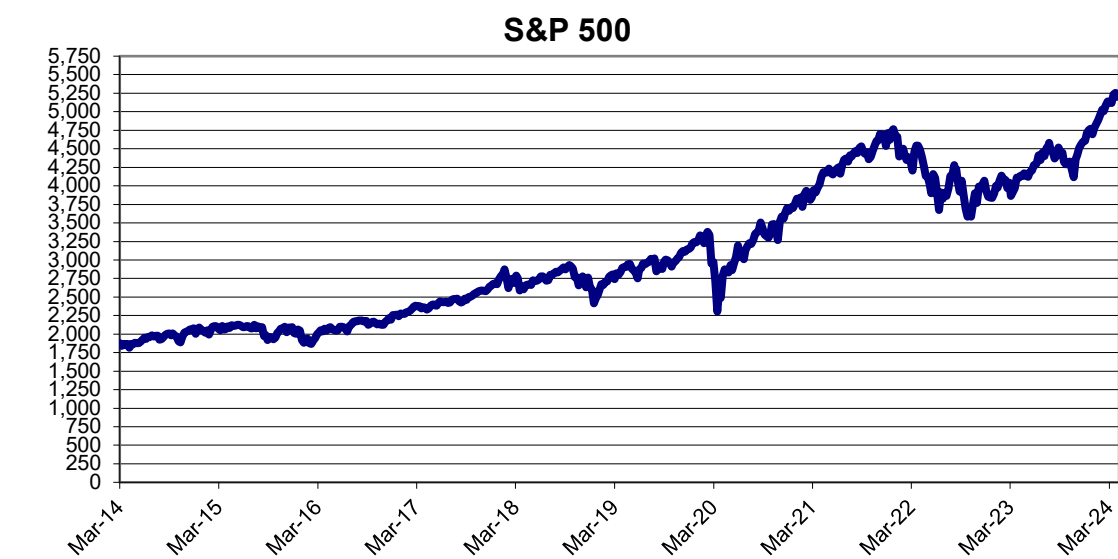
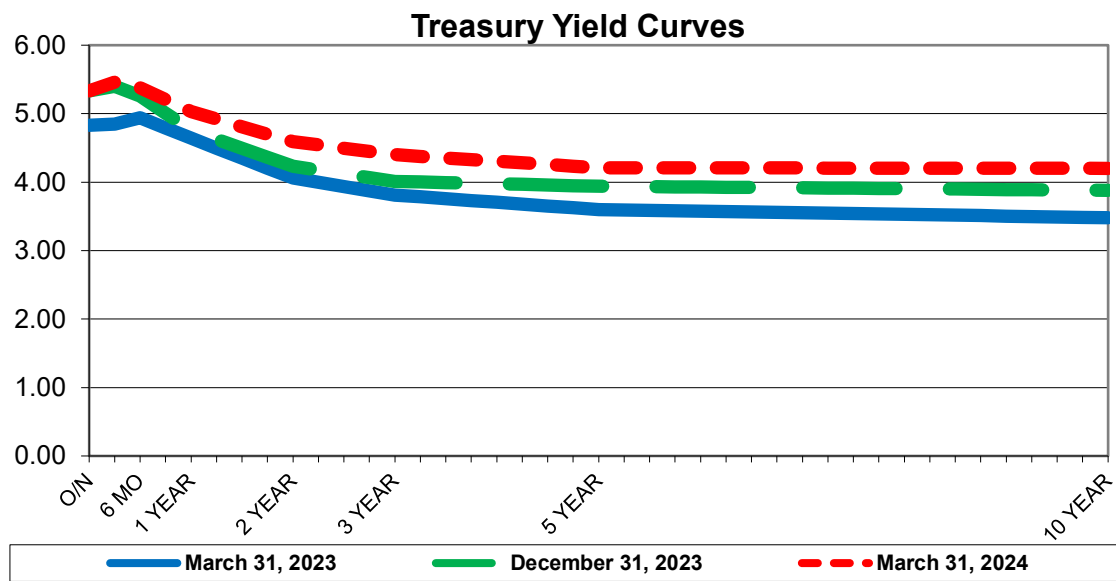
(1) **Current Quarter Average Yield** - based on adjusted book value, realized and unrealized gains/losses and investment advisory fees are not considered. The yield for the reporting month is used for bank, pool, and money market balances.

(2) **Fiscal Year-to-Date Average Yields** - calculated using quarter end report yields and adjusted book values and does not reflect a total return analysis or account for advisory fees.

Economic Overview

3/31/2024

The Federal Open Market Committee (FOMC) maintained the Fed Funds target range 5.25% - 5.50% (Effective Fed Funds are trading +/-5.33%). All expectations are for reduced future rates, but any actions will be meeting-by-meeting and "data-dependent." Fourth Quarter 2023 GDP recorded a stronger than expected 3.4%. The S&P 500 Stock Index reached another new high closing over 5,200. The yield curve remains inverted but longer yields rose slightly. Crude Oil traded over \$87 per barrel. Inflation stubbornly remained above the FOMC 2% target (Core PCE +/-2.8% and Core CPI +/-3.8%). Reduced global economic outlooks and ongoing/expanding military conflicts continue increasing uncertainty.



Investment Holdings

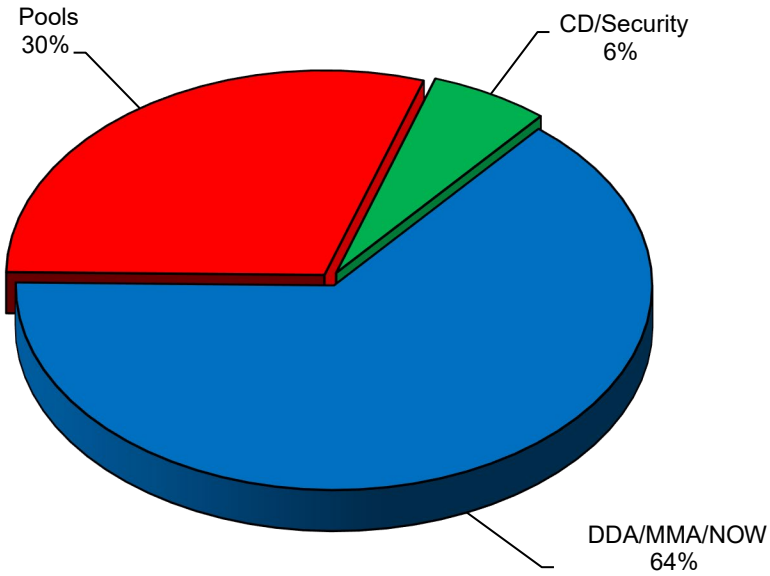
March 31, 2024

Description	Rating	Coupon/ Discount	Maturity Date	Settlement Date	Original Face\ Par Value	Book Value	Market Price	Market Value	Life (Days)	Yield
Southside Bank MMA		5.55%	04/01/24	03/31/24	\$ 34,014,078	\$ 34,014,078	1.00	\$ 34,014,078	1	5.55%
TexasDAILY	AAAm	5.31%	04/01/24	03/31/24	510,824	510,824	1.00	510,824	1	5.31%
LOGIC	AAAm	5.47%	04/01/24	03/31/24	335,842	335,842	1.00	335,842	1	5.47%
TexPool	AAAm	5.32%	04/01/24	03/31/24	13,618,896	13,618,896	1.00	13,618,896	1	5.32%
TexPool Prime	AAAm	5.49%	04/01/24	03/31/24	1,353,061	1,353,061	1.00	1,353,061	1	5.49%
East West Bank CD		5.64%	04/29/24	07/28/23	3,096,000	3,216,935	100.00	3,216,935	29	5.80%
					\$ 52,928,700	\$ 53,049,635		\$ 53,049,635	3	5.50%
									(1)	(2)

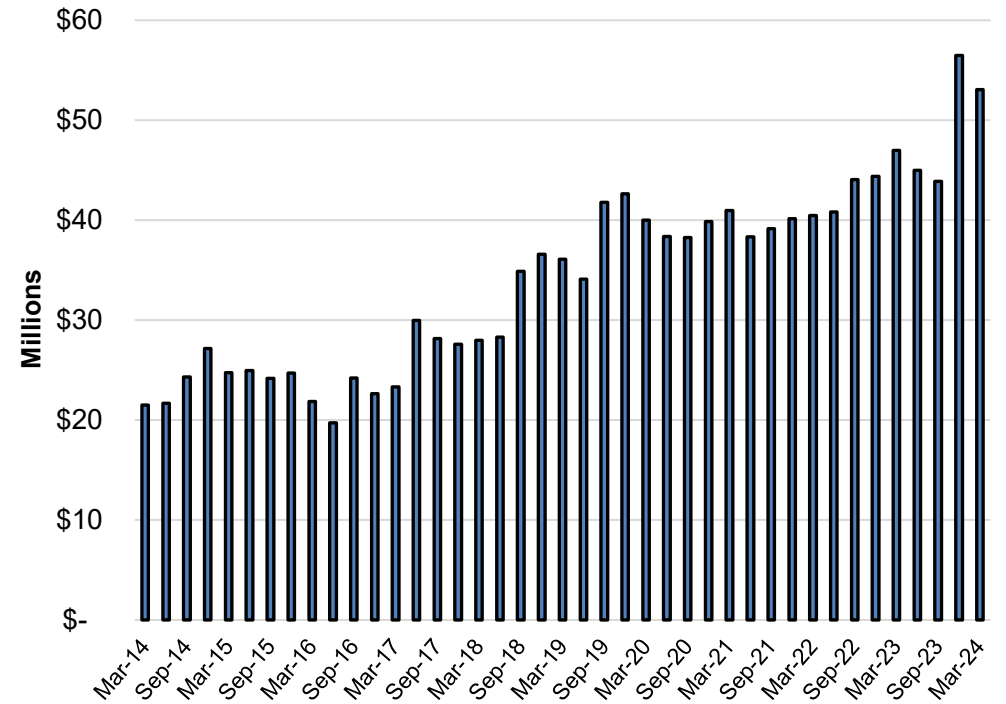
(1) **Weighted average life** - Pools, Money Market Funds, and Bank Deposits are assumed to have a one day maturity.

(2) **Weighted average yield to maturity** - The weighted average yield to maturity is based on Adjusted Book Value, adviser fees and realized and unrealized gains/losses are not considered. The pool and mutual fund yields are the average for the last month of the quarter. Bank deposit yields are estimated from the monthly allocated earnings.

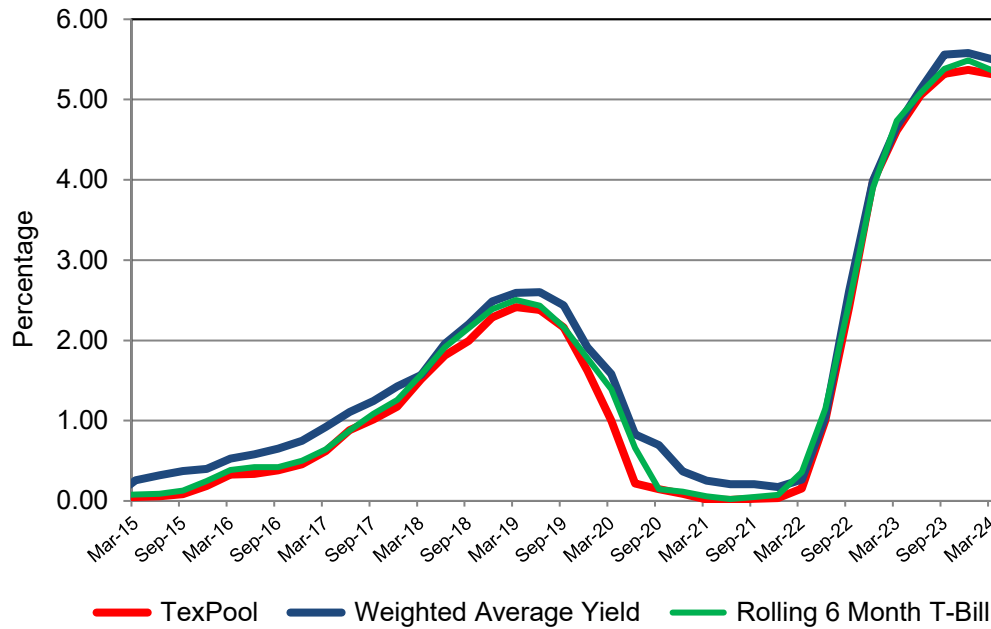
Portfolio Composition



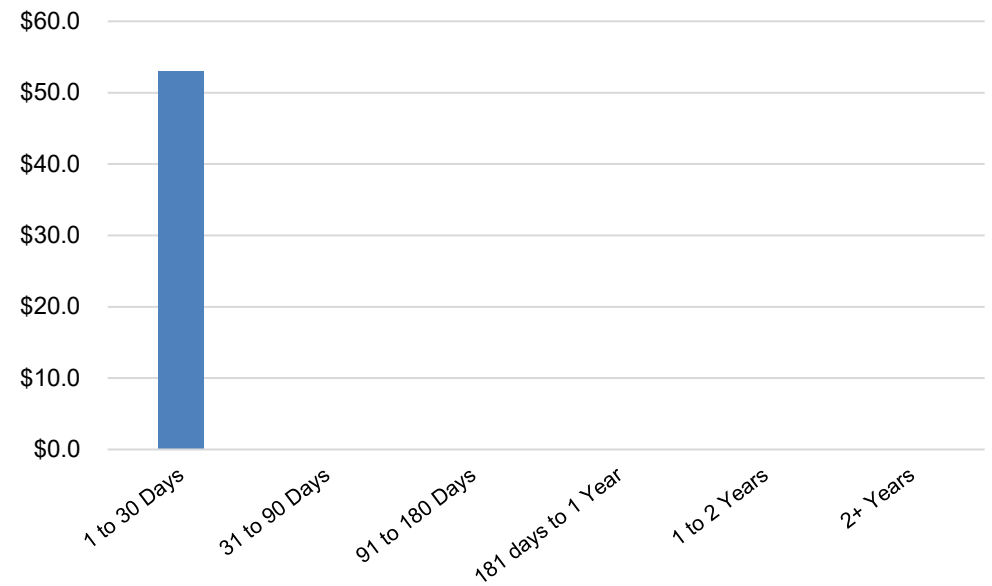
Quarter End Book Value



Total Portfolio Performance



Distribution by Maturity (Millions)



Book & Market Value Comparison

Issuer/Description	Yield	Maturity Date	Book Value 12/31/23	Increases	Decreases	Book Value 03/31/24	Market Value 12/31/23	Change in Market Value	Market Value 03/31/24
Southside Bank MMA	5.55%	04/01/24	\$ 37,465,534	\$ —	\$ (3,451,456)	\$ 34,014,078	\$ 37,465,534	\$ (3,451,456)	\$ 34,014,078
TexasDAILY	5.31%	04/01/24	504,110	6,714	—	510,824	504,110	6,714	510,824
LOGIC	5.47%	04/01/24	331,288	4,554	—	335,842	331,288	4,554	335,842
TexPool	5.32%	04/01/24	13,681,843	—	(62,947)	13,618,896	13,681,843	(62,947)	13,618,896
TexPool Prime	5.49%	04/01/24	1,334,630	18,431	—	1,353,061	1,334,630	18,431	1,353,061
East West Bank CD	5.64%	04/29/24	3,172,021	44,914	—	3,216,935	3,172,021	44,914	3,216,935
TOTAL / AVERAGE	5.50%		\$ 56,489,425	\$ 74,613	\$ (3,514,403)	\$ 53,049,635	\$ 56,489,425	\$ (3,439,790)	\$ 53,049,635

Allocation

March 31, 2024

Book & Market Value

	Total	Consolidated Cash	Construction	Crime Control District
Southside Bank MMA	\$ 34,014,078	\$ 5,867,689	\$ 28,146,389	\$ –
TexasDAILY	510,824	510,824	–	–
LOGIC	335,842	335,842	–	–
TexPool	13,618,896	13,593,332	–	25,564
TexPool Prime	1,353,061	1,353,061	–	–
04/29/24–East West Bank CD	3,216,935	3,216,935	–	–
Totals	\$ 53,049,635	\$ 24,877,682	\$ 28,146,389	\$ 25,564

Allocation

December 31, 2023

Book & Market Value

	Total	Consolidated Cash	Construction	Crime Control District
Southside Bank MMA	\$ 37,465,534	\$ 6,717,628	\$ 30,747,906	\$ –
Texas Term Daily	504,110	504,110	–	–
LOGIC	331,288	331,288	–	–
TexPool	13,681,843	13,656,615	–	25,228
TexPool Prime	1,334,630	1,334,630	–	–
04/29/24–East West Bank CD	3,172,021	3,172,021	–	–
Totals	\$ 56,489,425	\$ 25,716,292	\$ 30,747,906	\$ 25,228

Dallas–Fort Worth Economic Indicators

Federal Reserve
Bank of Dallas

DFW economy dashboard (February 2024)			
Job growth (annualized)	Unemployment rate	Avg. hourly earnings	Avg. hourly earnings growth y/y
Nov. 23–Feb. '24			
1.3%	3.7%	\$34.05	2.1%

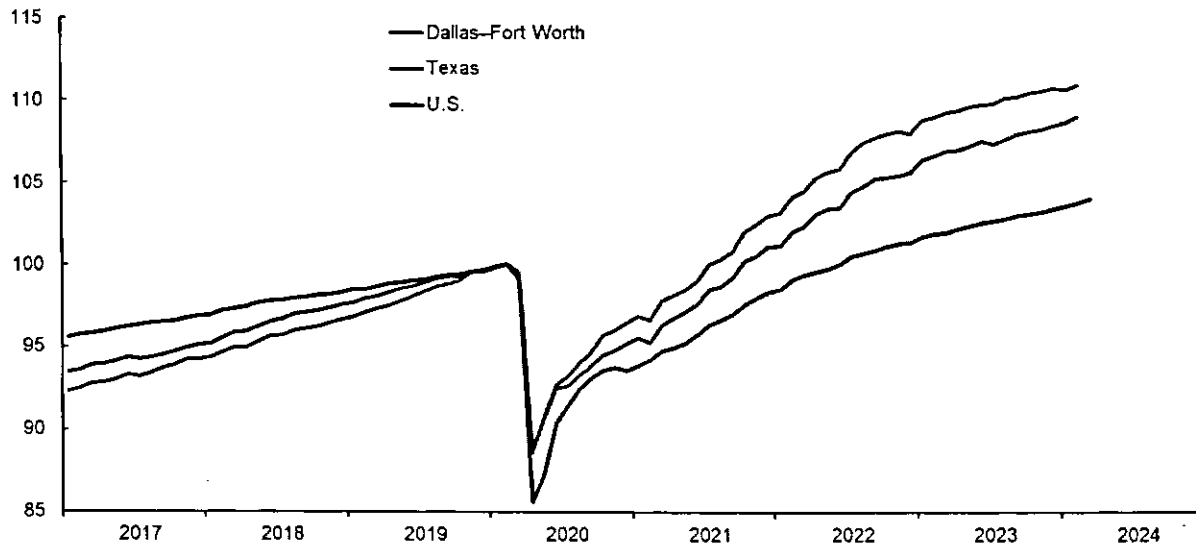
The Dallas–Fort Worth economy expanded in February. Job growth accelerated, and unemployment held steady for the third straight month. Sales tax collections climbed in March, suggestive of strong consumer spending, while apartment demand fell. According to recently released data, DFW continued to see strong population growth in 2023 due to solid in-migration.

Labor market

Employment rises

DFW payroll employment expanded an annualized 2.9 percent (10,000 jobs) in February following job declines in the previous month (*Chart 1*). In the three months through February, employment was up a modest 1.3 percent in DFW—below its trend growth rate. Job gains were mixed across sectors during this period, with job growth led by other services and manufacturing. Payrolls were flat in trade, transportation and utilities and declined in information services and construction and mining. Texas payrolls rose an annualized 2.8 percent in the three months ending in February, while U.S. employment increased 2.1 percent.

Chart 1
Employment growth
 Index, February 2020 = 100



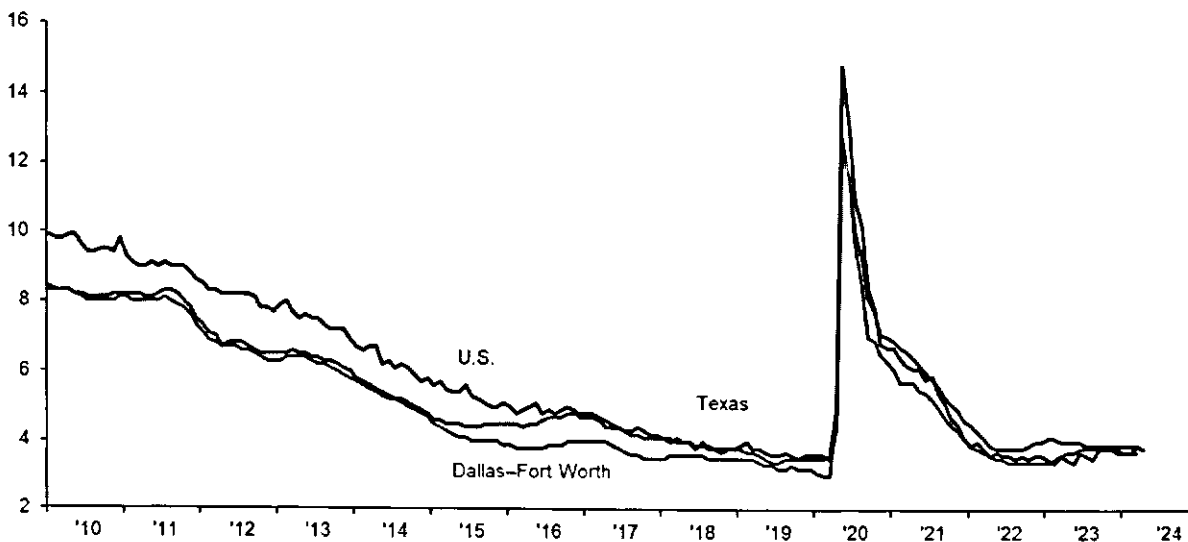
SOURCE: Bureau of Labor Statistics; Texas Workforce Commission; seasonal and other adjustments by the Dallas Fed.

Federal Reserve Bank of Dallas

Unemployment stable

The DFW labor market continued to be tight in February. The DFW unemployment rate held steady at 3.7 percent, remaining below both the state's and nation's jobless rate of 3.9 percent (*Chart 2*). The labor force declined an annualized 1.3 percent in DFW from November through February, while it grew 1.0 percent in the state.

Chart 2
Unemployment rate
 Percent*



*Seasonally adjusted.

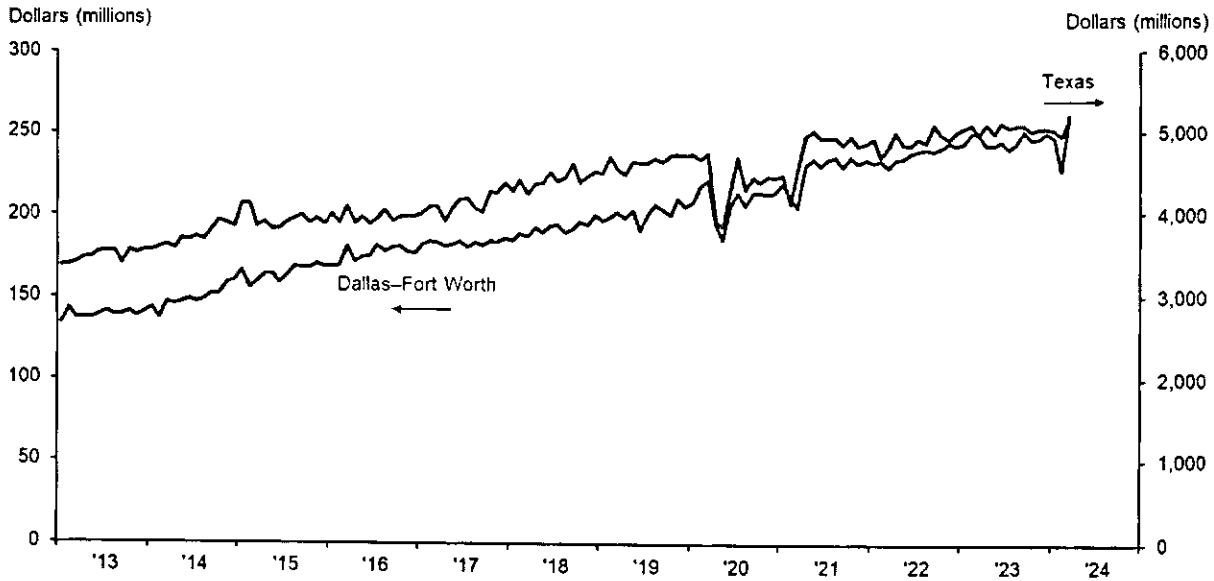
SOURCE: Bureau of Labor Statistics; Texas Workforce Commission; seasonal adjustments by the Dallas Fed.

Federal Reserve Bank of Dallas

Retail sales tax collections

In March, DFW retail sales tax collections climbed 14.8 percent to \$260 million (*Chart 3*). Sales tax collections were up 15.0 percent in Dallas, 7.9 percent in Fort Worth and 4.2 percent in Texas in March. Year over year, the metroplex's retail sales tax collections were up 4.6 percent, and Texas' collections rose 4.0 percent.

Chart 3
Retail sales tax collections



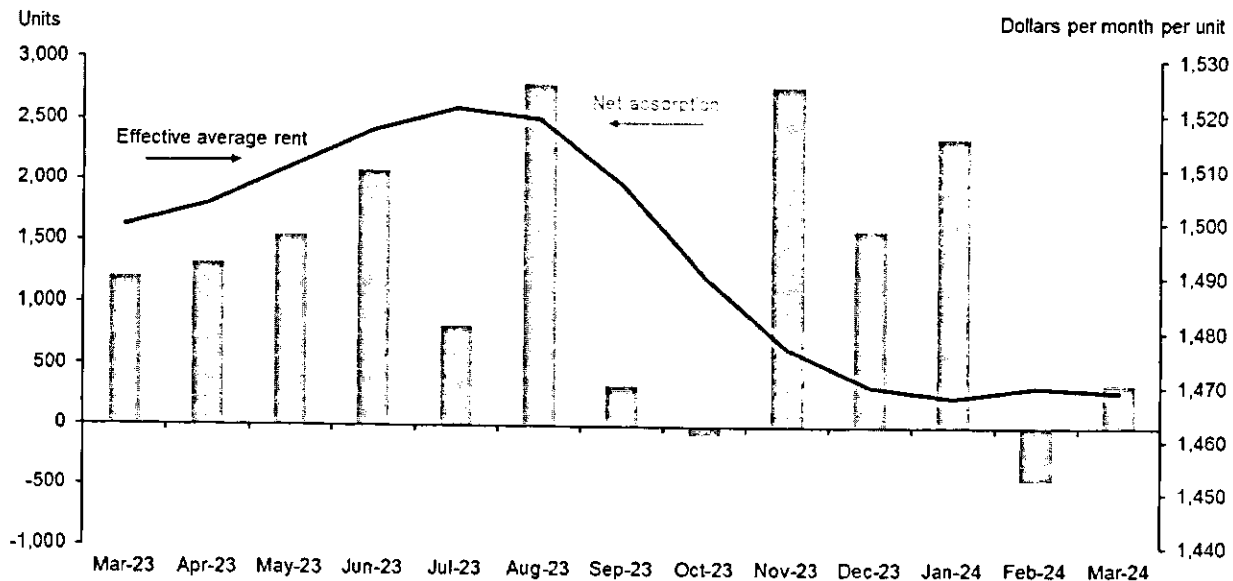
NOTE: Data are through March 2024 and are seasonally adjusted and real.
SOURCE: Texas Workforce Commission.

Federal Reserve Bank of Dallas

Multifamily housing

DFW apartment absorption moderated in February and March following strong demand in January. Net absorption was nearly 2,300 units in the first quarter this year following an increase of about 4,300 units in fourth quarter 2023 (*Chart 4*). With demand slowing, effective monthly rents in DFW were relatively flat at \$1,469 per unit in March compared with year-end 2023 but were down 2.0 percent from year-ago levels. Occupancy dipped to 89.1 percent and was 1.8 percentage points below March 2023 levels. Contacts noted that an elevated level of apartment completions was weighing down occupancy and rents.

Chart 4
DFW apartment market



SOURCE: MRI ApartmentData.com.

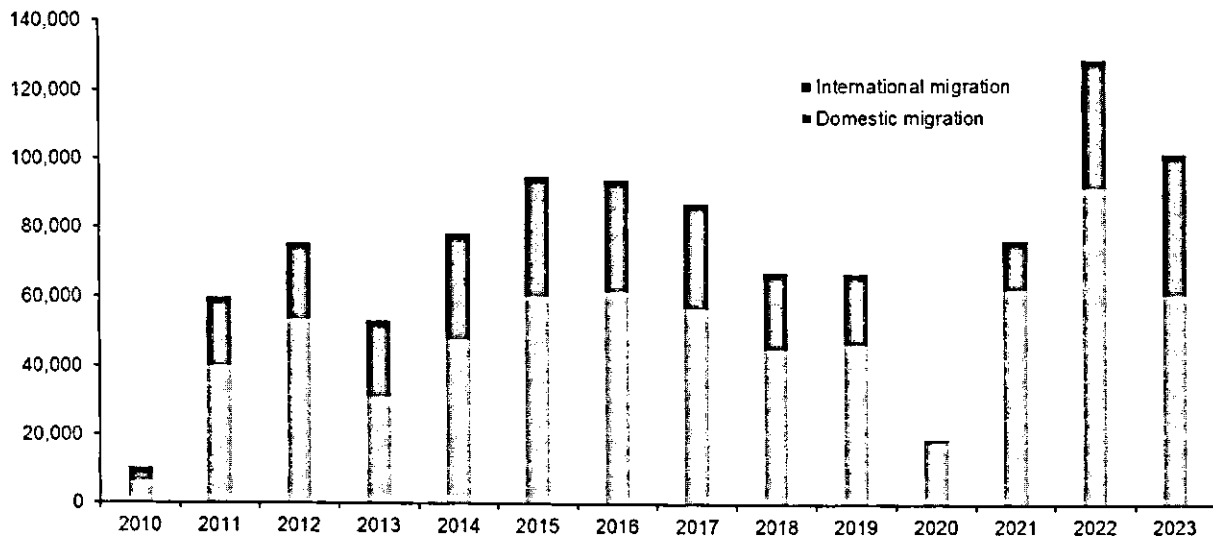
Federal Reserve Bank of Dallas

Population

According to recently released census data, DFW's population increased by 152,600 from July 2022 to July 2023 thanks to continuing strong migration. Domestic migration accounted for 40 percent of the increase (60,500 residents), while 27 percent of the growth (41,000) came from international migration (*Chart 5*). DFW's population eclipsed the 8 million mark last year, and growth was 1.9 percent, slightly slower than the 2.2 percent in 2022 but in line with its long-term average of 1.8 percent. In Dallas, population growth moderated to 2.0 percent in 2023 from 2.4 percent in 2022, while in Fort Worth, growth held steady at 1.8 percent. Population growth at the state level was stable at 1.6 percent in 2023.

Chart 5
Migration to DFW

Net migration



SOURCE: Census Bureau.

Federal Reserve Bank of Dallas

NOTE: Data may not match previously published numbers due to revisions.

About Dallas–Fort Worth Economic Indicators

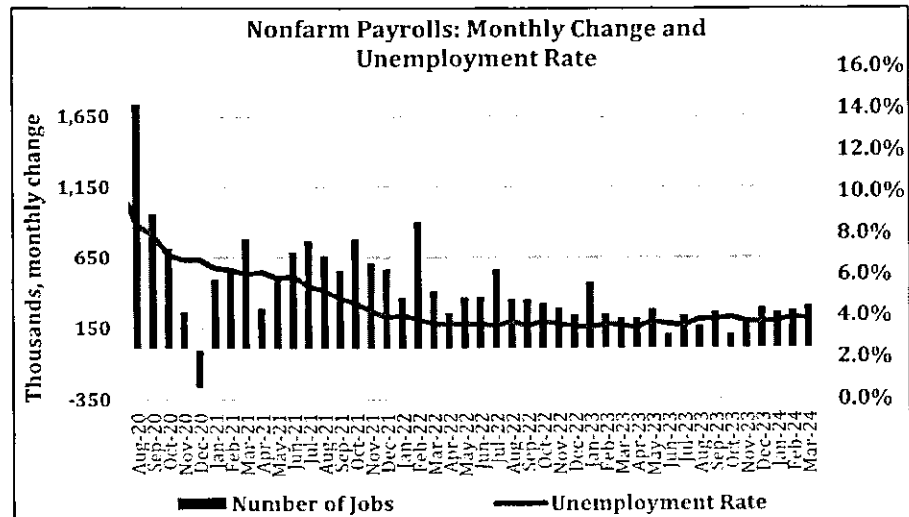
Questions or suggestions can be addressed to Laila Assanie at laila.assanie@dal.frb.org. *Dallas–Fort Worth Economic Indicators* is published every month after state and metro employment data are released.

Market Outlook

April 5, 2024

The Federal Open Market Committee (FOMC) voted to maintain the current Fed Funds Rate target range of 5.25% to 5.50% at their March meeting as they await more data to support a sustainable trend toward their 2% inflation goal. Persistently low housing supply has kept home prices elevated, and sales trends continue to track the minor movements in mortgage rates or temporary changes in supply. Final fourth quarter GDP was revised higher to 3.4% growth. Retail Sales picked back up in March but at a slower pace than the market expected.

The March Employment report added 303,000 jobs, vastly exceeding market expectations of 200,000. The previous two months were adjusted with a net increase of 22,000 jobs. February was revised to +270,000 from the +275,000 previously reported, and January was revised to +256,000 from the previously reported +229,000 jobs. The three-month average increased to +276,000 per month (the previous three-month average was +265,000 per month). Health/Education (+88,000), Government (+71,000), and Construction (+39,000) once again saw notable gains for the month. Leisure/Hospitality (+49,000) also continued its upward trend and has returned to its pre-pandemic level. Retail (+17,600), Professional/Business (+7,000), Transportation/Warehousing (+1,200), and Mining (+300) saw modest increases, while Manufacturing (0) came in flat for March. The March Labor Participation Rate, a measure of the percentage of eligible workers that hold jobs, increased to 62.7%, still below its pre-pandemic level of 63.4%. The Unemployment Rate decreased slightly to 3.8% from 3.9% in February. The U6 rate (or the under-employed rate – those that are either over-qualified for their job or working fewer hours than they desire) was unchanged at 7.3% for March. Average Hourly Earnings (AHE) for March increased 0.3%, in line with market forecasts. This brought AHE year-over-year to 4.1% from prior month's 4.3%. Job openings increased by 8,000 to 8.76 million jobs, slightly above market expectations of 8.75 million jobs. The number of unemployed people decreased by 29,000 in March to 6.4 million.



Existing Home Sales unexpectedly surged 9.5% in February, the largest increase in one year, as additional supply helped satisfy some market demand. The median existing-home sales price is up 5.7% from one year ago at \$384,500, the eighth consecutive month of year-over-year increases. Inventories of Existing Homes for sale increased 1.9% in February, with the supply at 2.9 months at the current sales pace. New Home Sales declined 0.3% in February, well below market expectations of a 3.0% rise. The decline was consistent with the increase in mortgage rates during February. The supply of New Homes for sale once again edged up to 8.4 months in February from 8.3 months in January and remains above the 6-month supply expected in a balanced market. The median sales price of new homes was \$400,500 for the month. The average 30-year mortgage rate at the end of March dropped to 6.79% from 6.94% at the end of February. The S&P Case Shiller report of home prices in 20 metropolitan areas reported a 0.1% decrease in home values during January, the third consecutive month of declines. The Federal Housing Finance Agency (FHFA), the entity that analyzes all domestic home prices, also showed a decrease of 0.1% for January, marking the first decline in the house price index since August 2022. Year-over-year Case Shiller is up 6.6% (versus 6.2% from December), and the FHFA index is up 6.3% (compared to 6.7% in December). Pending Home Sales in February rose 1.6%, slightly above market expectations of 1.5% growth. Year-over-year, pending home sales fell 7.0%. Housing Starts soared 10.7% in February amid the low supply of previously owned homes. Building Permits increased 2.4% in February, the largest increase since August 2023. Construction Spending declined 0.3% for the month despite market forecasts of a 0.7% rise.

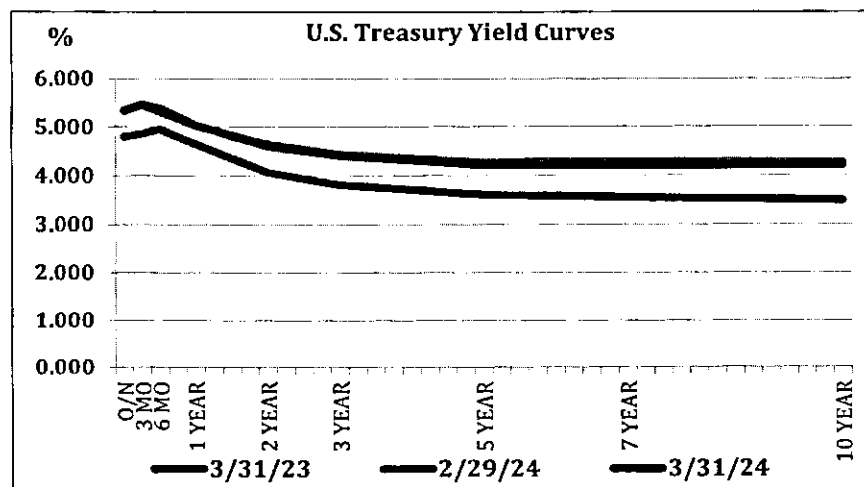
Final 2023 Q4 GDP showed +3.4% growth, slightly above the +3.2% previously estimated, with consumer spending and non-residential business investments contributing to the upward revision. Industrial Production recovered from two consecutive months of declines, rising 0.1% in February, beating market expectations of a flat month. Durable Goods Orders increased 1.4% in February, following a dramatic 6.1% drop in January, as orders for transportation

equipment rebounded. Excluding transportation, durable goods orders increased 0.5% for the month. Factory Orders exceeded market expectations and increased 1.4% in February following the 3.8% decline the month prior. Excluding transportation, Factory Orders increased 1.1%. Business inventories were flat for January while the market was anticipating a 0.2% advance. As an inflation impact measurement, the Producer Price Index (PPI) climbed 0.6% in February, the largest rise since August 2023, and well above market expectations of a 0.3% increase. PPI is up 1.6% from this time last year compared to 0.9% in January. The Consumer Price Index (CPI) rose 0.4% in February, driven significantly by an increase in the price of shelter and gas. Year-over-year, CPI edged up to 3.2% in February from 3.1% the prior month. Core CPI, or the results after food and energy numbers are excluded (due to price volatility), increased 0.4% in February, as the year-over-year eased to 3.8%, the lowest level in nearly three years. The Purchasing Managers Index increased to 50.3% in March, higher than market expectations of 48.4% and ending a sixteen-month period of contraction with positive trends in demand and a notable increase in production levels.

Personal Consumption in the fourth quarter of 2023 was upwardly revised to 3.3% growth from the previous estimate of 3.0%. Retail Sales rose 0.6% in February, lower than market expectations of a 0.8% gain. Year-over-year retail sales were up 1.5%. Excluding vehicle and gas purchases, sales increased 0.3% for the month. Consumers' attitudes as measured by both the Consumer Sentiment report (+2.5 points) and the Consumer Confidence report (-0.1 points) showed mixed readings. Consumer inflation expectations in the next year decreased slightly to 2.9% from 3.0% in February. Personal Consumption Expenditures (PCE) increased 0.3% in February, slightly below the market forecasts of 0.4%, bringing the year-over-year to 2.5% from 2.4% the prior month. The Core PCE Index measuring consumption net of food and energy, and one of the indicators watched closely by the FOMC, slowed to 2.8% year-over-year in February from January's 2.9%. This exceeded the FOMC's target inflation rate of 2.0% for the thirty-fifth consecutive month. Month-over-month the Personal Income component of the PCE series indicated that incomes rose 0.3% in February, slightly below market expectations of 0.4% growth, and Personal Spending increased by 0.8% for the month, the largest gain since January 2023.

The FOMC held their meeting March 19th and 20th and voted to keep the Fed Funds Rate target rate unchanged at 5.25% to 5.50%. The Committee also released their updated projections which showed stronger GDP for 2024 (+2.1% growth versus +1.4% from December's projection), 4.0% unemployment at the end of 2024 (versus December's 4.1% projection), and an inflation rate of 2.6% by the end of the year (compared to 2.4% from December's projection). The projected Fed Funds Rate remained unchanged at 4.6% by the end of 2024 implying three 25 basis-point rate cuts with six scheduled FOMC meetings remaining this year. Chair Powell reiterated the policy rate is likely at its peak for this tightening cycle, and it may be appropriate to begin dialing back policy restraint sometime this year. The FOMC will hold their next meeting April 30th and May 1st where they are expected to maintain the current Fed Funds target range of 5.25% to 5.50%. The Committee has stated decisions will be made meeting by meeting based on incoming data. At this time, the market is divided between June or July for the first 25-basis point rate cut in 2024.

Government Security Investment Pool yields remained largely unchanged from last month at +/- 5.31%. US Treasury and Agency rates continue jockeying as the market adjusts to anticipated Fed Funds Rate moves. The 1-year Treasury closed March at 5.03% after ending February at 5.01%. The 2-year Treasury fell to 4.59% at the end of March from February's close of 4.64% but has since climbed to 4.75% following the release of strong March employment numbers. The yield curve saw very little change from last month (the blue line is completely overlapping the green line in the chart above) and remains inverted with short-term rates higher than longer-term rates, peaking before 3-months. Bank CDs continue to offer opportunities to lock-in rates above securities in the short-term with 1-year CD yields back up to +/- 5.40%, however bank appetite continues to wane. Locking-in rates ahead of potential rate cuts can help sustain portfolio yields over the long term.



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Disclaimer: This material, based on data believed to be reliable, but not independently verified, is not intended to constitute an offer, solicitation or recommendation regarding any securities transaction or a guarantee of market conditions and is for informational purposes only. For use by the intended recipient only.



AGENDA MEMORANDUM

DATE: April 30, 2024
TO: Honorable City Council Members
FROM: Deby Woodard, Assistant Director of Finance
THROUGH: Sandra Gibson, Director of Finance
SUBJECT: Consider action to approve renewal of the audit services agreement with Weaver & Tidwell LLP

BACKGROUND/INFORMATION:

The City Charter 9.06(c) requires an independent audit to be conducted of all City accounts by a Certified Public Accountant. These audits are performed in accordance with generally accepted auditing standards as well as examination for compliance with procedures established by Charter, Ordinance, or where applicable, State and Federal laws and regulations. The audit and related reports comply with all standards provided by the Governmental Accounting Standards Board (GASB) and the Financial Accounting Standards Board (FASB) where applicable.

Section 13.001 of the Texas local Government Code requires a municipality to have its records and accounts audited annually and have an annual financial statement prepared based on the audit.

Financial Audit Services proposal # 20-009 was issued in July 2020 with responses from eleven (11) firms. Evaluations were completed by committee, resulting in a recommendation and award by the Council on August 13, 2020, to Weaver & Tidwell LLP. The proposal was based on the engagement for the 2019-2020 Fiscal Year with four (4) subsequent Fiscal Year audits upon staff recommendation and Council approval at predesignated amounts.

Staff has been pleased with the previous audit engagements and requests approval of the attached Weaver & Tidwell Letter of Engagement for the 4th and final renewal option to perform the Fiscal Year 2023-2024 independent audit of the general purpose financial statements in the amount of \$65,800, which is a \$1,900, or 3% increase from prior year.

FINANCIAL IMPLICATIONS:

Funds are budgeted and available.

RECOMMENDATION/ACTION DESIRED:



AGENDA MEMORANDUM

Approval of the Letter of Engagement for Weaver & Tidwell LLP to perform the Fiscal Year 2023-2024 City of Watauga independent audit in an amount of \$65,800, representing the 4th and final renewal of Proposal # 20-009 Financial Audit Services.

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Letter of Engagement Weaver & Tidwell
2. 1295 Form Weaver & Tidwell

REVIEWED BY:

Sandra Gibson, Director of Finance

David Berman, City Attorney

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 5/1/2024

Approved - 5/2/2024

Final Approval - 5/3/2024

April 29, 2024

Arthur Miner
Maylor
7105 Whitley Road
Watauga, Texas 76148

Dear Mayor Miner:

You have requested that Weaver and Tidwell, L.L.P. ("Weaver", "our", "us", and "we") audit the governmental activities, the business-type activities, the aggregate discretely presented component units, each major fund, and the aggregate remaining fund information of City of Watauga (the "City"), as of September 30, 2024, and for the year then ended and the related notes to the financial statements, which collectively comprise the City's basic financial statements as listed in the table of contents. In addition, we will audit the City's compliance over major federal award programs for the period ended September 30, 2024.

Accounting principles generally accepted in the United States of America ("U.S. GAAP"), as promulgated by the Governmental Accounting Standards Board ("GASB") require that management's discussion and analysis and budgetary comparison information, among other items, be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by GASB, which considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. As part of our engagement, we will apply certain limited procedures to the required supplementary information ("RSI") in accordance with auditing standards generally accepted in the United States of America ("U.S. GAAS"). These limited procedures will consist primarily of inquiries of management regarding their methods of measurement and presentation, and comparing the information for consistency with management's responses to our inquiries. We will not express an opinion or provide any form of assurance on the RSI. The following RSI is required by U.S. GAAP. This RSI will be subjected to certain limited procedures but will not be audited:

1. Management's Discussion and Analysis
2. Budgetary Comparison Schedule- General Fund
3. Schedule of Changes in Pension Liability and Related Ratios
4. Schedule of Pension Contributions
5. Schedule of Changes in Total OPEB Liability and Related Ratios

Supplementary information other than RSI will accompany the City's basic financial statements. We will subject the following supplementary information to the auditing procedures applied in our audit of the basic financial statements and perform certain additional procedures, including comparing and reconciling the supplementary information to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and additional procedures in accordance with U.S. GAAS. We intend to provide an opinion on the following supplementary information in relation to the financial statements as a whole:

1. Schedule of Expenditures of Federal Awards
2. Combining Balance Sheet
3. Combining Statement of Revenues and Changes in Fund Balances
4. Schedule of Revenues, Expenditures and Changes in Fund Balances; Budgetary Comparison Schedules

Also, the document we submit to you will include the following other additional information that will not be subjected to the auditing procedures applied in our audit of the basic financial statements:

1. Introductory Section
2. Statistical Section

Weaver and Tidwell, L.L.P.
CPAs AND ADVISORS | WEAVER.COM

We are pleased to confirm our acceptance and our understanding of this audit engagement by means of this letter.

Audit Objectives

The objective of our audit is the expression of opinions as to whether your basic financial statements are fairly presented, in all material aspects, in conformity with U.S. GAAP and to report on the fairness of the supplementary information referred to above when considered in relation to the basic financial statements as a whole. The objective also includes reporting on internal control related to the basic financial statements and compliance with the provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a material effect on the basic financial statements in accordance with *Government Auditing Standards* issued by the Comptroller General of the United States of America ("GAGAS"); and internal control over compliance related to major programs and an opinion (or disclaimer of opinion) on compliance with federal statutes, regulations, and the terms and conditions of federal awards that could have a direct and material effect on each major program in accordance with the Single Audit Act Amendments of 1996 and Title 2 U.S. Code of Federal Regulations (CFR) Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance).

Auditor Responsibilities

We will conduct our audit in accordance with U.S. GAAS, the standards applicable to financial audits contained in GAGAS, and the provisions of the Uniform Guidance. Those standards and the Uniform Guidance require that we plan and perform the audit to obtain reasonable assurance about whether the basic financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the basic financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the basic financial statements, whether due to error, fraudulent financial reporting, misappropriation of assets, or violations of laws, governmental regulations, grant agreements, or contractual agreements. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements. If appropriate, our procedures will therefore include tests of documentary evidence that support the transactions recorded in the accounts, tests of the physical existence of assets, and direct confirmation of cash, investments, and certain other assets and liabilities by correspondence with creditors and financial institutions. As part of our audit process, we may request written representations from your attorneys, and they may bill you for responding. At the conclusion of our audit, we will also request certain written representations from you about the basic financial statements and related matters.

Because of the inherent limitations of an audit, together with the inherent limitations of internal control, an unavoidable risk that some material misstatements or noncompliance (whether caused by errors, fraudulent financial reporting, misappropriation of assets, or violations of laws or governmental regulations) may not be detected exists, even though the audit is properly planned and performed in accordance with U.S. GAAS and GAGAS.

In addition, an audit is not designed to detect immaterial misstatements or violations of laws or governmental regulations that do not have a direct and material effect on the basic financial statements. However, we will inform the appropriate level of management of any material errors, fraudulent financial reporting, or misappropriation of assets that comes to our attention. We will also inform the appropriate level of management of any violations of laws or governmental regulations that come to our attention, unless clearly inconsequential. Our responsibility as auditors is limited to the period covered by our audit and does not extend to any later periods for which we are not engaged as auditors.

In making our risk assessments, we consider internal control relevant to the City's preparation and fair presentation of the basic financial statements in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the City's internal control. However, we will communicate to you in writing concerning any significant deficiencies or material weaknesses in internal control relevant to the audit of the basic financial statements that we have identified during the audit.

Ms. Jackie Gonzalez is the engagement partner or equivalent for the audit services specified in this letter, and is responsible for supervising our services performed as part of this engagement and signing or authorizing another qualified firm representative to sign the audit report.

We expect to begin our audit procedures in August 2024. We will issue a written report upon completion of our audit of the City's basic financial statements. Our report will be addressed to the Mayor and City Council of the City. We cannot provide assurance that unmodified opinions will be expressed. Circumstances may arise in which it is necessary for us to modify our opinions, add an emphasis-of-matter or other-matter paragraph(s), or withdraw from the engagement. If our opinions on the financial statements or compliance are other than unmodified, we will discuss the reasons with you in advance. If, for any reason, we are unable to complete the audit or are unable to form or have not formed opinions, we may decline to express opinions or withdraw from this engagement.

As part of obtaining reasonable assurance about whether the basic financial statements are free of material misstatement, we will perform tests of the City's compliance with certain provisions of laws, regulations, contracts, and grants that could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with the provisions is not an objective of our audit, and accordingly, we will not express such an opinion.

Our audit of the City's major federal award program(s) compliance will be conducted in accordance with the requirements of the Single Audit Act, as amended; and the provisions of the Uniform Guidance; and will include tests of accounting records, a determination of major programs in accordance with the Uniform Guidance, and other procedures we consider necessary to enable us to express such an opinion on major federal award program compliance and to render the required reports. We cannot provide assurance that an unmodified opinion on compliance will be expressed. Circumstances may arise in which it is necessary for us to modify our opinion or withdraw from the engagement.

The Uniform Guidance requires that we also plan and perform the audit to obtain reasonable assurance about whether the City has complied with applicable laws and regulations and the provisions of contracts and grant agreements applicable to major federal award programs. Our procedures will consist of determining major federal programs and performing the applicable procedures described in the U.S. Office of Management and Budget *OMB Compliance Supplement* for the types of compliance requirements that could have a direct and material effect on each of the City's major programs. The purpose of those procedures will be to express an opinion on the City's compliance with requirements applicable to each of its major programs in our report on compliance issued pursuant to the Uniform Guidance.

Also, as required by the Uniform Guidance, we will perform tests of controls to evaluate the effectiveness of the design and operation of controls that we consider relevant to preventing or detecting material noncompliance with compliance requirements applicable to each of the City's major federal award programs. However, our tests will be less in scope than would be necessary to render an opinion on these controls and, accordingly, no opinion will be expressed in our report.

In accordance with the requirements of GAGAS, we will also issue a written report describing the scope of our testing over internal control over financial reporting and over compliance with laws, regulations, and provisions of grants and contracts, including the results of that testing. However, providing an opinion on internal control and compliance over financial reporting will not be an objective of the audit and, therefore, no such opinion will be expressed.

We will issue a report on compliance that will include an opinion or disclaimer of opinion regarding the City's major federal award programs, and a report on internal controls over compliance that will report any significant deficiencies and material weaknesses identified; however, such report will not express an opinion on internal control.

Management Responsibilities

Our audit will be conducted on the basis that management and, when appropriate, those charged with governance, acknowledge and understand that they have responsibility:

- a. for the preparation and fair presentation of the basic financial statements in accordance with the framework described in Audit Objectives above;
- b. for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of basic financial statements that are free from material misstatement, whether due to error, for fraudulent financial reporting, misappropriation of assets, or violations of laws, governmental regulations, grant agreements, or contractual agreements;

- c. to provide us with:
 - i. access to all information of which management is aware that is relevant to the preparation and fair presentation of the basic financial statements, and relevant to federal award programs, such as records, documentation, and other matters;
 - ii. additional information that we may request from management for the purpose of the audit; and
 - iii. unrestricted access to persons within the City from whom we determine it necessary to obtain audit evidence.
- d. for including the auditor's report, and our report on any supplementary information if described above, in any document containing the basic financial statements that indicates that such basic financial statements have been audited by the City's auditor;
- e. for identifying and ensuring that the City complies with the laws and regulations applicable to its activities;
- f. for adjusting the basic financial statements to correct material misstatements and confirming to us in the management representation letter that the effects of any uncorrected misstatements aggregated by us during the current engagement and pertaining to the current year under audit are immaterial, both individually and in the aggregate, to the basic financial statements as a whole;
- g. for maintaining adequate records, selecting and applying accounting principles, and safeguarding assets;
- h. for identifying all federal awards expended during the period including federal awards and funding increments received prior to December 26, 2014, and those received in accordance with the Uniform Guidance generally received after December 26, 2014;
- i. for preparing the schedule of expenditures of federal awards (including notes and noncash assistance received) in accordance with the Uniform Guidance;
- j. for the design, implementation, and maintenance of internal control over compliance;
- k. For identifying and ensuring that the City complies with laws, regulations, grants, and contracts applicable to its activities and its federal award programs;
- l. For following up and taking corrective action on reported audit findings from prior periods and preparing a summary schedule of prior audit findings;
- m. For following up and taking corrective action on current year audit findings and preparing a corrective action plan for such findings;
- n. For submitting the reporting package and data collection form to the appropriate parties;
- o. For making the auditor aware of any significant vendor relationships where the vendor is responsible for program compliance;
- p. with regard to the supplementary information referred to above: (a) for the preparation of the supplementary information in accordance with the applicable criteria; (b) to provide us with the appropriate written representations regarding supplementary information; (c) to include our report on the supplementary information in any document that contains the supplementary information and that indicates that we have reported on such supplementary information; and (d) to present the supplementary information with the audited basic financial statements, or if the supplementary information will not be presented with the audited basic financial statements, to make the audited basic financial statements readily available to the intended users of the supplementary information no later than the date of issuance by you of the supplementary information and our report thereon;
- q. informing us of facts that may affect the basic financial statements of which you may become aware during the period from the date of the auditor's report to the date the basic financial statements are issued;
- r. for confirming your understanding of your responsibilities in this letter to us in your management representation letter.

April 29, 2024

We understand that your employees will prepare all confirmations we request and will locate any documents or support for any other transactions we select for testing.

If we agree herein or otherwise to perform any non-attest services (such as tax services or any other non-attest services), you agree to assume all management responsibilities for those services; oversee the services by designating an individual, preferably from senior management, with suitable skill, knowledge, or experience; evaluate the adequacy and results of the services; and accept responsibility for them. The entity has designated Sandra Gibson, Director of Finance to oversee these services. Such services include:

- i. Preparation of financial statements and related notes
- ii. Preparation of schedule of expenditures of federal awards
- iii. Assisting with entries to convert accounting records from modified accrual to full accrual (GASB 34 entries)
- iv. Preparation of the Data Collection Form

GAGAS require that we document an assessment of the skills, knowledge, and experience of management, should we participate in any form of preparation of the basic financial statements and related schedules or disclosures as these actions are deemed a nonaudit/nonattest service.

During the course of our engagement, we will request information and explanations from management regarding the City's operations, internal controls, future plans, specific transactions and accounting systems and procedures. At the conclusion of our engagement, we will require, as a precondition to the issuance of our report, that management provide certain representations in a written representation letter. The City agrees that as a condition of our engagement to perform an audit that management will, to the best of its knowledge and belief, be truthful, accurate and complete in all representations made to us during the course of the audit and in the written representation letter. The procedures we perform in our engagement and the conclusions we reach as a basis for our report will be heavily influenced by the written and oral representations that we receive from management. False or misleading representations could cause us to expend unnecessary efforts in the audit; or, worse, could cause a material error or a fraud to go undetected by our procedures.

Fees and Invoicing

We estimate the fee for this engagement will be \$65,800. The total fee for our services will be determined by the complexity of the work performed and the tasks required. Individual hourly rates vary according to the degree of responsibility involved and the skills required. It is understood that neither our fees nor the payment thereof will be contingent upon the results of this engagement.

Our fee estimate is based on anticipated cooperation from all involved and the assumption that unexpected circumstances will not be encountered during the engagement. Our engagement fees do not include consulting on the adoption of new accounting standards and any future increased duties because of any regulatory body, auditing standard or an unknown or unplanned significant transaction. If significant additional time is necessary, we will discuss the reasons with you and arrive at a new fee estimate before we incur the additional costs.

In addition to the fee for our services, reasonable and necessary out-of-pocket expenses we incur (such as parking, reproduction and printing, postage and delivery, and out-of-market travel, meals, and accommodations) will be invoiced at cost.

We will also invoice for reasonable and necessary time and out-of-pocket expenses we incur to respond to any request (such as a subpoena, summons, court order, or administrative investigative demand) pertaining to this engagement in a legal matter to which we are not a party. Our time to facilitate the response will be billed at our then-current standard hourly rates, and our expenses (including attorney's fees) will be billed at cost. If we agree to perform additional substantive services related to or arising out of the request, such matters may be the subject of a new engagement letter.

Our invoices are payable on presentation and will be rendered (generally monthly) as work progresses. You will have thirty (30) days from the invoice date to review the invoice and communicate to us in writing any disagreement with the charges, after which you will waive the right to contest them. For invoices not paid within sixty (60) days of the invoice date, a late charge will be added to any uncontested outstanding balance. The late charge will be assessed at a rate of half a percent (0.5%) of the unpaid balance per month. If invoices are not paid within one hundred twenty (120) days of the invoice date,

this engagement will be placed on hold and we will stop work until the balance is brought current, or we may withdraw from this engagement (and any other engagements for the same client), and we will not be liable for any damages you may incur as a result.

Ethical Conflict Resolution

In the unlikely event that circumstances occur which we in our sole discretion believe could create a conflict with either the ethical standards of our firm or the ethical standards of our profession in continuing our engagement, we may suspend our services until a satisfactory resolution can be achieved or we may resign from the engagement. We will notify you of such conflict as soon as practicable, and will discuss with you any possible means of resolving them prior to suspending our services.

The hiring of or potential employment discussions with any of our personnel could impair our independence. Accordingly, you agree to inform the engagement partner or equivalent prior to any such potential employment discussions taking place.

Audit Documentation and Confidentiality

The audit documentation we prepare pertaining to and in support of this engagement is our property and constitutes confidential information. If we are requested to make the audit documentation available to outside parties, except in the case of requests during our peer review (discussed below) or when prohibited by law or direction of law enforcement, any such requests will be discussed with you before we make the documentation available to the requesting parties.

Depending on the requirements of this engagement, we may use third-party service providers to assist us. Before sharing confidential information with those service providers, we will (i) secure agreements to maintain the confidentiality of confidential information and ensure the confidential information is only used for the purpose of assisting us with the performance of this engagement and (ii) take commercially reasonable precautions to determine the service providers have appropriate procedures in place to prevent the unauthorized disclosure of confidential information. If we use such service providers, we will remain responsible for all work performed and any breach of our confidentiality arrangements by those service providers.

We may be requested to make certain audit documentation (working papers) available to regulators and other government agencies, pursuant to authority given by law or regulation. You should understand that responding to many such requests is mandatory. In those cases, access to such working papers will be provided under our supervision and we may, upon their request, provide the regulator or agency with copies of all or selected working papers. The requesting party may intend or decide to distribute the copies or information contained therein to others, including other regulators or agencies. You will be billed for additional fees as a result of the aforementioned work.

Our firm, as well as other accounting firms, participates in a peer review program covering our audit and accounting practices. This program requires that once every three years, we subject our system of quality control to an examination by another accounting firm. As part of this process, the firm conducting our peer review will review a sample of our work. It is possible that the work we perform for you may be selected for such a review. If it is, our peer review firm is bound by professional standards to keep all information confidential and we are required to provide the required information.

It is expected that prior to the conclusion of the engagement, sections of the Data Collection Form will be completed by our firm. The sections that we will complete summarize our audit findings by federal grant or contract. Management is responsible to submit the reporting package (defined as including basic financial statements, schedule of expenditures of federal awards, summary schedule of prior audit findings, auditor's reports, and corrective action plan) along with the Data Collection Form to the federal audit clearinghouse. The instructions to the Data Collection Form require that the reporting package be an unlocked, unencrypted, text searchable portable document file (PDF) or else it will be rejected by the Federal Audit Clearinghouse. We will be available to assist management in creating the PDF if needed.

We will coordinate with you the electronic submission and certification upon the reporting package completion. If applicable, we will provide copies of our report for you to include with the reporting package if there is a need to submit the package to pass-through entities.

The Data Collection Form and the reporting package must be submitted within the earlier of 30 days after receipt of our reports or nine months after the end of the audit period.

We will retain our audit documentation for a period of at least seven years from the date of our report. You agree that following such period, we may destroy the audit documentation without notice to you.

To maintain independence, we will not act as the host of your financial or non-financial information or as your information back-up service provider. Instead, it is your responsibility to maintain a complete set of your financial and non-financial data and records. If some portion of your data and records is contained only within our files, you agree to inform us before the issuance of our report and we will provide that to you.

Except as may be noted herein, the parties do not intend this engagement letter to be for the benefit of any third-party. You may inform us of third-parties who will receive a copy of our report. Unless you inform us of such third-parties in writing, we are not aware of who you intend to supply our report to and we do not anticipate any such third-parties' reliance upon our professional services unless expressly stated herein.

In order to facilitate this engagement, we may transmit and store data via email, the cloud, or other electronic and Internet-based mechanisms. Please be aware that those mediums inherently pose a risk of misdirection or interception of confidential information. Any request you have to limit such transmissions or use a different means of transmission or storage must be made in writing and you will be responsible for any resulting compromise in data security.

Dispute Resolution Procedure including Jury Waiver

If a dispute arises out of or relates to this engagement or engagement letter, or the breach thereof, and if the dispute cannot be settled through negotiation, the parties agree first to try in good faith to settle the dispute by mediation before resorting to litigation. In such event, the parties will attempt to agree upon a location, mediator, and mediation procedures, but absent such agreement any party may require mediation in Houston, Texas, administered by the AAA under its Commercial Mediation Procedures.

This engagement letter and all disputes between the parties shall be governed by, resolved, and construed in accordance with the laws of the State of Texas, without regard to conflict-of-law principles. Any action arising out of or relating to this engagement or engagement letter shall only be brought in, and each party agrees to submit and consent to the exclusive jurisdiction of the federal or state courts in the State of Texas and convenience of those situated in Harris County, Texas.

Each party hereby irrevocably waives any right it may have to trial by jury in any proceeding arising out of or relating to this engagement or this engagement letter.

Whenever possible, this engagement letter shall be interpreted in such a manner as to be effective and valid under applicable laws, regulations, or published interpretation, but if any term of this engagement letter is declared illegal, unenforceable, or unconscionable, that term shall be severed or modified and the remaining terms of the engagement letter shall remain in force. The parties agree that the court should modify any term declared to be illegal, unenforceable, or unconscionable in a manner that will retain the intended term as closely as possible.

If because of a change in status or due to any other reason, any provision in this engagement letter or any other contract we have with you, or enter into, would be prohibited by, or would impair our independence for this engagement under laws, regulations or published interpretations by governmental bodies, professional organizations or other regulatory agencies, such provision shall, to that extent, be of no further force and effect and the contract shall consist of the remaining portions.

Miscellaneous

In accordance with the requirements of *Government Auditing Standards*, we have attached a copy of the latest external peer review report of our firm for your consideration and files.

We may at times provide you with documents marked as drafts. You understand that those documents are for your review purposes only. You should not rely upon those documents in any way.

Although the engagement partner or equivalent responsible for this engagement is a licensed certified public accountant, we inform you that we have nonlicensees who may provide services pertaining to this engagement.

If you intend to make reference to our firm or include our report or any portion of it in a published document or other reproduction, and that document or other reproduction includes a version of our report or the financial statements that is assembled differently than any version we provided you or audited, you agree to provide us with printers' proofs or masters for our review and approval before reproducing. You also agree to provide us with a copy of the final reproduced material

April 29, 2024

for our written approval before it is distributed. If, in our professional judgment, the circumstances require, we may withhold our approval. This requirement does not pertain to distributing our report or the financial statements when you do not modify their assembly or in situations where you disseminate the audited financial statements as a standalone document, such as on your website.

This engagement letter sets forth all of the agreed upon terms and conditions of our engagement with respect to the matters covered herein and supersedes any that may have come before. This engagement letter may not be amended or modified except by further writing signed by all the parties. Any provisions of this engagement letter which expressly or by implication are intended to survive its termination or expiration will survive and continue to bind the parties. The use of electronic signatures or multiple counterparts to execute this engagement letter shall have the same force and effect as a manually or physically signed original instrument.

We appreciate the opportunity to assist you and look forward to working with you and your team.

Sincerely,

Weaver and Tidwell, L.L.P.

WEAVER AND TIDWELL, L.L.P.
Fort Worth, Texas

Please sign and return a copy of this letter to indicate your acknowledgment of, and agreement with, the arrangements for our engagement as described herein, including each party's respective responsibilities. By signing below, the signatory also represents that they have been authorized to execute this agreement.

City of Watauga

Governance:

By: _____

Printed Name: _____

Title: _____

Date: _____

Management:

By: _____

Printed Name: _____

Title: _____

Date: _____



Report on Firm's System of Quality Control

September 19, 2022

To the Partners of Weaver & Tidwell, L.L.P.
and the National Peer Review Committee

We have reviewed the system of quality control for the accounting and auditing practice of Weaver & Tidwell, L.L.P. (the firm) applicable to engagements not subject to PCAOB permanent inspection in effect for the year ended May 31, 2022. Our peer review was conducted in accordance with the Standards for Performing and Reporting on Peer Reviews established by the Peer Review Board of the American Institute of Certified Public Accountants (Standards).

A summary of the nature, objectives, scope, limitations of, and the procedures performed in a system review as described in the Standards may be found at www.aicpa.org/prsummary. The summary also includes an explanation of how engagements identified as not performed or reported in conformity with applicable professional standards, if any, are evaluated by a peer reviewer to determine a peer review rating.

Firm's Responsibility

The firm is responsible for designing a system of quality control and complying with it to provide the firm with reasonable assurance of performing and reporting in conformity with applicable professional standards in all material respects. The firm is also responsible for evaluating actions to promptly remediate engagements deemed as not performed or reported in conformity with professional standards, when appropriate, and for remediating weaknesses in its system of quality control, if any.

Peer Reviewer's Responsibility

Our responsibility is to express an opinion on the design of and compliance with the firm's system of quality control based on our review.

Required Selections and Considerations

Engagements selected for review included engagements performed under *Government Auditing Standards*, including compliance audits under the Single Audit Act; audits of employee benefit plans, an audit performed under FDICIA, and examinations of service organizations [SOC 1 and SOC 2 engagements].)

As a part of our peer review, we considered reviews by regulatory entities as communicated by the firm, if applicable, in determining the nature and extent of our procedures.

Opinion

In our opinion, the system of quality control for the accounting and auditing practice of Weaver & Tidwell, L.L.P. applicable to engagements not subject to PCAOB permanent inspection in effect for the year ended May 31, 2022, has been suitably designed and complied with to provide the firm with reasonable assurance of performing and reporting in conformity with applicable professional standards in all material respects. Firms can receive a rating of *pass*, *pass with deficiency(ies)* or *fail*. Weaver & Tidwell, L.L.P. has received a peer review rating of *pass*.

A handwritten signature in black ink that reads "Eide Bailly LLP". The signature is written in a cursive, flowing style.

Eide Bailly LLP

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

1 of 1

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY CERTIFICATION OF FILING

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

Weaver and Tidwell, L.L.P.
Fort Worth, TX United States

Certificate Number:
2024-1153783

Date Filed:
04/29/2024

Date Acknowledged:
4-30-24

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

City of Watauga

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

20-009
Financial Audit Services

4	Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
			Controlling	Intermediary
	Mackel, John	Houston, TX United States	X	
	Rook, David	Houston, TX United States	X	
	Gonzalez, Jackie	Fort Worth, TX United States		X

5 Check only if there is NO Interested Party.

☐

6 UNSWORN DECLARATION

My name is Jackie Gonzalez, CPA, and my date of birth is 04/26/1979

My address is 2821 West 7th Street, Suite 700, Fort Worth, TX, 76107, U.S.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in Tarrant County, State of Texas, on the 29 day of April, 2024.
(month) (year)



Signature of authorized agent of contracting business entity
(Declarant)



AGENDA MEMORANDUM

DATE: May 2, 2024

TO: Honorable City Council Members

FROM: Paul Hackleman, Director of Public Works

THROUGH: Sandra Gibson, Director of Finance

SUBJECT: Consider action on an ordinance of the City of Watauga, Texas, amending Chapter 105 and Chapter 113 of the Code of Ordinances of the City of Watauga, Texas; amending the design criteria for Stormwater Construction; providing for repeal; providing for severability; and providing an effective date

BACKGROUND/INFORMATION:

In March 2021, the City Council authorized Burgess and Niple, Inc. to prepare a new Drainage Master Plan for the entire City. The Drainage Master Plan is complete and included ordinance revisions for updating the ordinances related to stormwater management and design.

The attached ordinance changes are recommended by Burgess and Niple, Inc. which will bring the City of Watauga in line with our surrounding cities utilizing the City of Fort Worth's criteria manual. By referencing the manual without a date, the City of Watauga will automatically adopt the newest manual as it becomes available. The current manual is the 2015 CFW Stormwater Criteria Manual.

The Fort Worth Stormwater Criteria Manual is available at the following link: <https://apps.fortworthtexas.gov/ProjectResources/> and clicking on Design Guidelines - Storm Water Design Manual - CFW Stormwater Criteria Manual.

FINANCIAL IMPLICATIONS:

N/A

RECOMMENDATION/ACTION DESIRED:

Respectfully recommend the Council review and approve the ordinance revisions.

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. 2015 CFW Stormwater Criteria Manual
2. ORDINANCE - Drainage Revisions - May 2024
3. Ordinance - Existing Pre May 2024



AGENDA MEMORANDUM

REVIEWED BY:

Paul Hackleman, Director of Public Works

David Berman, City Attorney

Sandra Gibson, Director of Finance

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 5/2/2024

Approved - 5/2/2024

Approved - 5/3/2024

Final Approval - 5/4/2024

STORMWATER CRITERIA MANUAL



September 29, 2015

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Foreword

Adoption of Manual by City of Fort Worth

This Stormwater Criteria Manual is adopted and becomes effective on September 29, 2015.

Relationship to Previous Manuals

The original City of Fort Worth (CFW) Storm Drainage Criteria and Design Manual was developed in 1967 and amended in 1975, 1986, and 1994. In 2006, updated design criteria were developed in conjunction with the first version of the NCTCOG's iSWM Manual™. In 2012, the manual was revised to incorporate the City's grading permit requirements and revised values for impervious cover in hydrologic calculations. The CFW criteria presented in this 2015 manual are generally consistent with those in the 2012 version. The 2015 revision incorporates local provisions into the document and reflects the development process changes implemented by the City of Fort Worth in 2013 – 2015. The intent of this revision is primarily to more clearly define the steps and requirements of stormwater development review for the City of Fort Worth. As such, all process requirements are now listed in Chapter 2.0 of this manual. As in 2012, the over-arching motivation for this manual is to provide efficient guidance for effective mitigation of the impacts of new development and construction on the character of stormwater runoff.

Purpose and Limitations of Manual

This manual is intended to provide a guideline for the most commonly encountered stormwater or flood control designs in the CFW. It shall be used as a guide for watershed master plans and for design of remedial measures for existing facilities. This manual was developed for users with knowledge and experience in the applications of standard engineering principles and practices of stormwater design and management. There will be specific situations not completely addressed or covered by this manual. Other methods of design or variances to the criteria may be requested using Form CFW-7 of Appendix A. Any variations from the practices established in this manual must have the expressed written approval of the Director of the Department of Transportation and Public Works (TPW) or designee. Close coordination with the staff of the CFW is recommended and encouraged during the planning, design and construction of all stormwater facilities.

The design procedures as presented herein are based on the historical rainfall records of duration, intensity, and frequency of storms that have occurred in the past in the Fort Worth area. This is the customary and accepted basis for the design of drainage facilities. There is no assurance, however, that rainfall will not occur in the future that will temporarily overload the drainage facilities. The degree of protection afforded by the procedures included herein is considered consistent with good municipal practice in this region.

Please note that all references in blue italics refer to the 2010 NCTCOG *iSWM Technical Manuals*, such as *Planning, Hydrology, Hydraulics, Site Development Controls*.

Goals and Objectives for Stormwater Management

A proper understanding of the City's adopted goals and objectives for stormwater management, as summarized in Chapter 1 is essential for the proper application of this Manual.

Contact Information

Additional information on Fort Worth's Stormwater management program and policies can be obtained at www.fortworthtexas.gov/stormwater/ or by contacting the SDS staff at SDS@fortworthtexas.gov. For information on the iSWM regional manual and program, contact the NCTCOG at 817-695-9220 or at the website <http://iSWM.nctcog.org/>.

Acknowledgments

The City of Fort Worth acknowledges the extensive efforts of the North Central Council of Governments and their consultants in the development of the iSWM regional program and manuals. The City also wishes to acknowledge the significant contribution by consulting engineers, planners, developers, and community leaders in the Fort Worth area who dedicated many hours of meetings, review of policy and criteria, and development of specific recommendations that were incorporated in the 2012 Manual and this 2015 document:

Brian Agbulos	Richard Contreras	Chris Johnson	Joshua Pettijohn
Richard Albin	Clair Davis	Dena Johnson	Phillip Poole
Jean-Marie Alexander	Ken Davis	Garrett Johnston	Benjamin Pylant
Don Allen	Jeff Davis	April Karr	Ron Rackley
Darrel Andrews	Tom Dayton	Debbie Kearns	Ragu Rao
Shamsul Arefin	Steve DeFilippo	Jim Keith	Kelly Rattan
Mark Assaad	Mike Dellies	Kiran Konduru	Jeff Rice
Travis Attanasio	Jim DeOtte	Ann Kovich	Jerry Roberts
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Robert Bardo	Kelly Dillard	Lynn Lovell	Scott Rutledge
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Joe Barrow	Cuneyt Erbaturo	Don McChesney	Derek Sellers
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George Behmanesh	Steve Eubanks	Morgan McDermott	Tony Sholola
Curtis Beitel	Tom Galbreath	Dan McInnis	Greg Simmons
Jonathan Bengfort	Brenda Gasperich	David McLendon	Steve Slater
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Scott Berman	Matt Goodwin	Janie Morels	Susan Stewart
Paul Berry	James Gossie	Ronald Morrison	Zubin Sukheswalla
Dana Burghdoff	Allison Gray	Ryan Mortensen	Caleb Tandy
Jeana Booker	Alan Greer	Cindy Mosier	Gary Teague
Paul Bounds	Jill Griffin	Mike Moya	Audra Valamides
Mike Brennan	Ryan Hague	Vincent Muzidi	Rhonda Visintainer
Ray Bromley	Walter Hardin	Osama Nashed	Mike Wayts
Lesley Brooks	Jim Harris	Stephen Nichols	Jason Weaver
Thad Brundrett	Michael Hobbs	Erika Nordstrom	Billy Wendland
Thomas Caffarel	Katie Hogan	Jason Oliver	Julie Westerman
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Gary Caldwell	David Hosseiny	Justin Oswald	Mathew Williamson
Kenny Calhoun	Steve Howard	Jerry Parche	Angela Wright
Kervin Campbell	Joe Howell	Richard Payne	Linda Young
Amy Cannon	Tom Huffhines	Raul Pena	
Lori Chapin	Michael James	Angela Pereira	

Halff Associates, Inc. coordinated the development of the 2012 Fort Worth local criteria. Freese and Nichols, Inc. coordinated the revisions to the 2012 criteria which are incorporated into the current 2015 manual.

Errata Sheet

Overview of the iSWM Program

The iSWM Program for Construction and Development is a cooperative initiative that assists municipalities and counties to achieve their goals of water quality protection, streambank protection, and flood mitigation, while also helping communities meet their construction and post-construction obligations under state stormwater permits.

Development and redevelopment by their nature increase the amount of imperviousness in our surrounding environment. This increased imperviousness translates into loss of natural areas, more sources for pollution in runoff, and heightened flooding risks. To help mitigate these impacts, more than 60 local governments are cooperating to proactively create sound stormwater management guidance for the region through the “*integrated*” Stormwater Management (iSWM) Program.

The iSWM Program is comprised of four types of documentation and tools as shown in Figure 1.1. These are used to complement each other and to support the development process.

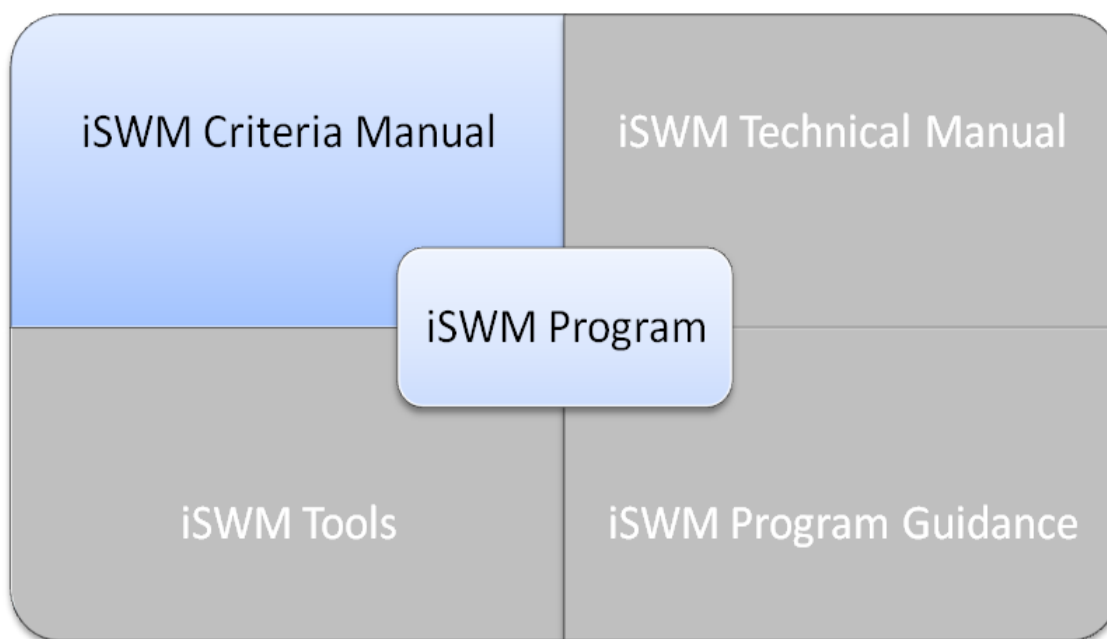


Figure 1.1 iSWM Program Support Documents and Tools

The four parts of iSWM are:

Stormwater Criteria Manual (this manual) – This document provides a description of the development process, utilizing the design concepts and regional criteria adopted as part of the iSWM focus areas. This document incorporates locally adopted design criteria as required by the CFW in conjunction with the iSWM criteria.

iSWM Technical Manual – This set of documents provides technical guidance including equations, descriptions of methods, fact sheets, etc. necessary for design. The *iSWM Technical Manual* includes categories for Planning, Water Quality, Hydrology, Hydraulics, Site Development Controls, Construction Controls and Landscape. The *iSWM Technical Manual* is referenced in this document.

iSWM Tools – This includes web-served training guides, examples, design tools, etc. that could be useful during design.

iSWM Program Guidance – This includes reference documents that guide programmatic planning rather than technical design.

The *iSWM Technical Manual*, Tools, and Program Guidance provide references and additional information that will be helpful in the development of an iSWM plan which will comply with the CFW criteria.

1.0 Stormwater Goals and Objectives

1.1 Introduction

The purpose of this manual is to provide design criteria and a framework for incorporating effective and environmentally sustainable stormwater management into the site development and construction processes.

The City's primary goal is to manage stormwater so that drainage conditions do not get worse as new areas are developed – while making improvements in the areas of the City that are already developed.

We can accomplish this goal by:

1. Developing detailed watershed plans that promote orderly growth and result in an *integrated* system of public and private stormwater infrastructure.
2. Adopting development policies and standards that prevent flooding, preserve streams and channels, and minimize water pollution without discouraging either new or infill development and Preliminary iSWM acceptance.
3. Fully complying with regulatory permit requirements.
4. Operating the stormwater system in a more efficient and effective manner.
5. Informing the public about stormwater issues in the community.
6. Securing funding that is adequate for meeting these needs and is recognized by the public as fair and equitable.

The City's planning and design objectives described in this manual are to:

1. Regulate the drainage policy and criteria for new development and redevelopment so the new development does not increase flooding problems, cause erosion or pollute downstream water bodies.
2. Facilitate the development of comprehensive watershed planning that promotes orderly growth and results in an *integrated* system of public and private stormwater infrastructure.
3. Minimize flood risks to citizens and properties, and stabilize or decrease streambank and channel erosion on creeks, channels, and streams.
4. Improve stormwater quality in creeks, rivers, and other water bodies, remove pollutants, enhance the environment and mimic the natural drainage system, to the extent practicable, in conformance with the Texas Pollutant Discharge Elimination System (TPDES) permit requirements.
5. Support multi-use functions of stormwater facilities for trails, green space, parks, greenways or corridors, stormwater quality treatment, and other recreational and natural features, provided they are compatible with the primary functions of the stormwater facility.
6. Encourage a more standardized, *integrated* land development process.

The criteria provided in this manual will help to meet sustainable development goals and objectives. There are many ways that sustainable development may be achieved while following these criteria.

Chapter Summary

The Stormwater Criteria Manual consists of five chapters:

Chapter 1 – Stormwater Goals and Objectives

Chapter 2 – Stormwater Development Process

Chapter 3 – Stormwater Design Criteria

Chapter 4 – Stormwater Construction Criteria

Chapter 5 – References

1.2 Abbreviations and Definitions

For convenience, two terms which are used frequently throughout this manual are abbreviated:

- CFW – City of Fort Worth
- TPW – Department of Transportation and Public Works

Several stormwater and development terms are used in this manual which have unique or special meanings. They are defined below:

1. **Adequate Outfall** – Outfall that does not create adverse flooding or erosion conditions downstream (No Adverse Impact) from the development through the downstream end of the Zone of Influence. In all cases shall be subject to the approval of the Director of the Transportation and Public Works Department. Refer to Section 3.1, Table 3.1.
2. **BMP or Best Management Practice** – A physical, chemical, structural, or managerial practice or device that prevents, reduces, or treats the pollution of stormwater, or reduces or treats erosion, or minimizes runoff.
3. **Development** – A contiguous tract of land (or a tract of land separated only by roadway and/or drainage right-of-way or easements) to be considered as a single development for purposes of this policy.
4. **Downstream Assessment** – Determination of the downstream limit of properties that could be impacted by the development (see Zone of Influence).
5. **Drainage Study** – Studies of the proposed development and drainage areas, which may include a downstream assessment, shall be included as part of the Preliminary and Final iSWM Plans. The necessary hydrologic and hydraulic analyses to clearly demonstrate that the limits of the Zone of Influence have been identified shall be included.
6. **Early Grading Permit** – The approval by the CFW to proceed with grading only for the disturbance of 1.0 acre or more, after review and acceptance of the early grading permit application.
7. **Engineer or Engineer of Record** – The person authorized to practice engineering in Texas who is responsible for preparing engineering plans for a development.
8. **Floodplain Development Permit** – A permit required before any development activity shall begin within a floodplain or FEMA designated Special Flood Hazard Area (SFHA). This shall require a separate submittal to the CFW Floodplain Administrator.
9. **Fully Developed Conditions** – For watershed hydrology, fully developed conditions include all existing developed areas which shall reflect current land use or current zoning, whichever yields the greatest runoff, and all existing undeveloped areas which shall reflect anticipated future land use designated by zoning classification, by the City's Comprehensive Plan, or by an accepted concept plan, or in the ETJ, NCTCOG future land use maps.

10. **Grading Permit** – The approval by the CFW to proceed with the disturbance of 1.0 acre or more, after review and approval of the Final iSWM Plan, and any additional City required permits. A grading permit is required prior to any construction activity 1.0 acre or more.
11. **iSWM Construction Plan** – A plan and notes indicating the installation and maintenance of BMPs and application of pollution prevention procedures used to control erosion, sediment, construction materials, and waste during the construction phase of improvements in conformance with the criteria contained in this Manual. This plan shall be included within the construction plan set required for development within the CFW.
12. **iSWM Plan** – An *integrated* stormwater management plan (SWMP) that conforms to the criteria contained in this Manual (See Drainage Study).
13. **Maintenance Plan or Operations and Maintenance Plan** – A plan prepared in accordance with this Manual for the purpose of describing maintenance and operational requirements of a structural BMP and interchangeably used with the “CFW Stormwater Facility Maintenance Plan.”
14. **Natural Creeks** – Those drainageways that are generally unimproved, that often exhibit a meandering course, and which are not proposed to be improved to City standards for earthen channels. Natural creeks are generally not dredged, mowed or otherwise maintained by the City and should be contained within floodplain easements rather than drainage easements.
15. **Offsite Drainage Area** – An area which drains to the proposed development.
16. **Private Water** – Runoff water which is generated on private property and flowing within the property or from one property to another. Drainage easements and drainage facilities which contain only private water shall not be maintained by the City.
17. **Public Water** – The concentration of surface water flowing through or from public land or right-of-way. Public water must be contained within a dedicated right-of-way, floodplain or drainage easement.
18. **Stormwater Fee Credits** – An incentive provided by the CFW to encourage the voluntary use of BMPs which improve stormwater management. See Appendix F.
19. **Stormwater Facility Maintenance Agreement or Maintenance Agreement (SWFMA)** – A legal agreement between the CFW and a property owner, including HOAs and POAs, for perpetual maintenance of a structural BMP.
20. **Stormwater Pollution Prevention Plan or SWPPP** – The site design, operations, and inspections plan required by the Environmental Protection Agency (EPA) and the Texas Council on Environmental Quality (TCEQ) for the control of erosion and sediment during construction.
21. **Zone of Influence** – A “zone of influence” from a proposed development extends to a point downstream where the discharge from a proposed development no longer has a significant impact, as defined in Chapter 3.1, Table 3.1 and Chapter 3.7.3, upon the receiving stream or storm drainage system, and downstream properties. The Zone of Influence for any proposed development must be defined by the development engineer by a drainage study that: (1) determines the extent of the downstream drainage route subject to impacts from a proposed development, and (2) delineates what existing conditions are in place or what proposed mitigation is planned so that “no adverse impacts” from the new development will occur.

1.3 Applicability of Stormwater Criteria

The Stormwater Criteria is applicable under the following conditions for development and redevelopment as illustrated below and in Table 1.1.

Table 1.1 Applicability
Applicable for iSWM Site Design and Construction:
Land disturbing activity or platting of 1.0 acre or more
OR
land disturbing activity of less than 1.0 acre where the activity is part of a common plan of development that is 1.0 acre or more.

A common plan of development consists of construction activity that is completed in separate stages, separate phases, or in combination with other construction activities. To be considered as a common plan of development for purposes of this policy, a tract must meet one or more of the following characteristics:

- Included in a single concept plan submitted to the CFW,
- Included in a single preliminary plat submitted to the CFW,
- Is comprised of contiguous land (or land separated only by roadway and/or drainage rights-of-way or easements) under the same root ownership,
- Is encumbered by a single Master Drainage Study or Plan,
- Is encumbered by a single Developer's Agreement, TIF, 380 Agreement or other public/private partnership agreement,
- Is overlaid by a common Homeowner's or Property Owner's Association (HOA, POA), or
- Is owned or managed by a common Master Developer.

CFW requires a Grading Permit or an accepted and current iSWM plan prior to any land disturbance of 1.0 acre or more. After construction and grading activities are completed and disturbed areas are stabilized, a Grading Certificate must be provided by the Contractor or Engineer which affirms that construction has been completed in substantial compliance with plans accepted by the CFW and all temporary BMP's have been removed.

Development and redevelopment are not specifically defined in this manual. Rather, the applicability of this criteria is based on land disturbance activities. If an existing site has been cleared and/or graded within the prior five years of the date of the developer's initial application submittal, the developer may consider the land conditions prior to the clearing and grading to be the existing site conditions.

New development or redevelopment, subject to the applicability requirements shown in Table 1.1, which are located in critical or sensitive areas, or as identified through a watershed study or plan, may be subject to additional performance and/or regulatory criteria. Furthermore, these sites may need to utilize certain structural controls in order to protect a special resource or address certain water quality or drainage problems identified for a drainage area or watershed.

Site Design below Applicable Criteria

Site developments that do not meet the applicability requirements will not require an iSWM plan submittal. However, all developments within the CFW city limits and ETJ shall comply with the City of Fort Worth Subdivision Ordinance and development permitting requirements, including but not limited to building permits, floodplain development permits, SWPPP, grading permits, and urban forestry permits.

Adoption of Standards

For projects which have an accepted drainage study and/or iSWM plan, including phased developments which have some existing constructed phases after the adoption of the iSWM criteria in June 2006, findings in accepted studies will remain valid. The applicability of the current drainage criteria is presented below in the Applicability of the iSWM Standards Adoption Language.

Concept, Preliminary and Final iSWM Plans, as well as drainage design calculations accepted by the City of Fort Worth after the adoption of the City's drainage design standards and criteria on June 1, 2006 shall be considered valid when:

- *The proposed project is a phase of a multi-phase development that has a valid preliminary plat*
- *The drainage infrastructure of the proposed phase will connect directly to drainage infrastructure of a phase of the same development with drainage infrastructure designed and constructed based on the standards in previous versions of the City's iSWM manual.*

All iSWM plans and stormwater design projects submitted after the September 29, 2015 adoption date not meeting the criteria above shall use the current iSWM standards and will be valid for a period of time that is concurrent with the accepted preliminary or final plat for the project.

If a proposed development maintains or decreases the percent imperviousness onsite, an iSWM submittal will be required to provide confirmation of maintained or decreased percent imperviousness and show no additional impacts.

For applicable sites, the building permit process shall require a drainage review of the Final iSWM Plan to ensure that the site runoff is consistent with existing runoff patterns or has been appropriately addressed.

2.0 Stormwater Development Process

This chapter discusses the CFW stormwater development process and review requirements. The submittal process, development paths and subsequent iSWM plans are described.

2.1 iSWM Submittals

Stormwater development review submittals shall be submitted to Transportation and Public Works Department – Stormwater Division at the City of Fort Worth located at 1000 Throckmorton, Fort Worth, Texas, 76102. All drainage reviews shall be submitted to the Stormwater Development Services Department. Digital submittals are highly encouraged and recommended. Information regarding digital submittals shall be available on Buzzsaw. The checklists are available in an editable form online through Buzzsaw and shall be included in the digital submittal. For additional information on the use of Buzzsaw contact the Stormwater Development Services Department at sds@fortworthtexas.gov. Upon receiving a stormwater submittal for review, the submittal package will receive a cursory review for completeness of submittal requirements. Incomplete submittals shall not be accepted. The checklists for each submittal are located in Appendix A of the iSWM Criteria Manual and listed below.

1. Preliminary iSWM Checklist – Form CFW – 1
2. Final iSWM Checklist – Form CFW – 2
3. Grading Permit Application – Form CFW – 9
4. Final Grading Certificate – Form CFW – 10

2.2 iSWM Plan Submittal Requirements

The requirement of each plan is dependent on the development path underway, as shown in Figure 2.1 at the end of this chapter. It should be noted that the process diagram provided in Figure 2.1 is for Stormwater development reviews only and does not include additional reviews required by other City of Fort Worth Departments. It shall be the applicant's responsibility to inquire regarding pertinent permitting and review submittals required for their project.

The level of drainage review is dependent on the type of development activity proposed. iSWM reviews are required for Grading Permits, Concept Plans, and Platting on properties with land disturbance of 1.0 acre or more, or smaller land disturbances part of a common plan of development. Requirements for each review are further described in this chapter.

An appropriate level drainage study of existing, proposed, and fully developed conditions will be required as part of each iSWM plan. The drainage study is necessary to determine appropriate easement needs, and perform a downstream assessment to determine the zone of influence. The Preliminary iSWM Plan will include only enough detail to determine approximate onsite controls and to establish adequate downstream capacity to the zone of influence to support future development of the project. A Preliminary iSWM Plan shall contain general volume and location information when detention is to be utilized. Detailed design calculation for detention requirements will be required for approval of public infrastructure construction documents and for Final iSWM Plan and final plat approval. The Final iSWM Plan will include the necessary hydrologic and hydraulic analysis to clearly demonstrate that the limits of the zone of influence have been identified, and that along the drainage route to that location, the parameters listed in Table 3.1 and Chapter 3.7.3 are met.

Concept Plan

A concept plan is intended for multi-phase developments and is required by the CFW Planning and Development Department when:

- Preliminary plats are proposed to be presented in stages
- Total land area of contiguous parcels under the same ownership and control is greater than one square mile (640 acres), and
- The area is located wholly or partially within the CFW or proposed for annexation to the City.

Additional information regarding the Conceptual iSWM Plan in support of concept plan is provided below and in Chapter 2.3, Step 2.

Conceptual iSWM Plan

The Conceptual iSWM Plan is required for the approval of a concept plan. The Conceptual iSWM Plan requirements are included as a subset of the Preliminary iSWM Checklist located in Appendix A, Form CFW – 1. Additional information regarding the Conceptual iSWM Plan is provided in Chapter 2.3, Step 2.

Platting

A preliminary plat requires an accepted Preliminary iSWM Plan. Subsequently, a final plat, a minor, short form final or a replat requires an accepted Final iSWM Plan.

Preliminary iSWM Plan

A Preliminary iSWM Plan is required for preliminary plans and preliminary platting. The Preliminary iSWM Plan requirements are provided on the Preliminary iSWM Checklist located in Appendix A, Form CFW – 1. Additional information regarding the Preliminary iSWM Plan is provided in Chapter 2.3, Step 3.

Grading Permit Application

Upon acceptance of a Preliminary iSWM Plan, if a proposed development of 1.0 acre or more requires earthwork only, an early grading permit may be obtained by completing a Grading Permit Application. A final grading permit shall be required for construction activities and may be obtained by completing a Grading Permit Application. The Grading Permit Application, provided in Appendix A, Form CFW – 9, lists the requirements necessary to obtain an early or final grading permit. Additional information regarding the application for a grading permit is provided in Chapter 2.3, Step 4. Grading permit applicants should refer to the City of Fort Worth Grading Ordinance for further information.

Final iSWM Plan

A Final iSWM Plan is required for final construction plans and final platting. The Final iSWM Plan requirements are provided on the Final iSWM Checklist located in Appendix A, Form CFW – 2. Additional information regarding the Final iSWM Plan is provided in Chapter 2.3, Step 5.

Additional Development Information

Proposed developments that are located within a FEMA Special Flood Hazard Area (SFHA) designated floodplain shall require a Floodplain Development Permit. Questions regarding the Floodplain Development Permit should be directed to the Floodplain Administrator at the CFW.

Proposed developments may require an urban forestry permit. Questions regarding the urban forestry permit should be directed to the Planning and Development Department at the CFW.

The Final iSWM Plan shall be required and accepted prior to obtaining a building permit, if applicable by ordinance or this manual. Prior to a Certificate of Occupancy being issued, a Final Grading Certificate prepared by an engineer or the contractor, as appropriate, shall be submitted. The Final Grading Certificate shall state that the site grading and drainage improvements are constructed in substantial compliance with the accepted plans. If the improvements were not constructed in substantial compliance with the plans,

appropriate documentation shall be provided to substantiate any changes. If changes were made to public facilities, the City shall require an engineer to document field changes by submitting certified as-built plans and documenting changed calculations and proposed corrective actions, if required. The final grading certificate, building permit, and certificate of occupancy are administered by the CFW Planning and Development Department.

Construction of public infrastructure shall require submittal of construction plans for review through the Infrastructure Plan Review Center (IPRC). These plans will be reviewed for conformance with the CFW drainage criteria and also consistency with the Conceptual, Preliminary and Final iSWM Plans previously submitted.

2.3 Development of an iSWM Plan

This chapter describes the typical contents and general procedure for preparing an iSWM plan, and the final construction plans and iSWM Construction Plan, required as part of the Final iSWM Plan. The level of detail involved in each submittal will depend on the project size and the individual site and development characteristics. Detailed criteria for the calculations required in the iSWM plans and construction plans are covered in Chapter 3 of this manual.

Stormwater master plans are an important tool used to assess and prioritize both existing and potential future stormwater problems and to consider alternative stormwater management solutions. The CFW may have individual watershed plans, or several developers may choose to work cooperatively to develop a unified approach to watershed planning, development controls, permit compliance, multi-objective use of floodplain and other areas, and property protection. The CFW Stormwater staff should be consulted on any regional approaches considered.

There are five steps defined in the preparation of Stormwater development review submittals. In general, each of the following steps builds on the previous step to result in the Final iSWM Plan, construction drawings and iSWM Construction Plan.

Step 1 – Baseline Data Collection and Analysis

Step 2 – Prepare Conceptual iSWM Plan (Concept Plans Only)

Step 3 – Prepare Preliminary iSWM Plan

Step 4 – Prepare Grading Permit Application (Early and/or Final)

Step 5 – Prepare Final iSWM Plan, Construction Drawings, iSWM Construction Plan, and Stormwater Facilities Maintenance Agreement (SWFMA)

Step 1 – Baseline Data Collection and Analysis

The site developer shall become familiar with the CFW stormwater management, development requirements and design criteria that apply to the site. These requirements include:

- Stormwater Criteria Manual (this manual)
- Available online iSWM Program documents, which include:
 - o iSWM Technical Manual
 - o iSWM Tools
 - o iSWM Program Guidance
- State and Federal Regulatory Requirements
- Other CFW Ordinances and Criteria (Not regulated by the Stormwater Division)
 - o Platting Procedures
 - o Zoning Requirements
 - o Development Codes and Procedures
 - o Tree and Landscape Requirements
 - o Special Use Permits
 - o Drainage Master Plans and Watershed Plans
 - o Erosion Control Plans
 - o Floodplain Development Ordinance

- o Grading Plan Ordinance
- o Construction/Building Permit Notifications and Requirements
- o Urban Forestry Requirements

Information regarding the above items can be obtained from this manual or at a pre-development conference with the CFW.

A critical part of any project involves the proposed developer working closely with various departments within the City. Integrating the stormwater management practices with other regulatory requirements will promote a sustainable development.

Opportunities for special types of development (e.g., clustering) or special land use opportunities (e.g., conservation easements or tax incentives) should be investigated. In addition, there may be an ability to partner with the local community for the development of greenways or other riparian corridor or open space developments.

All applicable state and federal regulatory requirements must also be met.

In addition to understanding all applicable regulations and ordinances, it is also necessary to collect and review information on the existing site conditions and map the following site features:

- Topography
- Drainage patterns and basins
- Intermittent and perennial streams on-site and off-site waters that will receive discharges from the proposed development
- Soil types and their susceptibility to erosion
- Ground cover and vegetation, particularly unique or sensitive vegetation areas to be protected during development.
- Existing development
- Existing Stormwater facilities on-site and off-site facilities that will be receive discharges from the proposed development
- Property lines, adjacent areas and easements
- Wetlands and critical habitat areas
- Boundaries of wooded areas and tree clusters
- Floodplain boundaries
- Steep slopes
- Required buffers and setbacks along water bodies
- Proposed stream crossing locations
- Other required protection areas

Upon completion of the baseline data collection and analysis, it is recommended and encouraged to schedule a stormwater pre-development conference with the CFW Stormwater Development Review Services staff. This meeting will allow a dialogue to begin between the developer and the City regarding the site conditions and potential areas of concern prior to work being done for the development. To schedule a pre-development conference with the Stormwater staff, please send an email to sds@fortworthtexas.gov.

The site analysis shall be summarized in the relevant iSWM plan along with any other supporting documents. The data collected and analyzed during this step of the development process shall be used as the starting point for preparing the iSWM plans and the iSWM Construction Plan.

Step 2 – Prepare Conceptual iSWM Plan (Concept Plans Only)

If a concept plan is not required or submitted, proceed to Step 3.

For larger master plan developments with multiple phases of development, a concept plan may be required. The concept plan allows the design engineer to propose a potential site layout and gives the developer and CFW a “first look” at the stormwater management system for the proposed development. Specific requirements for the concept plan shall be obtained through the CFW Planning and Development Department. If a concept plan is required, a Conceptual iSWM plan will be required.

For a Conceptual iSWM Plan, the following steps shall be followed in analyzing the drainage conditions for a concept plan:

1. Use *integrated* Site Design Practices. Note: *integrated* Site Design Practices are encouraged but not required within the CFW. Examples include:
 - Preserving the natural feature conservation areas defined in the site analysis
 - Fitting the development to the terrain and minimizing land disturbance
 - Reducing impervious surface area through various techniques
 - Preserving and utilizing the natural drainage system wherever possible
2. Determine the credits for *integrated* Site Design (Appendix F) and water quality volume reduction (Appendix F) as applicable, to be accounted for in the design of structural and non-structural stormwater controls on the site.
3. Calculate conceptual estimates of the design requirements for streambank protection and flood mitigation based on the conceptual plan site layout.
4. Perform screening and conceptual selection of appropriate temporary and permanent structural stormwater controls and identification of potential site locations.

Drainage requirements for the Conceptual iSWM Plan are presented as a subset of requirements specifically noted on the Preliminary iSWM Plan Checklist found in Appendix A (Form CFW – 1).

It should be noted that acceptance of the Conceptual iSWM Plan does not imply acceptance of the Preliminary and/or Final iSWM Plans. Those plans will be required and reviewed as development proceeds.

Step 3 – Prepare Preliminary iSWM Plan

The Preliminary iSWM Plan ensures that requirements and criteria are complied with and opportunities are taken to minimize adverse impacts from the development. An accepted Preliminary iSWM Plan is prerequisite of preliminary plat approval. This step builds on the data compiled in Step 1 by developing the existing and proposed runoff calculations and identifying proposed stormwater controls as well as the zone of influence associated with the development. The checklist for the Preliminary iSWM Plan in Appendix A (Form CFW-1) outlines the data that shall be included in the Preliminary iSWM Plan.

The Preliminary iSWM Plan, which includes a preliminary drainage study, must accompany a preliminary plat submitted for development review for any proposed development 1.0 acre or more in land disturbance. At a minimum the information listed in the Preliminary iSWM Checklist (Form CFW-1) shown in Appendix A – City of Fort Worth Detailed Checklists and Forms shall be required. The study shall include a downstream assessment of properties that could be impacted by the development. Unless using the simplified methods described in Chapter 3.7.2, these studies will include the hydrologic analysis to determine the existing, proposed, and fully-developed runoff for the drainage area that is affected by the proposed development and will include a hydraulic analysis that defines the adequate outfall as defined in Table 3.1. It will include a capacity analysis of all existing constraint points such as pipes, culverts/bridges, or channels from the point of stormwater discharge from the development (edge condition) downstream through the zone of influence. For development projects involving properties 100 acres or less, the downstream assessment will be limited to the zone of influence, determined either by the study or

established as the point where the property being developed comprises 10% of the total drainage area ([see the iSWM Hydrology Technical Manual, Section 2.4](#)). Consideration of critical infrastructure and logical analysis end points (ie. bridges, road crossings, creek or river confluences) will be required when using the 10% rule. It shall be the discretion of the reviewer to request the 10% analysis be extended if critical downstream infrastructure has not been included in the analysis. For development projects involving properties more than 100 acres in size, the “adequate outfall point” will be defined by the hydrologic and hydraulic analyses. The Preliminary iSWM Plan shall include the items listed in the Preliminary iSWM Checklist, located in Appendix A, Form CFW – 1.

Simplified methodology have been developed which may be used for the preliminary iSWM plan. Further discussion of these methods is provided in Chapter 3.7.2.

It should be noted that acceptance of the Preliminary iSWM Plan does not imply acceptance of the Final iSWM Plan. Those plans will be required and reviewed as development proceeds.

Step 4 – Prepare Grading Permit Application

Grading permits are available for early grading and final grading on a site of 1.0 acre or more. Early grading permits are applicable to clearing, grubbing, and grading only, with no construction allowed. A final grading permit is required even if an early grading permit is obtained. The final grading permit allows for infrastructure and building construction. The grading permit application is located in Appendix A (Form CFW – 9). All single family residential grading plans must conform to Chapter 3.8.2 (Subdivision Drainage Site Grading) and Appendix E (Single Family Residential Lot Drainage Types).

Changes in existing drainage divides shall be identified and data shall be required to document that capacity is available in the existing system to carry the additional flow to the system.

Grading permit applications should be submitted through the CFW Permit Center. Electronic submittals of the grading permit application are currently not available. At the application submittal, a completed grading permit application form, administrative fee, signed/sealed grading plan sheet(s) and a digital copy of the SWPPP will be required.

It should be noted that the early grading permit is for earthwork only and will be at the risk of the owner/developer. Grading permit issuance will require an accepted preliminary iSWM plan for an early grading permit or accepted final iSWM plan for a final grading permit, review and acceptance of the submitted grading plan sheets by Stormwater Development Services, review and acceptance of the SWPPP by the Environmental Department, approval through Part One of the Urban Forestry Permit, and an accepted Floodplain Development Permit, as applicable, by the Floodplain Manager.

Step 5 – Prepare Final iSWM Plan, Construction Drawings, iSWM Construction Plan, and Stormwater Facilities Maintenance Agreement

The Final iSWM Plan, construction drawings, and the iSWM Construction Plan shall be prepared together and submitted to the CFW for approval prior to final plat approval or any construction activities on the development site. The Final iSWM Plan adds further detail to the Preliminary iSWM Plan and reflects changes that are requested or required by the CFW. When public infrastructure will be constructed, submittals also must conform to the Infrastructure Plan Review Center (IPRRC) requirements. Changes identified during IPRC and/or Final iSWM Plan Review which result in changes to the preliminary plat will not require a resubmittal of the Preliminary iSWM plan. Changes will be reviewed as part of the Final iSWM plan review.

The Final iSWM plan, which includes a final drainage study, shall be prepared for development of all or a portion (i.e. phase one or phase two, etc.) of the overall development and submitted to the CFW. This submittal shall include at a minimum the information listed in the Final iSWM Checklist (Form CFW-2) shown in Appendix A – City of Fort Worth Detailed Checklists and Forms. Note that a downstream assessment for the Final iSWM Plan is not required for small infill developments which meet the specific criteria outlined in Chapter 3.7.2.

Please note:

1. The Final iSWM Plan shall be accepted upon conformance with Preliminary iSWM comments, final iSWM checklist requirements, and a drainage area map with calculations from the accepted engineering construction drawings. Drainage calculations presented on the construction plans must conform to calculations submitted in the Final iSWM Plan. Where City approval of construction plans is not required, the above information required for the iSWM plan, as well as construction plans for any drainage improvements, prepared according to criteria in the current TPW plan review checklists, shall be submitted. For changes during IPRC Review, Preliminary iSWM resubmittal is not required. Changes will be reviewed as part of Final iSWM Review.
2. If a stormwater facility is provided which qualifies for a Stormwater Fee Credit, the engineer must submit an application to the CFW along with supporting documentation which shows compliance with the Stormwater Credit Manual and iSWM standards for water quality treatment. The Stormwater Credit Manual is shown in Appendix F – Stormwater Utility Fee Credit Policy.
3. A Final Grading Permit and accepted Final iSWM Plan will be required prior to the issuance of a commercial building permit for a grading activity of 1.0 acre or more or smaller sites that are part of a larger common plan of development. See the Grading Permit Application (Form CFW-9) in Appendix A for submittal information. The Final Grading Permit will be required, even if an Early Grading Permit was obtained at an earlier stage.
4. Construction phase requirements shall comply with IPRC requirements.

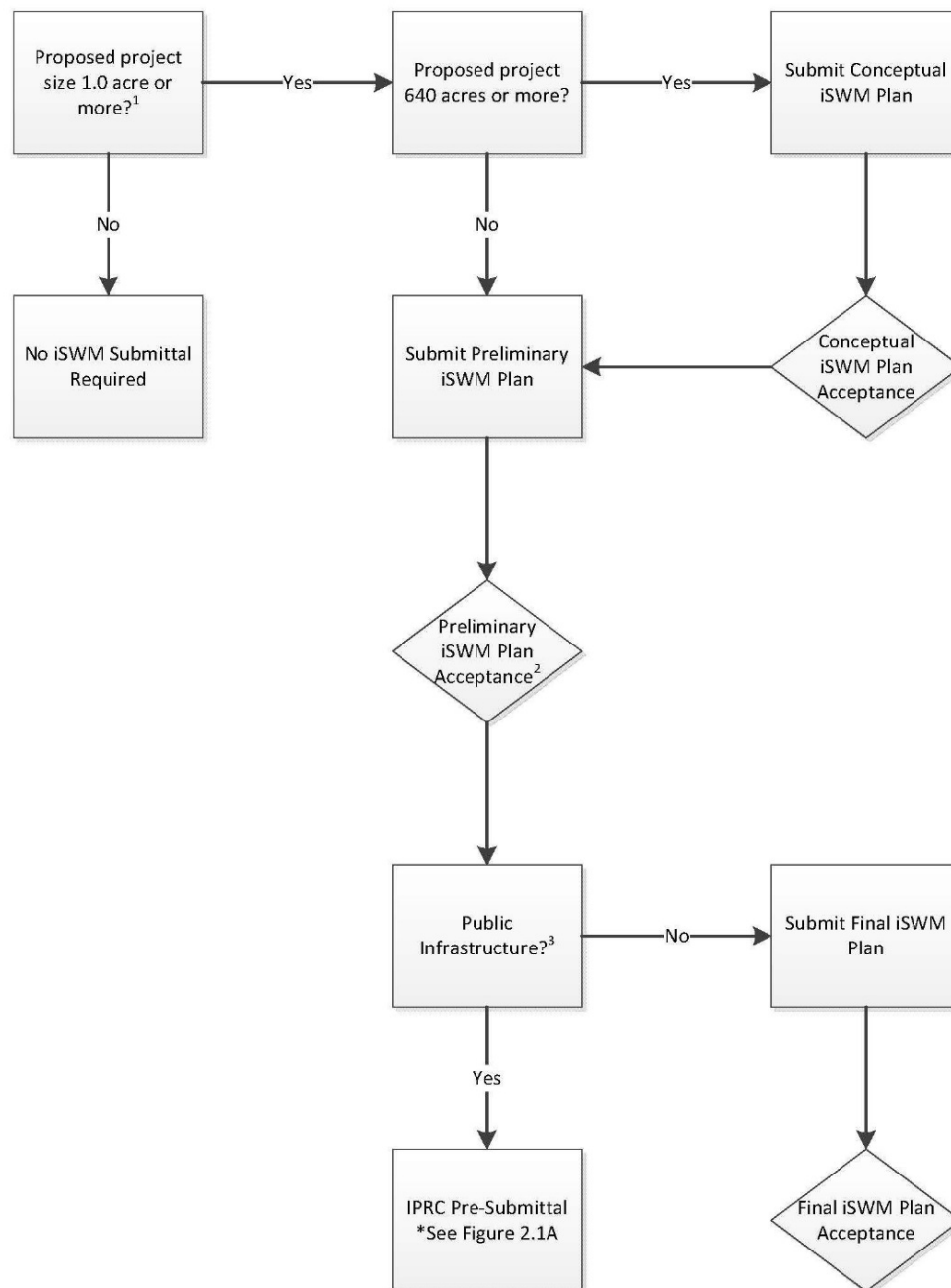
A Stormwater Facility Maintenance Agreement (SWFMA) is required for each stormwater control that will not be wholly maintained by the CFW. This agreement must outline both preventive maintenance tasks as well as major repairs, identify the schedule for each task, assign clear roles to effected parties, and provide a maintenance checklist to guide future owners including an annual self-inspection to be provided to the CFW. Please refer to the Stormwater Facility Maintenance Agreement Checklist provided in Appendix A, Form CFW – 8.

An Operations and Maintenance Plan shall be developed in accordance with CFW requirements and shall be included with the Final iSWM Plan. It should clearly state which entity has responsibility for operation and maintenance of temporary and permanent stormwater controls and drainage facilities to ensure they function properly from the time they are first installed.

The Operations and Maintenance Plan shall include but is not limited to:

- Responsible party for all tasks in the plan
- Inspection and maintenance requirements
- Maintenance of permanent stormwater controls and drainage facilities during construction
- Cleaning and repair of permanent stormwater controls and drainage facilities before transfer of ownership
- Frequency of inspections for the life of the permanent structures
- Description of maintenance tasks and frequency of maintenance
- Access and safety issues
- Maintenance easements
- Reviewed and accepted maintenance agreements

Guidance for development of Operation and Maintenance Plans has been provided with each temporary and permanent Best Management Practice (BMP) included in the *iSWM Construction Controls Technical Manual*.



Note: CFW SWM Goal = 10 business days per review and an average of no more than 3 review cycles per project.

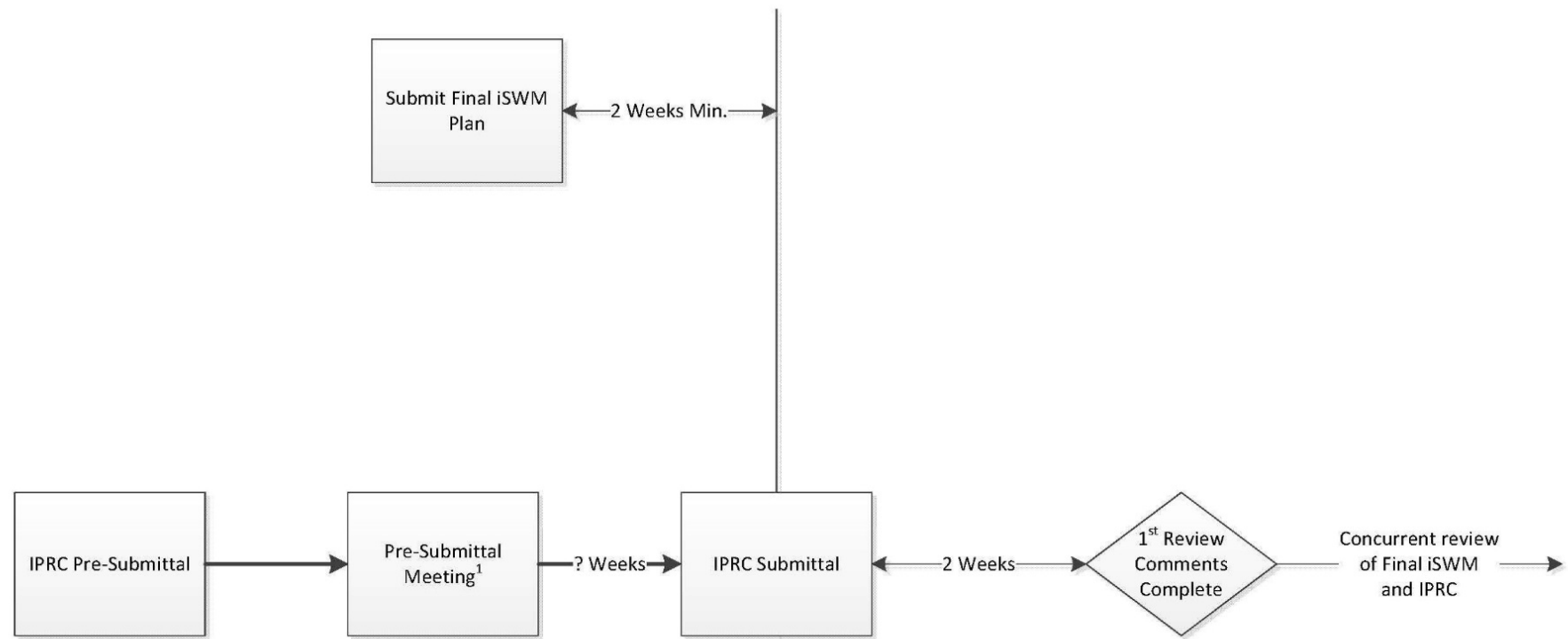
¹Applicability is for land disturbing activity of 1.0 acre or more, or part of a larger common plan of development (See Table 1.1).

²Preliminary and Final iSWM plans may be submitted together.

³Improvements in the ROW with Stormwater Systems OPCC \$20,000 or greater require a submittal to the IPRC.

Version Date: 09/29/2015

Figure 2.1 Stormwater Development Review Process - iSWM



¹SWM Comments based on Preliminary iSWM and SWM PDC, if used.

Version Date: 09/29/2015

Figure 2.2 Stormwater Development Review Process - IPRC

3.0 Stormwater Design Criteria

This chapter presents an *integrated* approach for meeting stormwater runoff quality and quantity management goals by addressing the key adverse impacts of development on stormwater runoff. Its framework consists of three focus areas, each with options in terms of how the focus area is applied.

Design Focus Areas

The stormwater management focus areas and goals are:

- **Water Quality Protection:** Remove pollutants in stormwater runoff to protect water quality. Note: Water quality protection is encouraged but not mandatory in the CFW.
- **Streambank Protection:** Regulate discharge from the site to minimize downstream bank and channel erosion.
- **Flood Mitigation and Conveyance:** Control runoff within and from the site to minimize flood risk to people and properties for the conveyance storm as well as the flood mitigation storm.

Water quality design criteria are voluntary in Fort Worth. The controls may be used, however, to obtain Stormwater Fee Credits, in which case iSWM standards are applicable. Information on Stormwater Fee Credits is contained in Appendix F of this manual.

While water quality protection is encouraged but not required in the CFW, steps for water quality protection are beneficial to sustainable development and are recommended in the development process.

Each of the Design Focus Areas should be used in conjunction with the others to address the overall stormwater impacts from a development site. When used as a set, the Design Focus Areas are intended to control the entire range of hydrologic events, from the smallest runoff-producing rainfalls up to the 100-year, 24-hour storm.

3.1 Design Options

There are multiple options provided to meet the criteria for water quality protection, streambank protection, conveyance, and flood mitigation. These design options are summarized in Table 3.2 and described in additional detail in Chapter 3.7.2.

Design criteria for streambank protection and flood mitigation are primarily based on a downstream assessment. The purpose of the downstream assessment is to protect downstream properties and channels from increased flooding and erosion potential due to upstream development. A downstream assessment is required to determine the zone of influence and the extent of improvements necessary for streambank protection and flood mitigation. Downstream assessments shall be performed for streambank protection, conveyance, and flood mitigation storm events as described in Table 3.1, Table 3.3 and Chapter 3.7.3. Note that sites demonstrating no increase in impervious cover and sites proposing detention storage, with a total land disturbance of less than 5 acres and a contributing drainage area of less than 25 acres at outfall will not require a downstream assessment. In cases where detention is proposed to waive downstream assessment, detention volume must adequately address the increase in discharge due to the proposed development.

If calculations indicate that a development causes no adverse impacts to existing conditions, then it is possible that mitigation would not be required.

Table 3.1 Zone of Influence (Adequate Outfall) Determination		
Item	Parameter	Requirements
1	Habitable Structures	No new or increased flooding (0.00 feet) of existing insurable (FEMA) structures (habitable buildings).
2	Flood Elevations	No increase greater than 0.1 feet in 1-, 5-, and 100-year flood elevations over existing roadways. No increase greater than 0.1 feet and 100-year flood elevations, unless contained in existing channel, roadway, drainage easement and/or R.O.W.
3	Floodplain Ordinance	Where provisions of the City's floodplain ordinance may be more restrictive, the floodplain ordinance shall have authority over the above provisions.
4	Channel Velocities	- Proposed channel velocities for 1-, 5-, and 100-year storms cannot exceed the applicable maximum permissible velocity shown in Table 3.16 and Table 3.17 of this manual. Exceptions to these criteria will require certified geotechnical /geomorphologic studies that provide documentation that the higher velocities will not create additional erosion. - If existing channel velocities exceed maximum permissible velocities shown in Table 3.16 and Table 3.17, no more than a 5% increase in velocities will be allowed.
5	Downstream Discharges	No increase in downstream discharges caused by the proposed development that, in combination with existing discharges, exceeds the existing capacity of the downstream storm drainage system or existing right-of-way.
6	Downstream Assessment	- For 1-5 acre sites with proposed detention and draining a watershed less than or equal to 25 acres, a downstream assessment is not required. The detention volume must adequately address the increase in discharge due to the proposed development. - For watersheds of one hundred (100 ac) acres or less at any proposed outfall, the downstream assessment may use the 10% rule of thumb (as delineated in Section 2.4 of the Hydrology Technical Manual) or a detailed study in order to determine the zone of influence. - For all other watersheds, the zone of influence will be defined by a detailed hydrologic and hydraulic analysis. - A downstream assessment exemption may be acquired for small infill developments which meet the specific criteria outlined in Chapter 3.7.2.

*[Section 2.0 of the Hydrology Technical Manual](#) gives additional guidance on calculation discharges and velocities, as well as determining the downstream extent of the assessment.

Table 3.2 Summary of Options for Design Focus Areas

Design Focus Area	Reference Chapter	Required Downstream Assessment	Design Options
Water Quality Protection (Not currently required by the CFW) Please note, water quality protection may be required by TRWD or other agencies.	3.5	No	Option 1: Use <i>integrated</i> Site Design Practices for conserving natural features, reducing impervious cover, and using the natural drainage systems
			Option 2: Treat the Water Quality Protection Volume (WQ _v) by reducing total suspended solids from the development site for runoff resulting from rainfalls of up to 1.5 inches (85 th percentile storm)
			Option 3: Assist in implementing off-site community stormwater pollution prevention programs/activities as designated in an accepted stormwater master plan or TPDES Stormwater permit
Streambank Protection	3.6	Yes	Option 1: Reinforce/stabilize downstream conditions
			Option 2: Install stormwater controls to maintain or improve existing downstream conditions
			Option 3: Provide on-site controlled release of the 1-year, 24-hour storm event over a period of 24 hours (Streambank Protection Volume, SP _v)
Flood Mitigation and Conveyance	3.7 and 3.8	Yes/No	Flood Mitigation (3.7) Option 1: Provide adequate downstream conveyance systems (Requires a downstream assessment or application of the Simplified Finding of No Significant Impact as presented in Chapter 3.7.2)
			Option 2: Install stormwater controls on-site to maintain or improve existing downstream conditions. A downstream assessment is waived for on-site controls in the form of detention when proposed site has less than 5 acres of land disturbance and is draining less than 25 acres at the outlet of the basin. Detention must completely mitigate the increase in peak discharge due to proposed development. Simplified detention volume estimation presented in Chapter 3.7.2 may be used for Preliminary iSWM only.
			Option 3: In lieu of a downstream assessment, mimic existing on-site runoff conditions (Does not require a downstream assessment)
			Option 4: When downstream impacts are limited to a single adjacent property, the developer may obtain a notarized letter of permission from the affected property owner acknowledging the impacts from the subjected property in lieu of mitigation.
			Conveyance (3.8) Minimize localized site flooding of streets, sidewalks, and properties by a combination of on-site stormwater controls and conveyance systems

3.2 Design Storms

The CFW requires the following storm events to be used in the *integrated* stormwater design.

Table 3.3 Storm Events		
Storm Event Name	Storm Event Description	Design Standard ²
"Water Quality" ¹	Criteria based on a volume of 1.5 inches of rainfall, not a storm frequency	
"Streambank Protection"	1-year return period	• Low flow channels and velocity check
"Conveyance"	5-year return period	• Secondary check for street inundation and open travel lanes
"Flood Mitigation"	100-year return period	• Open channels • Primary standard for street and storm drain in conjunction

¹Currently encouraged but not required in the CFW

²See Chapter 3.8 for specific design criteria

Throughout the manual the storms will be primarily referred to by their storm event names.

3.3 Design Criteria

The Design guidelines for the CFW are:

1. All development within the CFW City Limits or its Extra-territorial Jurisdiction (ETJ) shall include planning, design, and construction of storm drainage systems in accordance with this Stormwater Criteria Manual, Plan Commission Rules and Regulations, and Policy for the Installation of Community Facilities. Please see definition of development and project size limitations for specific design requirements under "Abbreviations and Definitions" in Chapter 1.2.
2. All drainage related plans and studies shall be prepared and sealed by a Licensed Professional Engineer with a valid license and a valid registered Firm number from the State of Texas. The engineer shall attest that the design was conducted in accordance with this Criteria Manual.
3. For currently developed areas within the CFW with planned re-development, stormwater discharges and velocities from the project should not exceed discharges and velocities from the existing developed conditions. Alternatively, a notarized letter of permission may be obtained from the affected property owner, acknowledging the proposed impact, as shown in Table 3.2, Option 4 under Flood Mitigation.
4. All drainage analyses and design plans shall be formulated and based upon fully developed watershed or drainage area runoff conditions from the upstream area. In certain circumstances where detention is in place with a valid SWFMA or a master plan has been adopted, a development may plan to receive less than fully developed flow from upstream with the approval of TPW. The rainfall frequency criteria for stormwater facilities, as enumerated within this Criteria Manual, shall be utilized for all drainage studies and design plans.
5. Stormwater must be carried to an "adequate or acceptable outfall". An adequate outfall is one that does not create or increase flooding or erosion conditions downstream and is in all cases subject to the approval of the TPW. See additional clarification in Table 3.1 and Chapter 3.7.3.
6. Proposed stormwater discharge rates and velocities from a development shall not exceed the rates and velocities from existing conditions, unless a detailed study is prepared that demonstrates that no adverse impacts will be created, as defined in Table 3.1 and Chapter 3.7.3.

7. If a proposed development drains into an improved channel or stormwater drainage system designed under a previous CFW drainage policy (Prior to 2006), then the hydraulic capacities of downstream facilities must be checked to verify that increased flows, caused by the new development, will not exceed the capacity of the existing system or cause increased downstream structure flooding. If there is not sufficient capacity to prevent exceedance of existing rights of way or increased downstream flooding, then detention or other acceptable measures must be adopted to accommodate the increase in runoff due to the proposed development. For projects which have an accepted drainage study and/or iSWM plan, including phased developments which have some existing constructed phases after the adoption of the iSWM criteria in June 2006, findings in accepted studies will remain valid.
8. Stormwater runoff may be stored in detention and retention basins to mitigate potential downstream impacts caused by a proposed development. Proposed detention or retention basins shall be analyzed both individually and as a part of the watershed system, to assure compatibility with one another and with the City's overall Stormwater Management Master Plan for that watershed (if available). Storage of stormwater runoff, near to the points of rainfall occurrence, such as the use of parking lots, ball fields, property line swales, parks, road embankments, borrow pits and on-site ponds is desirable and encouraged.
9. When detention is used to attenuate peak discharge from a proposed development, runoff must be controlled for the applicable storms listed in Table 3.3 so that detained proposed peak discharges do not adversely impact downstream flooding and stream bank conditions, as described in Design Guidelines 5 and 6, above. Where detention is used to completely offset the impact of the development, the proposed site is 5.0 acres or less and the contributing basin has a drainage area less than 25 acres at outlet, a downstream assessment may be waived.
10. Alternatives to detention or retention, for mitigation of potential downstream impacts caused by proposed development, include: acquisition of expanded drainage easements, ROW, or letter of consent; downstream channel and/or roadway drainage system improvements or stream bank erosion protection; and financial contributions to the CFW Stormwater Program for previously identified future improvements (not presently an active program for CFW). These alternatives will be considered, as presented by the developer, by the Director of the Transportation and Public Works Department, on a case-by-case basis.
11. Stream bank stabilization and protection features to reduce or prevent erosion and sedimentation for creeks, streams, and channels shall be required, as specified in this Manual, and to ensure the intent of Design Guidelines 5 and 6, above.
12. All proposed developments within the CFW City Limits or Extra-territorial Jurisdiction (ETJ) shall comply with all local, county, state and federal regulations and all required permits or approvals shall be obtained by the developer.
13. The policy of the CFW is to avoid substantial or significant transfer of stormwater drainage runoff from one basin to another and to maintain historical drainage paths whenever possible. However, the transfer of stormwater drainage from basin to basin may be necessary in certain instances and will be reviewed and a variance shall be requested from the TPW using Form CFW-7 in Appendix A – City of Fort Worth Detailed Checklists and Forms.

3.4 Hydrologic Design Criteria

3.4.1 Types of Hydrologic Methods

There are a number of empirical hydrologic methods available to estimate runoff characteristics for a site or drainage sub basin. However, the following methods have been selected to support hydrologic site analysis for the design methods and procedures included in this manual:

- Rational and Modified Rational Method
- SCS Unit Hydrograph Method
- Snyder's Unit Hydrograph Method
- USGS & TXDOT Regression Equations
- iSWM Water Quality Protection Volume Calculation
- Water Balance Calculations

Table 3.4 provides the CFW limitations on the use of several accepted hydrologic methods.

Table 3.4 City of Fort Worth Constraints on Using Recommended Hydrologic Methods		
Method	Size Limitations ¹	Comments
Rational ¹	0 – 200 acres	Method for estimating peak flows and the design of small site or subdivision storm sewer systems.
Modified Rational ^{1,2,3}	0 – 25 acres	Method can be used for detention planning in drainage areas up to 200 acres and for final design in single basins. However, modified rational method is not allowed for basins in series.
Unit Hydrograph (SCS)	Any Size	Method can be used for estimating peak flows and hydrographs for all design applications.
Unit Hydrograph (Snyder's)	100 acres and larger	Method can be used for estimating peak flows and hydrographs for all design applications.
TXDOT Regression Equations	10 to 100 mi ²	Method can be used for estimating peak flows for rural design applications.
USGS Regression Equations	3 – 40 mi ²	Method can be used for comparison with other methods

¹ Note: Calculations previously accepted by CFW using "C" coefficients from the 2006 manual shall be considered acceptable.

² MRM Methodology shall be as defined in Section 1.5.2 of the iSWM Hydrology Technical Manual.

³ A City provided Modified Rational Method tool is available and its use is encouraged. Please contact SDS staff at SDS@fortworthtexas.gov.

- CFW requires that the "C" coefficients presented in Table 3.5 be used in all Rational and modified Rational Method computations. It should be noted that calculations previously accepted by the CFW using "C" coefficients from the 2006 Manual shall be considered acceptable, as described in Chapter 1.3. Where existing land use does not correspond to Table 3.5, a composite "C" value may be calculated using 0.9 for impervious areas and 0.3 for pervious areas.
- Rainfall distribution for the SCS Unit Hydrograph shall be based on the Frequency Rainfall Data provided in [Section 5.0 of the Hydrology Technical Manual](#) centered at the midpoint of the rainstorm (12th hour of a 24-hour storm) unless otherwise accepted by the TPW.
- The percent impervious values presented in Table 3.5 shall be used in the SCS Unit Hydrograph calculations.

- The “Frequency Factors” referenced in [Section 1.2.3 of the Hydrology Technical Manual](#) are not required by the CFW.
- Figure 3.1 presents a sample computation summary sheet for the presentation of unit hydrograph method results. This form should be completed even if the computations are performed on an acceptable computer program such as HEC-1 or HEC-HMS. Refer to Appendix B for acceptable modeling programs.
- An alternative method to determine Snyder’s Lag is to determine the time of concentration (travel time) by the methodology described in [Section 1.3.6 of the Hydrology Technical Manual](#) and multiply this time of concentration by 0.6.
- The TxDOT and USGS Regression methods should only be used for comparison of the reasonableness of other accepted determinations, not for final results or design unless specifically accepted by TPW.
- iSWM Water Quality Protection Volume (WQv) calculation method is not currently required by CFW.
- Fully Developed Conditions – For watershed hydrology, fully developed conditions include:
 - All existing developed areas shall reflect current land use or current zoning, whichever yields the greatest runoff.
 - All existing undeveloped areas shall reflect anticipated future land use designated by zoning classification, by the City’s Comprehensive Plan, or by an accepted concept plan.
- If the anticipated offsite future development is unknown (not zoned or included in a comprehensive plan or other land plan), a minimum weighted runoff coefficient of 0.75 or equivalent SCS Curve Number with 75% impervious cover shall be used.

Table 3.5 presents the Rational Method Runoff “C” Coefficients for the CFW. The basis of these coefficients is the standard zoning classification used by the City (“A-43, “A-21”, etc.) An example of the determination of these coefficients is presented in

- Figure 3.2.

Table 3.5 Runoff Coefficients		
Description of Land Use	% Impervious	Runoff Coefficient "C"
Residential "A-43" one-acre lots (1) (2)	35	0.51
Residential "A-21" half-acre lots	37	0.52
Residential "A-10" 10,000 SF lots	49	0.59
Residential "A-7.5" (3)	55	0.63
Residential "A-5" (3)	61	0.67
Residential "MH", "A-R", "B", "R-1", & "R-2" (3)	65	0.69
Multi-family		
"CR"	64	0.69
"C"	79	0.77
"D"	93	0.86
Commercial/Industrial/House of Worship/School		
4% Open Space (Default if no site plan)	96	0.88
10% Open Space (Site plan required)	90	0.84
20% Open Space (Site plan required)	80	0.78
Parks, Cemeteries	7	0.34
Railroad Yard Areas	29	0.47
Streets: Asphalt, Concrete and Brick	100	0.90
Drives, Walks, and Roofs	100	0.90
Gravel Areas	43	0.56
Unimproved Areas	0	0.30
Assumptions:		
(1) For Residential Calculations:		
- Current CFW development standards for minimum lot size and maximum lot coverage (structure) for each classification		
- Assumed 10.5' Parkway and 18' driveway		
- Assumed 29' B-B street dimension		
- Calculated by applying 90% runoff from impervious areas and 30% runoff from pervious areas		
(2) Calculated from designated set-backs		

[illegible]

Figure 3.1 Computation Summary Sheet for Hydrology by Unit Hydrograph Method

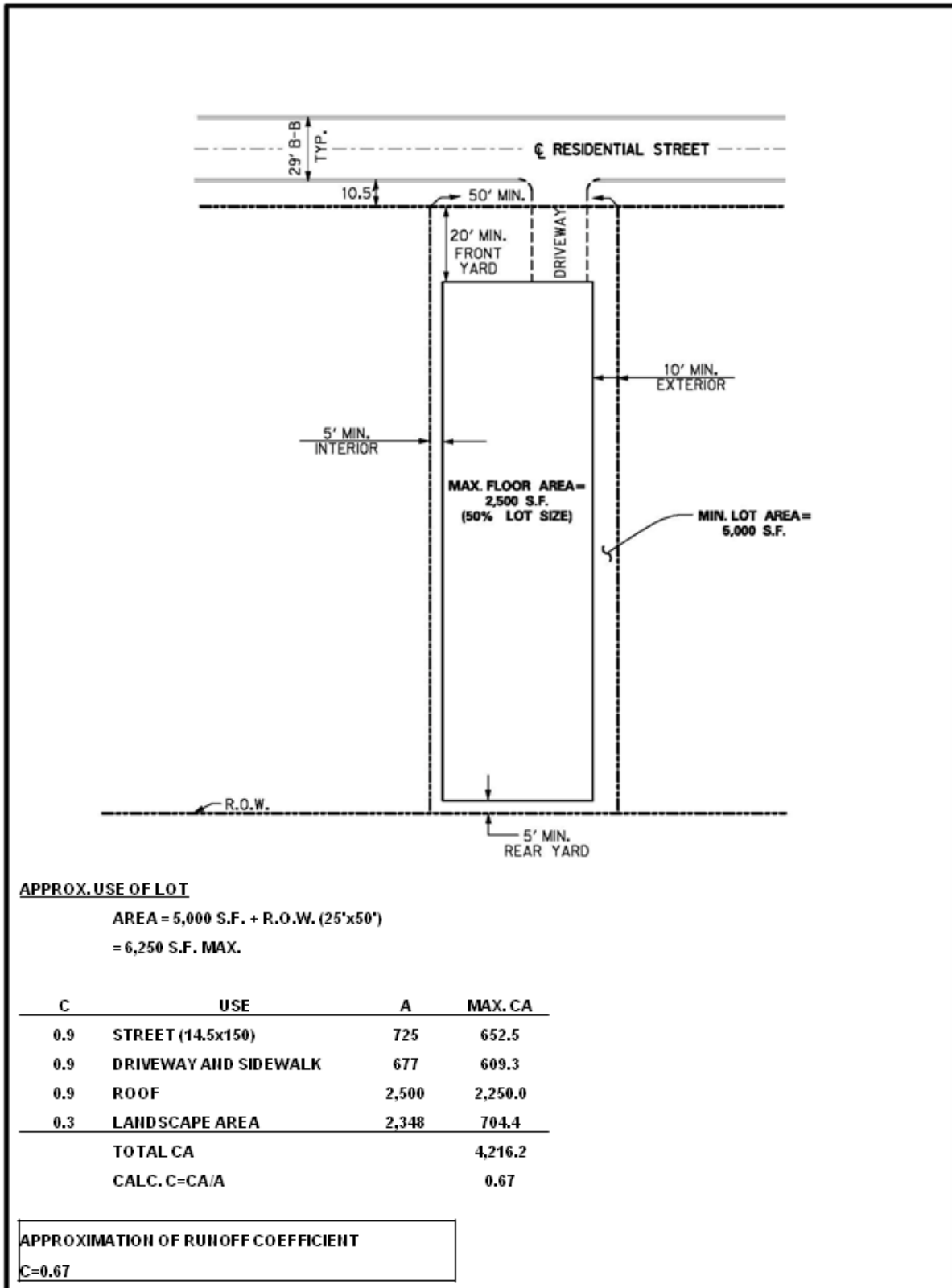


Figure 3.2 Sample Calculation Sheet for Runoff Coefficient “C”

3.4.2 *Rainfall Estimation*

Rainfall intensities are provided in [Section 5.0 of the Hydrology Technical Manual](#) for the sixteen (16) counties within the North Central Texas Council of Governments. The intensities are based on a combination of data from Hydro-35 and USGS. These intensities shall be used for all hydrologic analysis within the applicable county.

3.5 Water Quality Protection

3.5.1 *Introduction*

iSWM requires the use of *integrated* Site Design Practices as the primary means to protect the water quality of our streams, lakes, and rivers from the negative impacts of stormwater runoff from development. The *integrated* Site Design Practices shall be designed as part of the iSWM Plans. In addition to the *integrated* Site Design Practices, required water quality protection can be achieved by two additional options: (1) by treating the water quality protection volume and (2) assisting with off-site pollution prevention activities. These three approaches are described below.

The CFW has currently opted to implement the streambank protection and flood mitigation and conveyance goals, but not the water quality protection component. The CFW does not require water quality protection for development but strongly encourages this to be done. The CFW provides a stormwater fee credit (reduction) as an incentive for voluntary compliance with this component of stormwater management. See Appendix F for more information regarding fee credits.

3.5.2 *Option 1: integrated Site Design Practices and Credits*

The *integrated* Site Design Practices are methods of development that reduce the “environmental footprint” of a site. They feature conservation of natural features, reduced imperviousness, and the use of the natural drainage system. In this option, points are awarded for the use of different Site Design Practices. A minimum number of points are needed to meet the iSWM requirements for Water Quality. Additional points can be gained to qualify for development incentives. See Appendix F for additional details.

List of *integrated* Site Design Practices and Techniques

Twenty *integrated* Site Design Practices are grouped into four categories listed below. Not all practices are applicable to every site.

- Conservation of Natural Features and Resources
 1. Preserve Undisturbed Natural Areas
 2. Preserve Riparian Buffers
 3. Avoid Floodplains
 4. Avoid Steep Slopes
 5. Minimize Siting on Porous or Erodible Soils
- Lower Impact Site Design Techniques
 1. Fit Design to the Terrain
 2. Locate Development in Less Sensitive Areas
 3. Reduce Limits of Clearing and Grading
 4. Utilize Open Space Development
 5. Consider Creative Designs
- Reduction of Impervious Cover
 1. Reduce Roadway Lengths and Widths

2. Reduce Building Footprints
 3. Reduce the Parking Footprint
 4. Reduce Setbacks and Frontages
 5. Use Fewer or Alternative Cul-de-Sacs
 6. Create Parking Lot Stormwater "Islands"
- Utilization of Natural Features for Stormwater Management
 1. Use Buffers and Undisturbed Areas
 2. Use Natural Drainageways Instead of Storm Sewers
 3. Use Vegetated Swale Instead of Curb and Gutter
 4. Drain Rooftop Runoff to Pervious Areas

More detail on each site design practice is provided in the *integrated* Site Design Practice Summary Sheets in [Section 2.2 of the Planning Technical Manual](#).

Integration of Site Design Practices into Site Development Process

During the site planning process described in Chapter 2.3, Step 1, there are several steps involved in site layout and design, each more clearly defining the location and function of the various components of the stormwater management system. To be more effective and easier to incorporate, *integrated* Site Design Practices should be part of this overall development process as outlined in Table 3.6.

Table 3.6 Integration of Site Design Practices with Site Development Process	
Site Development Phase	Site Design Practice Activity
Site Analysis	• Identify and delineate natural feature conservation areas (natural areas and stream buffers) • Perform site reconnaissance to identify potential areas for and types of credits • Determine stormwater management requirements
Conceptual Plan	• Preserve natural areas and stream buffers during site layout • Reduce impervious surface area through various techniques • Identify locations for use of vegetated channels and groundwater recharge • Look for areas to disconnect impervious surfaces • Document the use of site design practices
Preliminary and Final Plan	• Perform layout and design of credit areas – integrating them into treatment trains • Ensure <i>integrated</i> Focus Areas are satisfied • Ensure appropriate documentation of site design credits according to local requirements

Table 3.6 Integration of Site Design Practices with Site Development Process	
Site Development Phase	Site Design Practice Activity
Construction	• Ensure protection of key areas • Ensure correct final construction of areas needed for credits • Inspect and maintain implementation of BMPs during construction
Final Inspection	• Develop maintenance requirements and documents • Ensure long term protection and maintenance • Ensure credit areas are identified on final plan and plat if applicable

3.5.3 Option 2: Treat the Water Quality Protection Volume

Treat the Water Quality Protection Volume by reducing total suspended solids from the development site for runoff resulting from rainfall of 1.5 inches (85th percentile storm). Stormwater runoff equal to the Water Quality Protection Volume generated from sites may be treated using a variety of on-site structural and nonstructural techniques with the goal of removing a target percentage of the average annual total suspended solids.

A system has been developed by which the Water Quality Protection Volume can be reduced, thus requiring less structural control. This is accomplished through the use of certain reduction methods, where affected areas are deducted from the site area, thereby reducing the amount of runoff to be treated. For more information on the Water Quality Volume Reduction Methods see [Section 1.3 of the Water Quality Technical Manual](#).

Water Quality Protection Volume

The Water Quality Protection Volume (WQ_v) is the runoff from the first 1.5 inches of rainfall. Thus, a stormwater management system designed for the WQ_v will treat the runoff from all storm events of 1.5 inches or less, as well as a portion of the runoff for all larger storm events. For methods to determine the WQ_v , see [Section 1.3 of the Water Quality Technical Manual](#).

Water Quality requirements are encouraged but not required by the CFW. Information is included for reference if the developer chooses to pursue such alternatives.

Recommended Stormwater Control Practices

Below is a list of recommended structural stormwater control practices. While these stormwater control practices are not mandatory in the CFW, they are highly recommended for sustainable development. This information is provided for reference if the developer chooses to pursue such an option. These structural controls are recommended for use in a wide variety of applications and have differing abilities to remove various kinds of pollutants. It may take more than one control to achieve a certain pollution reduction level. A detailed discussion of each of the controls, as well as design criteria and procedures, can be found in the [Site Development Controls Technical Manual](#). Refer to Table 3.7 for details regarding primary and secondary controls.

- Bioretention
- Enhanced swales (dry, wet, wetland)
- Alum treatment
- Detention
- Filter strips
- Sand filters, filter boxes, etc.
- Infiltration wells and trenches
- Ponds
- Porous surfaces
- Proprietary systems
- Green roofs
- Rainwater harvesting
- Wetlands
- Submerged gravel wetlands

Using Other or New Structural Stormwater Controls

Innovative technologies are encouraged and will be reviewed for applicability. Any such system will be required to provide sufficient documentation as to its effectiveness and reliability. Third party proof of performance, maintenance, application requirements, and limitations will be required prior to approval of innovative new technology.

More specifically, new structural stormwater control designs will not be accepted until independent performance data shows that the structural control conforms to local and/or state criteria for treatment, conveyance, maintenance, and environmental impact.

Suitability of Stormwater Controls to Meet Stormwater Management Goals

The stormwater control practices recommended in this manual vary in their applicability and ability to meet stormwater management goals:

Primary Controls

Primary structural stormwater controls have the ability to fully address one or more of the steps in the *integrated* focus areas if designed appropriately. Structural controls are recommended for use with a wide variety of land uses and development types. These structural controls have a demonstrated ability to effectively treat the Water Quality Volume (WQv) and have been shown to be able to remove 70% to 80% of the annual average total suspended solids (TSS) load in typical proposed urban runoff when designed, constructed, and maintained in accordance with recommended specifications. Several of these structural controls can also be designed to provide primary control for downstream streambank protection (SPv) and flood mitigation. These structural controls are recommended stormwater management facilities for a site wherever feasible and practical.

Secondary Controls

A number of structural controls are recommended only for limited use or for special site or design conditions. Generally, these practices either: (1) do not have the ability on their own to fully address one or more of the Steps in the *integrated* Focus Areas, (2) are intended to address hotspot or specific land use constraints or conditions, and/or (3) may have high or special maintenance requirements that may preclude their use. These types of structural controls are typically used for water quality treatment only. Some of these controls can be used as pretreatment measures or in series with other structural controls to meet pollutant removal goals. Such structural controls are not recommended for residential developments.

Table 3.7 summarizes the stormwater management suitability of the various stormwater controls in addressing the *integrated* Focus Areas. The [Site Development Controls Technical Manual](#) provides guidance on the use of stormwater controls as well as how to calculate the pollutant removal efficiency for stormwater controls in series. The [Site Development Controls Technical Manual](#) also provides guidance for choosing the appropriate stormwater control(s) for a site as well as the basic considerations and limitations on the use of a particular stormwater control.

Table 3.7 Suitability of Stormwater Controls to Meet <i>integrated</i> Focus Areas						
Category	<i>integrated</i> Stormwater Controls	TSS/ Sediment Removal Rate	Water Quality Protection	Streambank Protection	On-Site Flood Control	Downstream Flood Control
Bioretention Areas	Bioretention Areas	80%	P	S	S	-
Channels	Enhanced Swales	80%	P	S	S	S
	Channels, Grass	50%	S	S	P	S
	Channels, Open	-	-	-	P	S
Chemical Treatment	Alum Treatment System	90%	P	-	-	-
Conveyance System Components	Culverts	-	-	-	P	P
	Energy Dissipation	-	-	P	S	S
	Inlets/Street Gutters	-	-	-	P	-
	Pipe Systems	-	-	P	P	P
Detention	Detention, Dry	65%	S	P	P	P
	Detention, Extended Dry	65%	S	P	P	P
	Detention, Multi-purpose Areas	-	-	P	P	P
	Detention, Underground	-	-	P	P	P
Filtration	Filter Strips	50%	S	-	-	-
	Organic Filters	80%	P	-	-	-
	Planter Boxes	80%	P	-	-	-
	Sand Filters, Surface/Perimeter	80%	P	S	-	-
	Sand Filters, Underground	80%	P	-	-	-
Hydrodynamic Devices	Gravity (Oil-Grit) Separator	40%	S	-	-	-
Infiltration	Downspout Drywell	80%	P	-	-	-
	Infiltration Trenches	80%	P	S	-	-
	Soakage Trenches	80%	P	S	-	-
Ponds	Wet Pond	80%	P	P	P	P
	Wet ED Pond	80%	P	P	P	P
	Micropool ED Pond	80%	P	P	P	P
	Multiple Ponds	80%	P	P	P	P
Porous Surfaces	Green Roof	85%	P	S	-	-
	Modular Porous Paver Systems	²	S	S	-	-
	Porous Concrete	²	S	S	-	-
Proprietary Systems	Proprietary Systems ¹	¹	S/P	S	S	S
Re-Use	Rain Barrels	-	P	-	-	-
Wetlands	Wetlands, Stormwater	80%	P	P	P	P
	Wetlands, Submerged Gravel	80%	P	P	S	-

P = Primary Control: Able to meet design criterion if properly designed, constructed and maintained.
S = Secondary Control: May partially meet design criteria. Designated as a Secondary control due to considerations such as maintenance concerns. For Water Quality Protection, recommended for limited use in accepted community-designated areas.
- = Not typically used or able to meet design criterion.
¹ = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data, if used as a primary control. Third-party sources could include Technology Acceptance Reciprocity Partnership, Technology Assessment Protocol – Ecology, or others.
² = Porous surfaces provide water quality benefits by reducing the effective impervious area.

3.5.4 Option 3: Assist with Off-Site Pollution Prevention Programs and Activities

The CFW does not currently require off-site pollution prevention activities; however, some communities have implemented pollution prevention programs/activities in certain areas to remove pollutants from the runoff after it has been discharged from the site. This may be especially true in intensely urbanized areas facing site redevelopment where many of the BMP criteria would be difficult to apply.

3.6 Streambank Protection

The second focus area is in streambank protection. There are three options by which a developer can provide adequate streambank protection downstream of a proposed development. The first step is to perform the required downstream assessment as described in Table 3.1, Table 3.2 and Chapter 3.7.3. If it is determined that the proposed project does not exceed acceptable downstream velocities or the downstream conditions are improved to adequately handle the increased velocity through the limits of the zone of influence, then no additional streambank protection is required. If on-site or downstream improvements are required for streambank protection, easements or letters of consent will need to be obtained in accordance with Chapter 3.11. If the downstream assessment shows that the velocities are within acceptable limits, then no streambank protection is required. Acceptable limits for velocity control are contained in Table 3.16 and Table 3.17.

Option 1: Reinforce/Stabilize Downstream Conditions

If the increased velocities are greater than the allowable velocity of the downstream receiving system, then the developer must reinforce/stabilize the downstream conveyance system. The proposed modifications must be designed so that the downstream system is protected from the proposed velocities. The developer must provide supporting calculations and/or documentation that the downstream velocities do not exceed the allowable range once the downstream modifications are installed.

Allowable bank protection methods include stone riprap and bio-engineered methods. Chapter 3.8.4 of this manual and [Sections 3.2 and 4.0 of the Hydraulics Technical Manual](#) give design guidance for designing stone riprap for open channels, culvert outfall protection, riprap aprons for erosion protection at outfalls, and riprap basins for energy dissipation.

Option 2: Install Stormwater Controls to Maintain Existing Downstream Conditions

The developer may use on-site controls to keep downstream proposed discharges at or below allowable velocity limits. The developer must provide supporting calculations and/or documentation that the on-site controls will be designed such that downstream velocities for the three storm events (Streambank Protection, Conveyance, and Flood Mitigation) are within an allowable range once the controls are installed.

Option 3: Control the Release of the 1-yr, 24-hour Storm Event

Twenty-four hours of extended detention may be provided for on-site, post-developed runoff generated by the 1-year, 24-hour rainfall event to protect downstream channels. The required volume for extended detention is referred to as the Streambank Protection Volume (denoted SP_v). The reduction in the frequency and duration of bankfull flows through the controlled release provided by extended detention of the SP_v will reduce the bank scour rate and severity.

To determine the SP_v refer to Chapter 3.0 of the Hydrology Technical Manual.

It should be noted that a 10% stormwater fee credit is available as an incentive for using this option. See Appendix F for more information.

3.7 Flood Mitigation

3.7.1 Introduction

Flood analysis is based on the design storm events as defined in Chapter 3.2, Table 3.3 for the conveyance storm and the flood mitigation storm.

The intent of the flood mitigation criteria is to provide for public safety; to minimize on-site and downstream flood impacts from the three storm events; to maintain the boundaries of the mapped 100-year floodplain; and to protect the physical integrity of the on-site stormwater controls and the downstream stormwater and flood mitigation facilities.

Flood mitigation must be provided for on-site conveyance systems, as well as downstream outfalls as described in the following chapters.

3.7.2 Flood Mitigation Design Options

There are four options by which a developer may address downstream flood mitigation. These options closely follow the four options for Streambank Protection. When on-site or downstream modifications are required for downstream flood mitigation, easements or letters of consent will need to be obtained in accordance with Chapter 3.11.

The developer will provide all supporting calculations and/or documentation to show that the existing downstream conveyance system has capacity (Q_f) to safely pass the fully developed flood mitigation storm discharge, including any increase due to the proposed development, or demonstrate no adverse impact.

Flood mitigation criteria are intended to protect public safety by ensuring minimal upstream, on-site and downstream flood impacts. Table 3.2 of this Criteria Manual provides four options for Flood Mitigation in the CFW:

1. Option 1 – Confirm Adequate Downstream Conveyance Systems (Downstream Assessment)
2. Option 2 – Provide On-Site Stormwater Controls (Detention)
3. Option 3 – Mimic Existing On-Site Runoff Conditions (Low Impact Design)
4. Option 4 – Obtain letter from impacted downstream property owner (limited to impacts on one single adjacent property).

Option 1 – Provide Adequate Downstream Conveyance Systems

Provide calculations for analysis of the downstream conveyance system to confirm adequate capacity is available to convey the increased runoff, due to development, within a drainage structure, easement, or right-of-way. This downstream assessment can include any available existing conveyances systems (existing drainage pipes, channels, natural creeks and streams, easements or right-of-ways specified for drainage use). If the existing drainage systems do not have capacity to convey the increased runoff from the development, additional stormwater controls will be necessary to safely discharge runoff without:

1. Causing new or increased flooding upstream of the development
2. Causing new or increased flooding on the development site
3. Causing new or increased flooding downstream of the development

The developer may provide additional conveyance by providing and/or modifying the off-site, downstream conveyance system through construction of additional drainage capacity or acquisition of drainage easements to contain impacts. The design and analysis of such systems will be required to show that the proposed systems safely convey the required design storm events. Systems are required to be analyzed to an adequate outfall, (i.e. a downstream assessment is required) as defined in Table 3.1 and Chapter 3.7.3.

If the downstream assessment shows that all above runoff conditions have been met as defined in Table 3.1 and Chapter 3.7.3 of this manual, no on-site drainage controls are required to mitigate for increased runoff from the site due to the proposed development.

Simplified Finding of No Significant Impact

For small infill developments that meet specific criteria below, the downstream assessment may be waived. This policy was developed based on an analysis by Dr. Cuneyt Erbatur, P.E., CFM, LEED AP, of Dunaway Associates.

Requirements:

1. The proposed development is less than 5 acres of disturbed land.
2. The site developed drains directly to an existing roadway and does not redirect drainage area from one street or watershed to another.
3. The receiving roadway has a longitudinal slope of at least 1%.
4. The site area is less than 10% of the existing offsite area drainage to the same receiving roadway.
5. The existing offsite area (excluding the site to be developed) has a rational C value of at least 0.6.

Submittal of calculations to confirm these conditions will be required at the time of Preliminary iSWM submittal. Once reviewed and accepted by the CFW SDS the site development can be considered as having no significant impact and no mitigation is required.

Option 2 – Provide On-Site Stormwater Controls (Detention)

In the event that downstream conveyance systems, including receiving streams, do not have sufficient capacity, on-site stormwater controls may be proposed to mitigate the impact of increased discharges from the site to a level that meets the requirements of Table 3.1 and Chapter 3.7.3.

Downstream assessment may be waived for either of the following conditions:

1. Sites proposing detention storage with a contributing drainage area of less than 25 acres at detention outfall, and
2. Sites proposing detention when the total site disturbance is less than 5.0 acres.

In cases where detention is proposed to waive downstream assessment, detention volume must adequately address the increase in discharge due to the proposed development.

Simplified Detention Volume Estimation

At the preliminary plat stage, a conservative detention volume estimate from the table below may be used in lieu of more detailed detention hydrologic calculations. Table 3.8 below may only be used for sites that do not redirect drainage area from one watershed to another. Please note that the final iSWM submittal will still require detailed drainage and design calculations. The table below may be used in lieu of detailed drainage calculations at the preliminary plat and preliminary iSWM plan stage only.

Table 3.8 Simplified Detention Volume	
Development Area	Detention Volume Required*
0-25 acres	0.20 acre-feet per acre
More than 25 acres	0.25 acre-feet per acre

*If no calculations are submitted

If this detention estimate is used in lieu of a downstream assessment, the preliminary plat must show the volumes graphically in the approximate location and at the approximate size. In addition, the plat shall include the following text: "This plat identifies preliminary need and locations for storm water storage facilities known as detention ponds. It is expressly understood and agreed by the owner or owner's designee of any specific lot or tract within the platted subdivision that the owner or owner's designee of lots or tracts shall be responsible to provide for the final detention volume mitigation during the site development. The preliminary detention storage volume estimate is noted at each location. The final detailed analysis detention volume and required easement may be more or less than shown on this plat.

The detention pond design shall be in accordance with the City of Fort Worth Stormwater Criteria Manual current at the time the Final iSWM Plan is submitted.

Option 3 – Mimic Existing On-Site Runoff Conditions

A downstream assessment is not required. This option only requires that on-site improvements are provided to maintain/mimic existing discharges. This option requires reduced percent imperviousness using *integrated* Site Design practices to mimic the existing runoff conditions (discharge and velocity). No downstream assessment is required in this option, however, it should be noted that a downstream assessment may reduce the amount of on-site detention required. Calculations shall be submitted to substantiate the proposed discharges.

Stormwater controls include the various types of structural and non-structural controls as described in this manual (Chapter 3) and listed below.

1. Stormwater Facilities
2. *Integrated* Site Design Practices
3. Regional Approaches
4. Erosion Control BMPs

Option 4 – Obtain Letter From Impacted Downstream Property Owner

When downstream impacts are limited to a single adjacent property, the developer may obtain a notarized letter of permission from the affected property owner acknowledging the impacts in lieu of mitigation.

3.7.3 Acceptable Downstream Conditions

As part of the iSWM plan development, the downstream impacts of development must be carefully evaluated for the two focus areas of Streambank Protection and Flood Mitigation. The purpose of the downstream assessment is to protect downstream properties from increased flooding and downstream channels from increased erosion potential due to upstream development. The importance of the downstream assessment is particularly evident for larger sites or developments that have the potential to dramatically impact downstream areas. The cumulative effect of smaller sites, however, can be just as dramatic and, as such, following the *integrated* Focus Areas is just as important for the smaller sites as it is for the larger sites.

The assessment, defined by the development engineer, shall extend from the outfall of a proposed development to a point downstream where the discharge from a proposed development no longer has a significant impact, as defined in Table 3.1, on the receiving stream or storm drainage system. The CFW shall be consulted to obtain studies, records and maps related to the National Flood Insurance Program and the availability of Flood Insurance Studies and Flood Insurance Rate Maps (FIRMs) which may be helpful in this assessment. The assessment shall be a part of the Preliminary and Final iSWM Plans, and must include the following:

- Detailed drainage study and calculations for existing and proposed conditions (include digital submittal of hydrologic and hydraulic models, if utilized)
- Pre- and post-project conditions drainage area maps. Drainage area maps shall be of same scale and limits for both pre- and post-project conditions. Drainage area maps must clearly delineate all contributing areas draining to or through the entire site. Drainage area maps shall have topographic contour intervals no greater than two (2) feet.
- Discharges at critical downstream design points
- Separate analysis for each outfall from the proposed development
- Preliminary iSWM Plan shall include delineation of adequate outfalls and determination of zones of influence.

- Final iSWM Plan shall include final hydrology with all calculations, delineation of adequate outfalls and determination of zones of influence, required mitigation and final stormwater controls identified with sizes with the structural details and specifications, as required.
- Written narrative supporting methodology and conclusions of analysis.
- Analysis must confirm that conditions regarding an acceptable outfall, as defined in Table 3.1, are met at each outfall location.

Section 2.0 of the Hydrology Technical Manual gives additional guidance on calculating the discharges and velocities, as well as determining the downstream extent of the assessment.

3.8 Stormwater Conveyance Systems

3.8.1 Introduction

Stormwater system design is an integral component of both site and overall stormwater management design. Good drainage design must strive to maintain compatibility and minimize interference with existing drainage patterns; control flooding of property, structures, and roadways for design flood events; and minimize potential environmental impacts on stormwater runoff.

Stormwater collection systems must be designed to provide adequate surface drainage while at the same time meeting other stormwater management goals such as water quality, streambank protection, habitat protection, and flood mitigation.

Design

Unless regional detention is in place or a master plan has been completed which indicates a plan for reduced discharges, fully developed watershed conditions shall be used for determining runoff for the conveyance storm and the flood mitigation storm unless otherwise accepted by TPW.

3.8.2 Subdivision Drainage Site Grading

An engineered overall site grading plan shall be submitted with the subdivision's paving and drainage plans. The plan shall be consistent with the drainage area map included in the iSWM plan. The plan shall include flow arrows and Type A, B, or C drainage for each lot within the subdivision as described in Federal Housing Administration (FHA) Land Planning Bulletin No. 3, as amended (see Appendix E). Type 1 or 2 block grading as shown in the FHA information is preferred. Type 3 and block 4 grading is allowed only if:

- a swale, flume or channel is constructed at the rear of the lot to intercept runoff; and
- runoff from 3 or more lots is collected and conveyed within an underground drainage system, swale, flume or channel contained within a dedicated easement.

The engineer may utilize berms and swales to redirect flows. Grass swales shall have a minimum slope of 2% except where contained within a drainage easement, in which case a 1% minimum slope can be allowed. The engineer shall provide more detailed information in addition to the lot grading type (A, B, or C) by indicating spot elevations on each lot. For Type B lots, side-yard swales should extend from behind the rear building line to the street, in order to collect runoff from the roof. Roof drains, if used in along the rear building line of these lots, should use splash blocks to direct the runoff into the side swales.

The finished floor elevation and surrounding grading must conform to current building codes adopted by the City and provide a minimum height of the finished floor of twelve (12) inches above the surrounding ground. Areas within 10' of the foundation should be sloped to drain away from the foundation. Minimum slopes of 2% for structural improvements and 5% for non-structural elements, respectively, must be maintained away from the footing. See Figure 3.3.

If the site is complex and an overall site grading plan cannot be developed in accordance with the HUD standards, an individual grading plan for each lot shall be submitted by an engineer prior to issuing the Building Permit. The individual grading plans shall be coordinated with surrounding lots. For these complex plans, an "as-built" letter shall be submitted prior to final inspection.

Four (4) inches of topsoil shall be provided for all disturbed areas not protected by impervious cover, in order to sustain vegetation after construction has been completed.

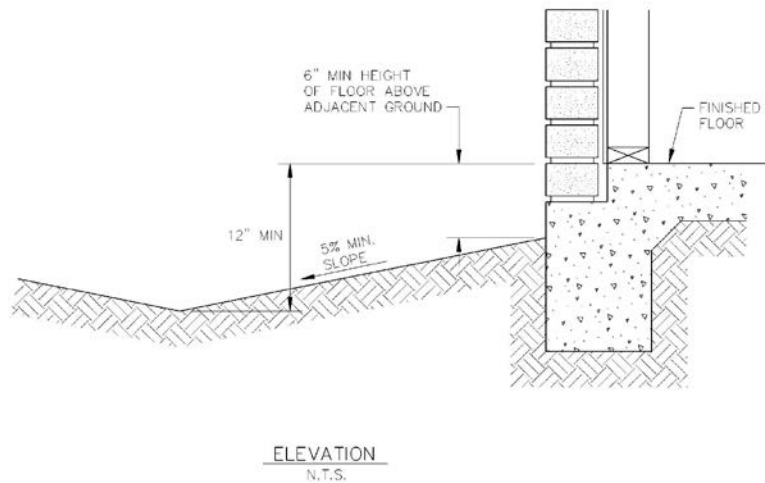


Figure 3.3 Grading Requirements Next to Building Foundation

3.8.3 Hydraulic Design Criteria for Streets and Closed Conduits

Introduction

This chapter is intended to provide criteria and guidance for the design of on-site flood mitigation system components including:

- Street and roadway gutters
- Stormwater inlets
- Parking lot sheet flow
- Storm drain pipe systems

Streets and Stormwater Inlets

Design Frequency

- | | |
|--|---|
| <ul style="list-style-type: none"> • Streets and roadway gutters: conveyance storm event • Inlets on-grade: conveyance storm event • Parking lots: conveyance storm event • Storm drain pipe systems: conveyance storm event and flood mitigation storm event. | <ul style="list-style-type: none"> • Low points: flood mitigation storm event • Combined Street ROW and storm drain pipe systems: flood mitigation storm event • Drainage and floodplain easements: flood mitigation storm event |
|--|---|

Design Criteria

The iSWM Inlet Design Methodology (*iSWM Hydraulics Technical Manual*) is adopted. Under the CFW classification system, inlets have been classified into two major groups namely: Inlets in Sumps and Inlets on Grade with Gutter Depression. The only curb inlets that are allowed by the CFW are those in sumps and depressed inlets on grade. Grate inlets and combination inlets are allowed only by permission of the Director of TPW.

Figures presented in the following chapters shall be used to document all closed conduit calculations even if calculations are performed on an acceptable computer program unless otherwise accepted by TPW.

A “rooftop” section should be used for concrete streets and a parabolic section for asphalt streets. Note that the nomograph in *Figure 1.2 of the iSWM Hydraulics Technical Manual* does not completely address cases where the crown elevation is lower than the top of curb elevation. For those cases a combination of *Figure 1.2 and 1.3 in the iSWM Hydraulics Technical Manual* can be used or a standard hydraulics program such as HEC-RAS or FlowMaster can be applied.

The design storms required by the CFW are as follows:

Storm Sewer System

The design storm is the fully developed land use conditions for the flood mitigation storm for the combination of the closed conduit and surface drainage system, to the limits of ROW.

Runoff from the fully developed conveyance storm must be contained within the permissible spread of water in the gutter. The flood mitigation storm flow must be contained within the ROW. Adequate inlet capacity shall be provided to intercept surface flows before the ROW capacity is exceeded. Note: the capacity of the underground system may be required to exceed the conveyance storm in order to satisfy the flood mitigation storm criteria.

The 5-year closed conduit Hydraulic Grade Line (HGL) must be equal to or below the gutter line for pipe systems and one (1) foot or more below the curb line at inlets. For sump conditions without an existing structural overflow, the 100-year HGL must be one (1) foot below the curb at the inlet. For situations where no ROW exists, the 100-year HGL must be below finished ground. The 100-year HGL will be tracked carefully throughout the system and described in the hydraulic calculations tables provided herein and on the construction drawings.

Inlets in Sumps

Curb opening inlets in sumps (Type CO-S) are addressed in *Section 1.2.7 of the Hydraulics Technical Manual*. Drop inlets in sumps (Y Inlet) are addressed in *Section 1.2.9 of the Hydraulics Technical Manual*.

In sag or sump conditions, the storm drain and sump inlets should be sized to intercept and convey a minimum of the 25-year storm and a positive structural overflow is required to provide for the remainder of the flood mitigation storm. The positive overflow structure must be concrete or other acceptable non earthen structure with a minimum bottom width of four (4) feet extending from the sump inlet to the storm sewer outfall. It must be designed to pass at least 20 cfs with one (1) foot of freeboard from the top of curb to the adjacent finish floor elevations (minimum finish floor elevations for all lots adjacent to said overflows must be shown on the plat).

All flumes that pass through sidewalks shall have a bolted-down, rust-proof, 3/8-inch (min.) steel plate with a pedestrian-rated walking surface. The plate shall be recessed into the concrete sidewalk from face of curb to the property line. The plate must be secured to the concrete with bolts and flush with the top of sidewalk. A center support may be added depending on the width of the flume. Fences must be kept behind the curb line of the flume. Where a structural overflow is not feasible, a variance must be requested from TPW. If no structural overflow is constructed, the sump inlets must be designed with a 50% clogging factor. In a cul-de-sac where no structural overflow is feasible, additional on-grade inlet capacity may be provided upstream of the sump in lieu of additional sump inlets.

An explanation of the Inlets in Sumps Calculation Sheet is included in is included in the following sections.

Inlets on Grade with Gutter Depression (Type CO-D, Figure 3.6)

The hydraulic efficiency of storm-water inlets varies with gutter flow, street grade, street crown, and with the geometry of the inlet depression. The design flow into any inlet can be greatly increased if a small amount (5% to 10%) of gutter flow is allowed to flow past the inlet. When designing inlets, prevention of clogging or from interference with traffic often takes precedence over hydraulic considerations. The computation sheet for Type CO-D Inlet in Table 3.7.

The depression of the gutter at a curb opening inlet (See Figure 3.6) below the normal level of the gutter increases the cross-flow towards the opening, thereby increasing the inlet capacity. Also, the downstream transition out of the depression causes backwater which further increases the amount of water captured. Depressed inlets should be used on all public streets and alleys. Recessed depressed inlets shall be used on all arterials.

The capacity of a depressed curb inlet on grade will be based on the methodology presented in [Section 1.2.7 of the iSWM Hydraulics Technical Manual](#).

Drop Inlets (Area Drains)

1. Drop inlets serving a drainage area of 10 to 25 acres will be designed with a 50% clogging factor.
2. Grading plans to direct flow into drop inlets will be included in the construction plans. Where earthen swales or other means of collecting and directing runoff into drop inlets are needed, they should be contained in appropriately sized drainage easements.
3. Consideration should be given to a structural overflow in the same manner as described for sump inlets.
4. Drop inlets shall be located where they can be easily accessed for inspection and maintenance by the City.

Headwalls

1. A headwall will be used to collect a drainage area of twenty-five (25 ac) acres or more flowing to one spot.
2. Areas that have been channelized or discharged from a storm drain system will use a headwall to reintroduce the flow to a new storm drain system. These provisions do not apply to special multi-stage outlet structures draining detention facilities.

Stormwater Inlets Computation Sheets**Explanation of the Inlets in Sumps Computation Sheet (Type CO-S, Figure 3.4)**

In order to facilitate the computations required in determining the various hydraulic properties for curb opening inlets and Y Inlets (drop inlets) in sumps use the Computation Sheet for Curb Opening and Drop Inlets shown in Figure 3.5. See Figure 3.4 for an illustration of a curb opening inlet.

Table Column Description

Column 1	Inlet number and designation.
Column 2	Slope of gutter in ft. per ft.
Column 3	Crown slope of pavement in ft. per ft. For parabolic crowns enter type of street section.
Column 4	Total gutter flow in cfs. For inlets other than the first inlet in a system, gutter flow is the sum of runoff from contributing area plus carry-over flow from inlet or inlets upstream.
Column 5	Depth of gutter flow in feet from the spread of water calculations in Figure 1.2 (iSWM Hydraulics Technical Manual), Section 1.2.4 or from direct solution of Manning's equation for triangular gutters.
Column 6	Depth of gutter depression in ft. (0.33 ft for a standard recessed curb inlet)
Column 7	Depth of water at inlet opening in ft. Column 5 plus Column 6.

- Column 8 Capacity of curb opening inlet or drop inlet in cfs per ft. of length of opening or perimeter around inlet from Figures 1.10, 1.12 or 1.14 in the *iSWM Hydraulics Technical Manual* or by direct solution.
- Column 9 Assumed length of inlet opening or perimeter in feet.
- Column 10 Capacity of inlet in cfs. Column 8 times Column 9.
- Column 11 Carry-Over flow passing inlet (into overflow swale) in cfs. Column 4 minus Column 10.
- Column 12 Percent of flow captured by inlet. Column 10 divided by Column 4 times 100.

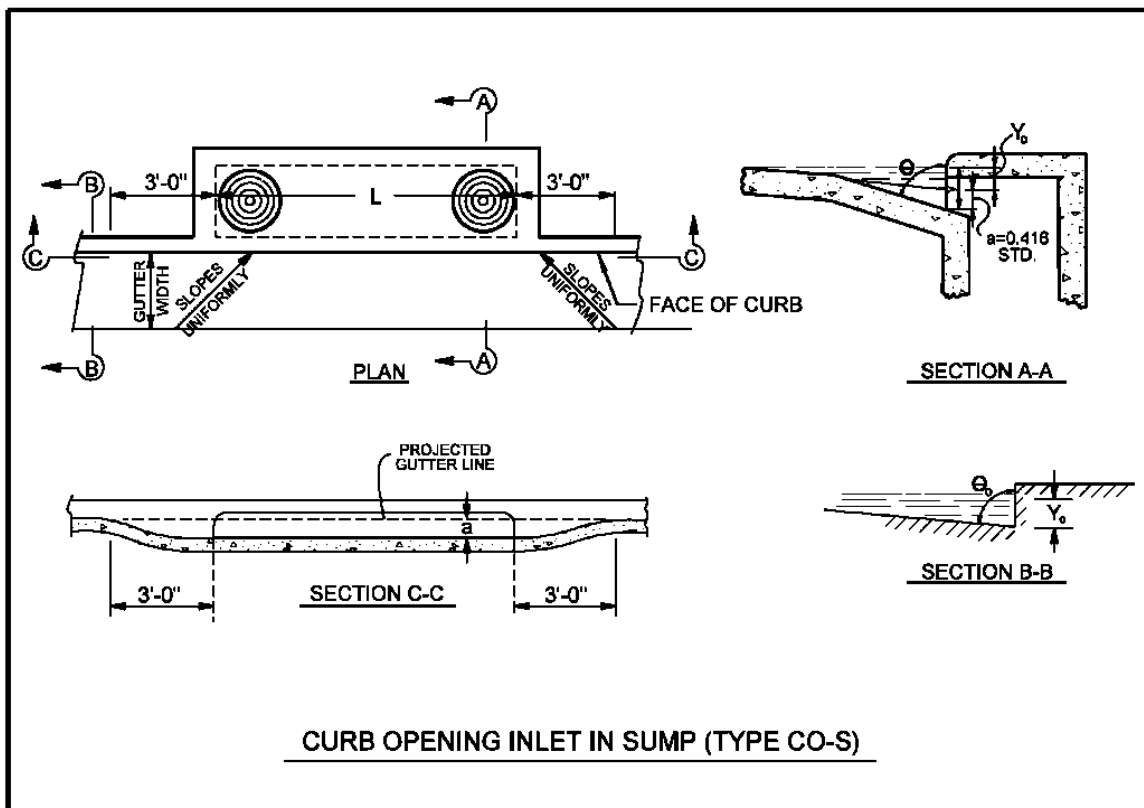


Figure 3.4 Type CO-S Inlet

Explanation of the Inlets On Grade with Gutter Depression (Type CO-D, Figure 3.6) Computation Sheet

In order to facilitate the computations required in determining the various hydraulic properties for Curb Opening Inlets Type CO-D on grade (depressed), Figure 3.7, the Computation Sheet for On Grade Curb Inlets has been prepared.

Table Column Description:

Column 1	Design Point for Inlet
Column 2	Inlet number(s)
Column 3	Location of inlet by storm drain station number
Column 4	Drainage area designation for incremental area
Column 5	Drainage area size (acres)
Column 6	Runoff coefficient "C" provided in Table 3.5 located in Chapter 3.4.1 under "Types of Hydrologic Methods"
Column 7	Time of concentration (minutes)
Column 8	Longitudinal slope (ft/ft)
Column 9	Cross slope of the pavement (ft/ft)
Column 10	Cross slope of the gutter measured from the cross slope of the pavements. The cross slope is equal to the gutter depression (in) divided by the width of the depressed gutter (in)
Column 11	Depth of gutter flow "yo" in approach gutter from spread of water determinations in the <i>iSWM Hydraulics Technical Manual, Figure 1.3</i> , or from direct solution of Manning's equation for triangular gutters: $yo = 1.245 Q_o^{3/8} (n^{3/8}/S_o^{3/16}) (1/z)^{3/8}$. When the crown is overtopped, a composite analysis will be required.
Column 12	Spread of flow is calculated using <i>Figure 1.2 in the iSWM Hydraulics Technical Manual</i> or from direct solution of Manning's Equation
Column 13	Equivalent cross slope is computed by using <i>Figure 1.3 and 1.4 in the iSWM Hydraulics Technical Manual</i> to determine the ratio of flow in the depressed gutter section to the total flow
Column 14	Street crown section type (straight crown ["rooftop"] or parabolic)
Column 15	Manning's roughness coefficient (n) for pavement values located in <i>Section 1.2.4 of the iSWM Hydrologic Technical Manual Table 1.2</i>
Column 16	5-year rainfall intensity (in/hr), From <i>Section 5.0 in the iSWM Hydrology Technical Manual Tarrant County Rainfall Table</i>
Column 17	5-year runoff, $Q=CAi$ (cfs)
Column 18	5-year carryover flow from upstream inlet (cfs)
Column 19	5-year total gutter flow (Column 17 + Column 18) (cfs)
Column 20	100-year rainfall intensity (in/hr), From <i>Section 5.0 in the iSWM Hydrology Technical Manual Tarrant County Rainfall Table</i>
Column 21	100-year runoff, $Q=CAi$ (cfs)
Column 22	100-year carryover flow from upstream inlet (cfs)
Column 23	100-year total gutter flow (Column 20 + Column 21) (cfs)
Column 24	Total right-of-way capacity (normally 2.5" over top of curb) (cfs)

- Column 25 This indicates the controlling storm for inlet spacing, depending on which criteria (5-year in street or 100-year in ROW) may be exceeded. This indicates whether the inlet is sized for the 5-year or 100-year flows
- Column 26 Length required for total interception of the design storm determination in [Figure 1.8 of the iSWM Hydraulics Technical Manual](#) or by direct solution of Manning's Equation. Please note that the example in Figure 1.8 does not consider inlet depression (slope).
- Column 27 Actual length (L) in feet of the inlet which is to be provided (10', 15', or 20')
- Column 28 Ratio of the length of inlet provided (L) to the length of the inlet required for 100% interception (L_T). Column 26 divided by Column 29
- Column 29 The efficiency of the provided inlet determined by [Figure 1.9 in the iSWM Hydraulics Technical Manual](#).
- Column 30 Discharge (Q_i) in cubic feet per second in which the inlet in question actually intercepts in the design storm. Column 19 or 23 multiplied by Column 27
- Column 31 Carry-over flow (q) is the amount of water which passes the inlet in a conveyance storm. A substantial portion of the 5-year flow should be picked up by the inlet. The carry-over flow should be accounted for in further downstream inlets.
- Column 32 Carry-over flow (q) is the amount of water which passes the inlet in a flood mitigation storm. The carry-over flow should be accounted for in further downstream inlets and should be reflected in the inlet bypass flow (Column 17) in the Storm Drain Hydraulics Table, Figure 3.10 (minor variances may occur due to travel time routing in the Hydraulics Table).

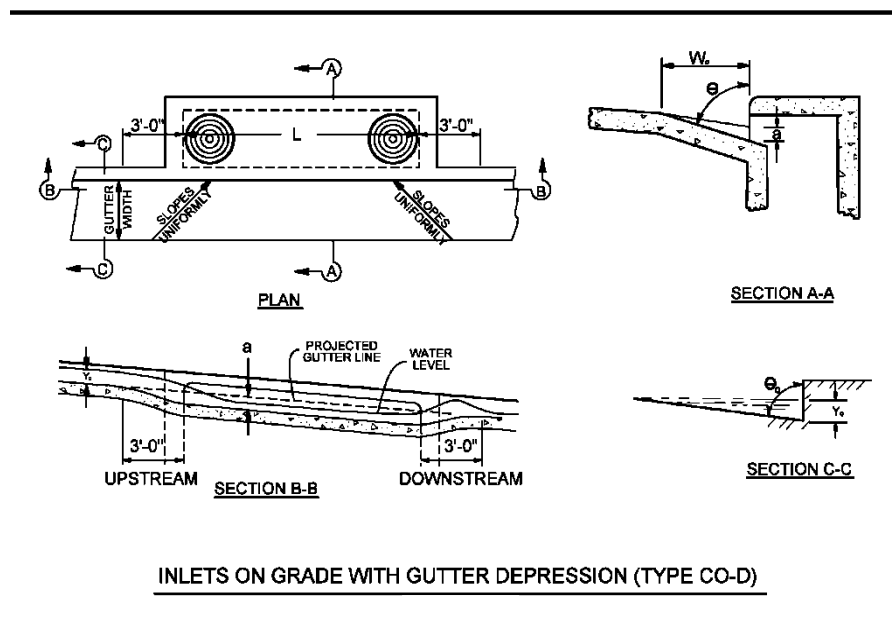


Figure 3.6 Type CO-D Inlet

Streets and ROW

Depth in the street shall not exceed top of curb or exceed maximum spread of water limits for the fully developed conveyance storm. Limiting the spread of water allows one or more lanes to remain dry during the conveyance storm and helps prevent hydroplaning of vehicles. The fully developed flood mitigation storm shall be contained within the right-of-ways or easements.

Parking Lots

Parking lots shall be designed for the conveyance storm not to exceed top of curb with maximum ponding at low points of one (1) foot. The flood mitigation storm shall be contained on-site or within dedicated easements.

Spread of Water Limits

Inlets shall be spaced so that the spread of water in the street for the conveyance storm shall not exceed the guidelines provided below.

For all applications, the engineer/developer must use roadway sections as approved by CFW.

The following spread of water values shall be used for the various types of streets.

Arterials (Divided)

1. **Permissible Spread of Water**-The permissible spread of water in gutters of major divided thoroughfares shall be limited so that one traffic lane on each side remains clear during the conveyance storm. Gutter flow shall be based on maximum storm duration of 15 minutes. The flood mitigation storm shall be contained within the ROW.
2. **Conditions**-Inlets shall be located at street intersections, and at low points of grade or where the gutter flow exceeds the permissible spread of water criteria. Inlets shall be located, when possible, on side streets when grades permit. In no cases shall the gutter depression at inlets exceed the standard. In super-elevated sections, inlets placed against the center medians shall have no gutter depression. Furthermore, inlets and superelevated sections shall be placed to intercept flow before it can cross the street.

Arterials (Not Divided)

1. **Permissible Spread of Water**-The permissible spread of water in gutters of major undivided thoroughfares shall be limited so that one traffic lane in each direction will remain clear during the conveyance storm.
2. **Conditions**-Inlets shall preferably be located at street intersections, low points of grades, or where the gutter flow exceeds the permissible spread of water criteria. Inlets shall be located, when possible, on the side streets when grades permit. In no case shall the gutter depression at inlets exceed the standard.
3. **Super-elevated Sections**-Intercept gutter flow at the point of zero crossfall to prevent flow from crossing the thoroughfare. Unless expressly accepted by the TPW, stormwater will not be allowed to cross major thoroughfares on the surface in valley gutters or otherwise.

Collector Streets

1. **Permissible Spread of Water**-The permissible spread of water in gutters of collector streets shall be limited so that one standard lane of traffic will remain clear during the conveyance storm.
2. **Conditions**-Inlets shall preferably be located at street intersections, low points of grade or where the gutter flow exceeds the permissible spread of water criteria. Inlets shall be located, when at all possible, on the side streets when grade permits. In no case shall the gutter depression at inlets exceed the standard.

Minor Streets (Residential)

1. **Permissible Spread of Water**-The permissible spread of water in gutters for minor streets shall be limited by the height of the curb for the conveyance storm. The flood mitigation storm shall be contained within the R.O.W.
2. **Conditions**-Inlets shall be located at street intersections, low points of grade or where the gutter flow exceeds the permissible spread of water criteria. In no case shall the gutter depression at inlets exceed the standard.

Storm Drain Pipe DesignDesign Frequency

- Flood Mitigation storm, less any gutter, roadway, ROW, and flume flows.

Design Criteria

Velocities in sewers are important mainly because of the possibilities of excessive erosion on the storm drain inverts. Table 3.9 shows the maximum desirable velocities for most storm drainage design. Velocities in excess of those shown on this table must be accepted by TPW. Supercritical flow in main lines should be avoided unless accepted by TPW.

- The maximum hydraulic gradient shall not produce a velocity that exceeds 20 feet per second (fps). Table 3.9 shows the desirable maximum velocities for most storm drainage design. Storm drains shall be designed to have a minimum mean velocity flowing full at 2.5 fps. A main is defined as any pipe connected to two or more inlets.

Table 3.9 Desirable Velocity in Storm Drains	
Description	Maximum Allowable Velocity
Culverts (All types)	15 fps
Storm Drains (Inlet laterals)	25 fps
Storm Drains (Mains)	20 fps

This chapter replaces the Closed Conduit System sections 1.2.9, most of 1.2.10, and 1.2.11 of the *ISWM Hydraulics Technical Manual*. Storm Drain Outfalls located within section 1.2.10 (page HA-49) are adopted. Although, use of Table 1.10 may be substituted by a detailed hydrologic and hydraulic study. It is the purpose of this chapter of the manual to consider the significance of the hydraulic elements of storm drains and their appurtenances to the storm drainage system. This chapter is generally excerpted from the 1967 CFW Design Criteria Manual.

Velocities and Grades

Storm drains should operate with velocities of flow sufficient to prevent excessive deposits of solid materials, otherwise objectionable clogging may result. The controlling velocity is near the bottom of the conduit and considerably less than the mean velocity of the sewer. Storm drains shall be designed to have a minimum mean velocity (flowing full) of 2.5 fps. Table 3.10, Minimum Grades for Storm Drains, indicates the minimum grades for concrete pipe ($n = 0.013$), flowing at 2.5 fps.

Table 3.10 Minimum Grades for Storm Drains

Pipe Size (Inches)	Concrete Pipe Slope FT./Ft.
21	0.0015
24	0.0013
27	0.0011
30-96	0.0010

Materials

Only reinforced concrete pipe is allowed under pavement for public storm drains in the CFW except as noted hereafter: profile-wall thermoplastic pipe (corrugated exterior with smooth interior), including High-Density Polyethylene (HDPE) pipe and Corrugated PVC (CPVC), may be used in the following specific situations:

- Profile-wall thermoplastic pipe is permitted for use in driveway culverts (i.e. across roadside ditches). Minimum allowable size shall be fifteen (15) inches, and driveway permits will be required from the TPW Street Management office.
- Profile-wall thermoplastic pipe may be allowed for certain off-pavement applications only as accepted by TPW on a case-by-case basis (using Request for Variance Form CFW-7).
- A request for variance (Form CFW-7) shall be required for profile wall HDPE pipe up to thirty-six (36) inch in diameter under publicly maintained concrete pavement in residential streets. No exceptions to this rule will be considered for installation of HDPE/CPVC pipe under other publicly maintained street sections.
- Profile-wall thermoplastic pipe used as storm drain shall be installed in accordance with the appropriate CFW Standard Detail, and with all manufacturer's specifications, and shall meet or exceed ASTM D-2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications. Note that Class I aggregate (CFW Standard Construction Specification Documents – Section 330510 (Old TPW Item 402.2) or NCTCOG Aggregate Grade 4) shall be required for pipe embedment.

All contractors shall be trained and certified by the manufacturer prior to installing HDPE/CPVC pipe. A copy of the training certification and proof of insurance shall be provided to the City before any work shall commence.

Roughness Coefficients

In selecting roughness coefficients for concrete pipe, consideration will be given to the average conditions at the site during the useful life of the structure. The 'n' value of 0.015 for concrete pipe shall be used primarily in analyzing existing sewers where alignment is poor and joints have become rough. For example, concrete pipe is being designed at a location where it is considered suitable and there is reason to believe that the roughness would increase through erosion or corrosion of the interior surface, slight displacement of joints or entrance of foreign materials. A roughness coefficient will be selected which in the judgment of the designer, will represent the average condition. Any selection of 'n' values below the minimum or above the maximum, either for monolithic concrete structures, concrete pipe or HDPE, will have to have written approval of the TPW.

Table 3.11 Manning's Coefficients for Storm Drain Conduits	
Type of Storm Drain	Manning's n
Concrete Pipe (Design n = 0.013)	0.012 – 0.015
Concrete Boxes (Design n = 0.015)	0.012 – 0.015
Corrugated Metal Pipe, Pipe-Arch and Box (Annular or Helical Corrugations - see Table 1.8 in iSWM Hydraulics Technical Manual . NOTE: CFW DOES NOT ALLOW CMP FOR NEW CONSTRUCTION	0.022-0.037*
Profile Wall Thermoplastic High Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC)	0.010-0.013
NOTE: Actual field values for conduits may vary depending on the effect of abrasion, corrosion, deflection, and joint conditions.	

*Note: analysis of existing conditions may require a different value than the stated design coefficients.

Manholes

Manholes shall be located at intervals not to exceed 550 feet for pipe 54 inches in diameter or smaller. For pipes sixty (60) inches in diameter and larger or equivalently sized boxes, the maximum interval is 800 feet. Manholes must be installed at the upstream end of a system and where a storm drain leaves the pavement, unless the outfall is within fifty (50) feet of the roadway and directly accessible. Manholes shall preferably be located at street intersections, sewer junctions, changes of grade and changes of alignment. When the storm drain is a concrete box instead of an RCP, four (4) foot diameter manhole risers may be installed instead of vaults to provide access. In all cases, steps or ranges shall be installed from the ground surface to the flowline of the pipe.

Full or Part Full Flow in Storm Drains

All storm drains shall be designed by the application of the Continuity Equation and Manning's Equation either through the appropriate charts or nomographs or by direct solutions of the equations as follows:

$$Q = A V, \text{ and}$$

$$Q = \frac{1.486}{n} A r^{\frac{2}{3}} S_f^{\frac{1}{2}}, \text{ where}$$

Q = Runoff in cubic feet per second.

A = Cross-sectional area of pipe or channel.

V = Velocity of flow.

n = Coefficient of roughness of pipe or channel.

r = Hydraulic radius = A/P

S_f = friction slope in feet per foot in pipe or channel.

P = Wetted perimeter.

The size of pipe required to transport a known-quantity of storm runoff is obtained by substituting known values in the formula. In practice, the formula is best utilized in the preparation of a pipe flow chart which interrelates values of runoff, velocity, slope, and pipe geometry. With two of these variables known or assumed, the other two are quickly obtained from the chart. A pipe flow nomograph for circular conduits

flowing full graph is shown in *iSWM Hydraulics Technical Manual Figure 1.17*. Equations for flow in conduits with other cross-sections are available in the TxDOT Hydraulic Design Manual, dated October 2011, Chapter 6, and Section 2. For circular conduits flowing partially full, graphs are presented in *iSWM Hydraulics Technical Manual Figure 1.19a*.

Hydraulic Gradient and Profile of Storm Drain

In storm drain systems flowing full (or partially full as discussed above), all losses of energy through resistance with flow in pipes, by changes of momentum, or by interference with flow patterns at junctions, must be accounted for by accumulative head losses along the system from its initial upstream inlet to its outlet. The purpose of accurate determinations of head losses at junctions is to include these values in a progressive calculation of the hydraulic gradient along the storm drain system. In this way, it is possible to determine the water surface elevation which will exist at each structure. The rate of loss of energy through the storm drain system shall be represented by the hydraulic grade line, which measures the pressure head available at any given point within the system.

The HGL shall be established for all storm drainage design in which the system operates under a head. The HGL is often controlled by the conditions of the sewer outfall; therefore, the elevation of the tailwater must be known. The hydraulic gradient is calculated upstream from the downstream end, taking into account all of the head losses that may occur along the line. The *iSWM Hydraulics Technical Manual Table 1.10* provides a table of coincident design frequencies to assist with tailwater determination. The hydraulic gradient shall begin at the higher of the tailwater or depth of flow in the pipe at the downstream end. An alternative to the use of *Table 1.10* is the performance of a detailed hydrologic and hydraulic study to determine coincident tailwater.

All head losses shall be calculated if the storm drain system is in a subcritical flow regime whether the system is flowing partially full or surcharged. Hydraulic calculations shall reflect partially full pipe where appropriate. Supercritical flow is allowed in main lines only with the approval of TPW. If the system is in supercritical regime the section should be marked "SUPERCritical FLOW." The presence of supercritical regime should be confirmed by analyzing from downstream as well as upstream.

The friction head loss shall be determined by direct application of Manning's Equation or by appropriate nomographs or charts as discussed in the first paragraph of this subchapter. Minor losses due to turbulence at structures shall be determined by the procedure of last subchapter of this chapter ("Minor Headlosses at Structures) or in the *iSWM Hydraulics Technical Manual*. All HGL calculations will be carried upstream to the inlet.

The HGL shall in no case be above the surface of the ground or street gutter for the conveyance storm. Allowance of head must also be provided for future extensions of the storm drainage system. In all cases the maximum HGL must be twelve (12) inches below top of curb at any inlet for the conveyance storm.

Minor Head Losses at Structures

Detailed information on the calculation of minor head losses at structures is provided in the proceeding section. Figure 3.8 and Figure 3.9 provide details of minor losses for manholes, wye branches, and bends in the design of closed conduits. Minimum head loss used at any structure shall be 0.10 foot.

Storm Drain Design Example

An example of storm drain design is provided in the proceeding sections.

Hydrologic Methodology with MWH InfoWorks/SWMM Programs

InfoWorks SD by MWH Soft and the Stormwater Management Model (SWMM) family of programs have been applied to several complex storm sewer systems in the CFW. These programs include several hydrologic subarea runoff procedures. In addition to the hydrologic methods described in Chapter 3.4.1, the CFW accepts the following procedures when applying these programs:

- With case-by-case approval by TPW, the SWMM Method in which the flow is routed using a single linear reservoir, whose routing coefficient depends on surface roughness (Manning's n), surface area, ground slope and catchment width.

- A version of the Unit Hydrograph Method in which a triangular unit hydrograph is developed using the time to peak (time of concentration times 0.6), total runoff time (time to peak times 2.67) and the peak of the unit hydrograph (2 divided by total runoff time). Refer to Appendix B, CFW Stormwater computer models for more information.

Minor Head Losses at Structures Calculations

The following head losses at structures shall be determined for manholes, wye branches or bends in the design of closed conduits. See Figure 3.8 and Figure 3.9 for details of each case. Minimum head loss used at any structure shall be one-tenth (0.10) foot.

The basic equation for most cases, where there are both upstream and downstream velocity, takes the form as set forth below with the various conditions of the coefficient "K_j" shown in Table 3.12.

$$h_j = \left(\frac{V_2^2}{2g} \right) - K_j \left(\frac{V_1^2}{2g} \right)$$

h_j = Junction or structure head loss in feet.

V₁ = Velocity in upstream pipe in fps.

V₂ = Velocity in downstream pipe in fps.

K_j = Junction or structure coefficient of loss.

In the case where the manhole is at the very beginning of a line or the line is laid with bends or on a curve, the equation becomes the following without any velocity of approach.

$$h_j = K_j \frac{V_2^2}{2g}$$

60° Bend - 85%; 45° Bend - 70%; 22-1/2° Bend - 40%

The values of the coefficient "K_j" for determining the loss of head due to obstructions in pipes are shown in Table 3.13 and the coefficients are used in the following equation to calculate the head loss at the obstruction:

$$H_j = K_j \frac{V_2^2}{2g}$$

Table 3.12 Junction or Structure Coefficient of Loss			
Case No.	Reference Figure	Description of Condition	Coefficient K _j
I	3.8	Inlet on Main Line	0.50
II	3.8	Inlet on Main Line with Branch Lateral	0.25
III	3.8	Manhole on Main Line with 45° Branch lateral	0.50
IV	3.8	Manhole on Main Line with 90° Branch Lateral	0.25
V	3.8	Manhole on Main Line with no Branch	1.0
VI	3.9	45° Wye Connection or cut-in	0.75
VII	3.9	Inlet or Manhole at Beginning of Line	1.25
VIII	3.9	Conduit on Curves for 90° *	
		Curve radius = diameter	0.50
		Curve radius = 2 to 8 diam.	0.25
		Curve radius = 8 to 20 diam.	0.10
IX	3.9	Bends where radius is equal to diameter	
		90° Bend	0.50
		60° Bend	0.43
		45° Bend	0.35
		22-1/2° Bend	0.20
		Manhole on line with 60° Lateral	0.35
		Manhole on line with 22/1/2° Lateral	0.75
* Where bends other than 90° are used, the 90° bend coefficient can be used with the following percentage factor applied: 60°- 85%. 45° – 70%. 22.5° – 40%			

Table 3.13 Head Loss Coefficients Due To Obstructions			
A/A_o*	K_j	A/A_o*	K_j
1.05	0.10	3.0	15.0
1.1	0.21	4.0	27.3
1.2	0.50	5.0	42.0
1.4	1.15	6.0	57.0
1.6	2.40	7.0	72.5
1.8	4.00	8.0	88.0
2.0	5.55	9.0	104.0
2.2	7.05	10.0	121.0
2.5	9.70		
* A/A _o = Ratio of area of pipe to area of opening at obstruction.			

The values of the coefficient “K_j” for determining the loss of head due to sudden enlargements and sudden contractions in pipes are shown in Table 3.14, and the coefficients are used in the following equation to calculate the head loss at the change in section:

$$H_j = K_j \frac{V^2}{2g}, \text{ where,}$$

V = Velocity in smaller pipe

Table 3.14 Head Loss Coefficients Due To Sudden Enlargements and Contractions		
$\frac{D_2}{D_1}$	Sudden Enlargements K_j	Sudden Contractions K_j
1.2	0.10	0.08
1.4	0.23	0.18
1.6	0.35	0.25
1.8	0.44	0.33
2.0	0.52	0.36
2.5	0.65	0.40
3.0	0.72	0.42
4.0	0.80	0.44
5.0	0.84	0.45
10.0	0.89	0.46
~	0.91	0.47
* D ₂ /D ₁ = Ratio of larger to smaller diameter		

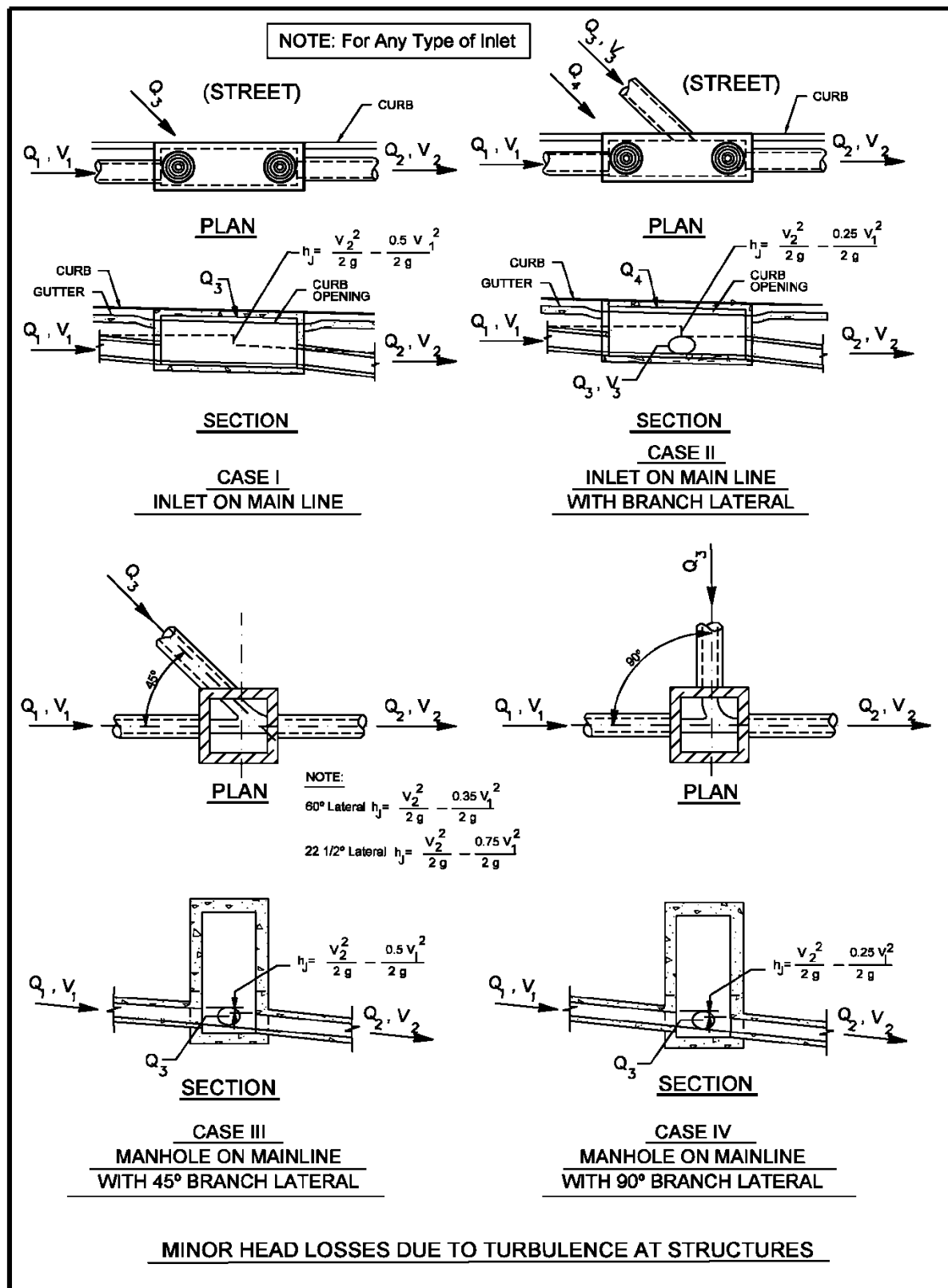


Figure 3.8 Minor Head Losses at Structures (1 of 2)

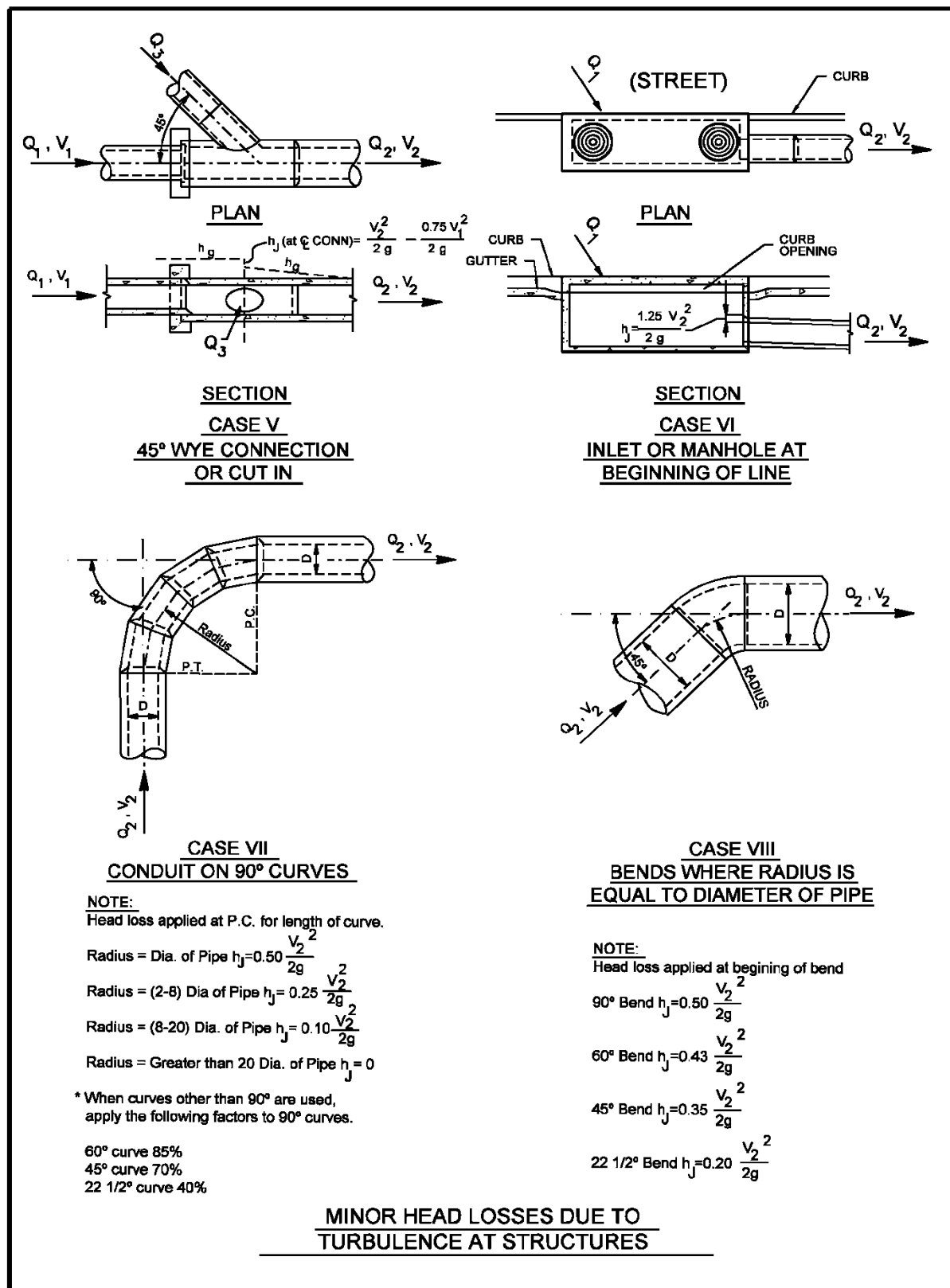


Figure 3.9 Minor Head Losses at Structures (2 of 2)

Storm Drain Design Examples

All storm drains shall be designed by the application of the Manning Equation either directly or through appropriate charts or nomographs. In the preparation of hydraulic designs, a thorough investigation shall be made of all existing structures and their performance on the waterway in question.

An example of the use of the method used in the manual for the design of a storm drainage system is outlined below and shown on Figure 3.10, Computations Sheet for Storm Drains. The design theory has been presented in the preceding chapters with their corresponding tables and graphs of information.

Preliminary Design Considerations

- Prepare a drainage map of the entire area to be drained by proposed improvements. The scale of the map shall not be less than 1 inch = 200 feet for project area although smaller scale maps for large offsite drainage areas may be used. A maximum contour interval of 2 feet shall be provided.
- Prepare a layout of the proposed storm drainage system, locating all inlets, manholes, mains, laterals, ditches, culverts, etc.
- Outline the drainage area for each inlet in accordance with present and future street development.
- Indicate on each drainage area the code identification number and the direction of surface runoff by small arrows. Provide a runoff table showing area, "C" factor for each portion and composite "e", Tc, I5, Q5, I100 and Q100. Provide zoning classifications or land use data.
- Show all existing underground utilities.
- Establish design rainfall frequency.
- Establish minimum inlet time of concentration.
- Establish the typical cross section of each street.
- Establish permissible spread of water on all streets within the drainage area.
- Plot profile of existing natural ground along the center line of the proposed storm drain.
- Extend downstream plan and profile beyond the end of the pipe to a point of acceptable outfall. The flowline or invert of proposed outlet shall be equal to or slightly higher than receiving stream.

Runoff Computations

Storm drain hydraulics are shown on the computation sheet provided on Figure 3.10. The first 18 columns of the computation sheet cover the tabulation for runoff calculations:

Table Column Description

Column 1	Enter the downstream storm drain station number.
Column 2	Enter the upstream storm drain station number. This is the design point. Design should start at the farthest upstream point.
Column 3	Enter the distance (in feet) between the storm drain stations.
Column 4	Enter the designation of the drainage area(s) at the design point in Column 2 corresponding to the designations shown on the drainage area map.
Column 5	Enter the area in acres for the drainage area identified in Column 4.
Column 6	Enter the total drainage area in acres within the system corresponding to storm drain station shown in Column 2.
Column 7	Enter the runoff coefficient "C" for the drainage area shown in Column 5.
Column 8	Multiply Column 5 by Column 7 for each area.
Column 9	Determine the total "CA" for the drainage system corresponding to the inlet or manhole shown in Column 2.

Column 10	Determine inlet time of concentration (See Section 1.2.4 iSWM Hydrology Technical Manual).
Column 11	Determine flow time in the storm drain in minutes. The flow time is equal to the distance in Column 3 divided by 60 times the velocity of flow through the storm drain in ft/sec.
Column 12	Total time of concentration in minutes. Column 10 plus Column 11. Note that time of concentration only changes at a downstream junction with another drainage area(s). It remains the same from an inlet or junction to the next inlet or junction picking up additional drainage areas. The junction of two paired inlets with each other is not a downstream junction.
Column 13	The intensity of rainfall in inches per hour for the conveyance storm frequency from the appropriate county rainfall table in the iSWM Hydrology Technical Manual .
Column 14	The intensity of rainfall in inches per hour for the flood mitigation storm frequency from the appropriate county rainfall table in the iSWM Hydrology Technical Manual .
Column 15	The conveyance storm runoff in cfs. Column 9 times Column 13.
Column 16	The flood mitigation storm runoff in cfs. Column 9 times Column 14.
Column 17	The proposed inlet bypass during a flood mitigation storm. This should generally correspond to the carry-over flow “q” in Column 31 of the On-Grade Inlet Capacity Calculations Table (minor variances may occur due to travel time routing in the Hydraulics Table).
Column 18	Design Discharge for the storm drain system (“Qpipe”) in cfs. This should be the greater of a substantial portion of Q5 (Column 15) or Q100-Qbypass (Column 16 minus Column 17).

Hydraulic Design

After the computation of the quantity of storm runoff entering each inlet, the size and gradient of pipe required to carry the design storm are determined. Any number of computer programs are available to provide design assistance for pipe sizing to the engineer. However, storm drain hydraulics must be converted and reported in Figure 3.10, Computation Sheet for Storm Drains. The hydraulic grade line (HGL) must be calculated for all storm drain mains and laterals using appropriate head loss equations. In all cases, the storm drain HGL must remain below grade and must be at least one (1) foot below top of curb at any inlet for the conveyance storm.

In partial flow conditions, the HGL represents the actual water surface within the pipe. Note that for partial flow conditions, the velocity of the flow should be calculated based on actual area of flow, not the full flow area of the pipe or box.

Although the table is presented from upstream to downstream, the calculations are normally performed from the outfall upstream to each inlet. Unless partial flow conditions exist, the beginning hydraulic gradient (Column 22 of the last downstream section) must begin at either the top of pipe or at the hydraulic gradient of the receiving stream at the coincident frequency provided in [Table 1.10 of the Hydraulic Technical Manual](#), whichever is higher. It is also acceptable to perform a detailed hydrologic and hydraulic study of the watershed of the receiving stream to determine the connected outfall hydraulic gradient.

Table Column Description

Column 19	Enter the selected pipe size.
Column 20	Enter the appropriate Manning's roughness coefficient “n” from Table 3.18

COMPUTATION SHEET
HYDRAULIC COMPUTATIONS FOR STORM DRAINS

STORM DRAIN HYDRAULIC CALCULATIONS TABLE																																				
FROM	TO	Pipe Length	Drainage Area		Runoff "c"	Incr. cA	Total cA	Time of Concentration			5-year Intensity	100-year Intensity	Q5 Runoff	Q100 Runoff	Inlet bypass	Q pipe	Pipe Size	n	Sf	HGL		HEAD LOSS CALCULATIONS										Design HGL Elev.	Invert Elev.		T/C Elev.	COMMENTS
			Incremental	Total Area				Inlet	Travel	Total										D/S Elev.	U/S Elev.	V1 (in) ft/sec	V2 (out) ft/sec	V1²/2G ft.	V2²/2G ft.	Kj	KjV1²/2G ft.	Hk ft.	FROM ft.	TO ft.						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34			
LINE A																																				
4+00	5+42	142	A1	35.00	35.00	0.65	22.75	22.75	15.00		15.00	4.86	7.98	110.57	181.55	14.50	167.05	48	0.013	0.0135	818.17	820.09	13.29	13.29	2.74	2.74	0.00	0.00	0.00	820.09	813.16	816.00	822.50	A1=future phases		
1+86	4+00	214	A2	0.50	35.50	0.65		23.08	15.00	0.18	15.18	4.86	7.98	112.14	184.14	11.80	172.34	54	0.013	0.0077	816.08	817.72	13.29	10.84	2.74	1.82	0.50	1.37	0.45	818.17	811.02	813.16	819.50			
1+43	1+86	43	A3	0.18	35.68	0.65	0.12	23.19	15.00	0.51	15.51	4.86	7.98	112.71	185.07	0.00	185.07	54	0.013	0.0089	814.96	815.34	10.84	11.64	1.82	2.10	0.75	1.37	0.74	816.08	809.59	810.52	818.00			
0+50	1+43	93	A4	0.56	36.24	0.65	0.36	23.56	15.00	0.57	15.57	4.86	7.98	114.48	187.98	0.00	187.98	60	0.013	0.0052	814.10	814.59	11.64	9.57	2.10	1.42	0.50	1.05	0.37	814.96	808.53	809.09	817.78	min Hk = 0.10'		
0+00	0+50	50			36.24	0.65		23.56	15.00	0.57	15.57	4.86	7.98	114.48	187.98	0.00	187.98	60	0.013	0.0075	813.23	813.61	9.57	9.57	1.42	1.42	0.35	0.00	0.50	814.10	808.23	808.53	---	45° BEND		
LINE A-2																																				
A 1+86	n. inlet	22	see note	0.25	0.25	0.65	0.09	0.16	15.00		15.00	4.86	7.98	1.24	2.65	0.00	2.65	21	0.013	0.0003	818.17	818.18	0.00	1.10	0.00	0.02	1.25	0.00	0.02	818.20	812.02	815.00	819.50	half A1 bypass + half A2		
A 1+86	s. inlet	24	see note	0.25	0.25	0.65	0.09	0.16	15.00		15.00	4.86	7.98	1.24	2.65	0.00	2.65	21	0.013	0.0003	818.17	818.18	0.00	1.10	0.00	0.02	1.25	0.00	0.02	818.20	812.02	815.00	819.50	half A1 bypass + half A2		
LINE A-3																																				
A 1+86	n. inlet	22	see note	0.18	0.18	0.65	0.09	0.12	15.00		15.00	4.86	7.98	9.28	14.08	0.00	14.08	21	0.013	0.0079	816.08	816.25	0.00	5.86	0.00	0.53	1.25	0.00	0.67	816.91	811.52	813.50	818.00	half (A1+A2 bypass) + half A3		
A 1+86	s. inlet	24	see note	0.18	0.18	0.65	0.09	0.12	15.00		15.00	4.86	7.98	9.28	14.08	0.00	14.08	21	0.013	0.0079	816.08	816.27	0.00	5.86	0.00	0.53	1.25	0.00	0.67	816.93	811.52	813.50	818.00	half (A1+A2 bypass) + half A3		
LINE A-4																																				
0+20	s. inlet	18	A4/2	0.28	0.28	0.65	0.18	0.18	15.00		15.00	4.86	7.98	0.88	1.45	0.00	1.45	21	0.013	0.0001	814.97	814.97	0.00	0.60	0.00	0.01	1.25	0.00	0.01	814.98	811.67	813.07	817.57			
0+20	0+37	17	A4/2	0.28	0.28	0.65	0.18	0.18	15.00		15.00	4.86	7.98	0.88	1.45	0.00	1.45	21	0.013	0.0001	814.97	814.97	0.00	0.60	0.00	0.01	1.25	0.00	0.01	814.98	811.67	813.07	817.57	north inlet		
0+00	0+20	20			0.56	0.65	0.00	0.36	15.00		15.00	4.86	7.98	1.77	2.90	0.00	2.90	24	0.013	0.0002	814.96	814.96	0.60	0.92	0.01	0.01	0.75	0.00	0.01	814.97	810.22	811.42	817.78			
LINE B																																				
5+98	6+15	17	B1/2	3.20	3.20	0.65	2.08	2.08	15.00		15.00	4.86	7.98	10.11	16.60	6.49	10.11	21	0.013	0.0041	817.70	817.77	0.00	4.20	0.00	0.27	1.25	0.00	0.34	818.12	814.73	815.04	819.54	west inlet		
4+50	5+98	148	B1/2	3.20	6.40	0.65	2.08	4.16	15.00	0.07	15.07	4.86	7.98	20.22	33.20	12.98	20.22	24	0.013	0.0080	816.02	817.20	4.20	6.44	0.27	0.64	0.50	0.14	0.51	817.70	813.00	814.48	819.48			
2+15	4+50	235	B2	5.20	11.60	0.65	3.38	7.54	15.00	0.45	15.45	4.86	7.98	36.64	60.17	23.53	36.64	30	0.013	0.0080	813.76	815.63	6.44	7.46	0.64	0.87	0.75	0.48	0.38	816.02	810.15	812.50	818.00			
0+50	2+15	165	B3	2.50	14.10	0.65	1.63	9.17	15.00	0.98	15.98	4.86	7.98	44.54	73.14	20.00	53.14	36	0.013	0.0063	812.27	813.31	7.46	7.52	0.87	0.88	0.50	0.43	0.44	813.76	808.00	809.65	815.65			
0+00	0+50	50	B4	1.80	15.90	0.65	1.17	10.34	15.00	1.34	16.34	4.86	7.98	50.23	82.47	0.00	82.47	48	0.013	0.0075	811.53	811.91	7.52	6.56	0.88	0.67	0.35	0.31	0.36	812.27	805.00	807.00	814.00	channel HGL=811.53		
LINE B-1A																																				
B 5+98	n. inlet	17	B1/2	3.20	3.20	0.65	2.08	2.08	15.00		15.00	4.86	7.98	10.11	16.60	6.49	10.11	21	0.013	0.0041	817.70	817.77	0.00	4.20	0.00	0.27	1.25	0.00	0.34	818.12	814.73	815.04	819.54	east inlet		
LINE B-2 A&B																																				
B 4+50	e. inlet	18	B2/2	2.60	2.60	0.65	1.69	1.69	15.00		15.00	4.86	7.98	13.11	19.98	11.77	8.21	21	0.013	0.0027	816.02	816.07	0.00	3.41	0.00	0.18	1.25	0.00	0.23	816.29	812.50	813.50	818.00	includes B1 bypass		
B 4+50	w. inlet	18	B2/2	2.60	2.60	0.65	1.69	1.69	15.00		15.00	4.86	7.98	13.11	19.98	11.77	8.21	21	0.013	0.0027	816.02	816.07	0.00	3.41	0.00	0.18	1.25	0.00	0.23	816.29	812.50	813.50	818.00	includes B1 bypass		
LINE B-3 A&B																																				
B 2+15	e. inlet	18	B3/2	1.25	1.25	0.65	0.81	0.81	15.00		15.00	4.86	7.98	10.97	18.25	10.00	8.25	21	0.013	0.0027	813.76	813.81	0.00	3.43	0.00	0.18	1.25	0.00	0.23	814.04	810.65	811.15	815.65	includes B2 bypass		
B 2+15	w. inlet	18	B3/2	1.25	1.25	0.65	0.81	0.81	15.00		15.00	4.86	7.98	10.97	18.25	10.00	8.25	21	0.013	0.0027	813.76	813.81	0.00	3.43	0.00	0.18	1.25	0.00	0.23	814.04	810.65	811.15	815.65	includes B2 bypass		
LINE B-4																																				
0+20	w. inlet	18	B4/2	0.90	0.90	0.65	0.59	0.59	15.00	0.00	15.00	4.86	7.98	2.84	14.67	0.00	14.67	24	0.013	0.0042	812.44	812.51	0.00	4.67	0.00	0.34	1.25	0.00	0.42	812.94	808.65	809.50	814.00	includes B3 bypass		
0+20	0+38	18	B4/2	0.90	0.90	0.65	0.59	0.59	15.00	0.00	15.00	4.86	7.98	2.84	14.67	0.00	14.67	24	0.013	0.0042	812.44	812.51	0.00	4.67	0.00	0.34	1.25	0.00	0.42	812.94	808.65	809.50	814.00	east inlet; B3 bypass		
0+00	0+20	15			1.80	0.65	0.00	1.17	15.00	0.00	15.00	4.86	7.98	5.69	29.34	0.00	29.34	33	0.013	0.0031	812.27	812.31	4.67	4.94	0.34	0.38	0.75	0.25	0.12	812.44	807.00	807.90	814.00			
Notes: 1 Time of concentration (and intensity) only changes at downstream junctions. Paired inlets do not constitute a downstream junction. 2 HGL must be below grade along main or at least 1' below top of curb at each inlet (including entry loss of 1.25v²/2g). 3 Inlet spacing shall be determined by 5-year to top of curb or 100-year filling right-of-way, whichever is most restrictive. 4 Minimum head loss shall be 0.10 feet in a subcritical flow regime. Supercritical flow regimes do not generate head losses.																																				

Figure 3.10 Computations Sheet for Storm Drains

Table Column Description

Column 21	Enter the required slope of the frictional gradient (hydraulic gradient) determined by Manning's equation. The pipe shall be designed on a grade such that the inside crown of the pipe coincides or is below the HGL when flowing full. In a partial flow condition, the friction slope is the slope of the water surface and should follow the slope of the pipe.
Column 22	This is the beginning hydraulic gradient of the line. It is equal to the Design HGL (Column 31) for the next downstream segment, or the beginning HGL of the system as described above.
Column 23	This is the upstream HGL before the structure and is calculated as Column 22 plus the friction loss (Column 3 times Column 21).
Column 24	Velocity of flow in incoming pipe (main line) at the junction, inlet or manhole at the design point identified in Column 2.
Column 25	Velocity of flow in outgoing pipe (i.e. the pipe segment being analyzed) at junction, inlet or manhole at design point identified in Column 2.
Column 26	Velocity head of the velocity in Column 24.
Column 27	Velocity head of the velocity in Column 25.
Column 28	Head loss coefficient "Kj", at junction, inlet or manhole at design point from Table 3.12, Table 3.13, or Table 3.14, or from Figure 3.8 and Figure 3.9.
Column 29	Multiply Column 26 by Column 28.
Column 30	Head Loss at Structure. At a junction or change in pipe size, this is Column 27 minus Column 29. At a bend or inlet, this is Column 27 times Column 28. In all cases this is 0.10' minimum. EXCEPTION: In a supercritical flow regime with partial flow conditions, head losses are not generated at upstream junctions. These may be designated as "SUPERCRITICAL PARTIAL FLOW" in the head loss calculations, but must be supported by Froude Number in the comments column. Any other proposed deviations from standard head loss calculations due to other unusual flow regimes must be accepted by TPW on a case-by-case basis.
Column 31	Design HGL at the design point identified in Column 2. Column 23 plus Column 30. This is the beginning HGL (Column 22) for any upstream pipe discharging into that junction.
Column 32	Invert elevation for the pipe being analyzed at the downstream storm drain station in Column 1.
Column 33	Invert elevation for the pipe being analyzed at the design point (upstream storm drain station) in Column 2.
Column 34	Top of curb elevation at the design point in Column 2.

The above procedure is followed for each section of the storm drain. At the outfall, the hydraulic gradient of the line must be at the same elevation or above the gradient of the conduit or channel receiving the storm runoff discharge. [See Sections 1.2.10 iSWM Hydraulics Technical Manual](#) for guidance on outfall hydraulic gradients. In lieu of the guidance in the [Sections 1.2.10 iSWM Hydraulics Technical Manual](#) it is acceptable to perform a detailed hydrologic and hydraulic study of the watershed of the receiving stream to determine the connected outfall hydraulic gradient.

With the hydraulic gradient established for a particular line, considerable latitude is available for the physical placement of the pipe flow line elevations. The inside top of the pipe must be on or below the hydraulic gradient, thus allowing the pipe to be lowered where necessary to maintain proper cover and to minimize grade conflicts with existing utilities.

3.8.4 Hydraulic Design Criteria for Channels, Culverts, Bridges and Detention Structures

Introduction

This chapter is intended to provide design criteria and guidance on several on-site flood mitigation system components, including culverts, bridges, vegetated and lined open channels, storage design, outlet structures, and energy dissipation devices for outlet protection.

Open Channels

Design Frequency

The CFW requires that open channels are designed for the flood mitigation storm for fully developed watershed conditions. Channels may be designed with multiple stages (e.g., a “low-flow” or “pilot” channel section for common recurring flows, and a high flow section that contains the design discharge). The “low-flow” or “pilot” channel shall convey 2% of the design flood mitigation storm discharge.

General Criteria

- If relocation of a stream channel is unavoidable, the cross-sectional shape, meander, pattern, roughness, sediment transport, and slope shall conform to the existing conditions insofar as practicable. Energy dissipation will be necessary when existing conditions cannot be duplicated.
- Streambank stabilization shall be provided, when appropriate, as a result of any stream disturbance such as encroachment and shall include both upstream and downstream banks as well as the local site.
- HEC-RAS, or similarly capable software accepted by the City, shall be used to confirm the water surface profiles in open channels. Refer to Appendix B, Table B.1, Stormwater Modeling Programs and Design Tools for other additional acceptable hydraulic software programs.
- The final design of artificial open channels shall be consistent with the velocity limitations for the selected channel lining. Maximum velocity values for selected lining categories are presented in Table 3.16 and Table 3.17. Seeding and mulch shall only be used when the design value does not exceed the allowable value for bare soil. Velocity limitations for vegetative linings are reported in Table 3.17. Vegetative lining calculations and stone riprap procedures are presented in this Chapter and in [Section 3.2 of the Hydraulics Technical Manual](#).
- The design of stable rock riprap lining depends on the intersection of the velocity (local boundary shear) and the size and gradation of the riprap material. More information on calculating acceptable riprap velocity limits is available in [Section 3.2.7 of the Hydraulics Technical Manual](#). The Gregory Method shall be used for riprap designing in CFW.

Normal Depth (Uniform Flow):

For uniform flow calculations, the theoretical channel dimensions, computed by the slope-area methods outlined in this manual, are to be used only for an initial dimension in the design of an improved channel. Exceptions will be for small outfall channels (with the approval of TPW) with the following options:

- Completely contained on the development site for on-site drainage.
- Where no off-site drainage easement is required (i.e. not crossing or adjacent to another property that could be flooded if design storm occurs).
- No nearby downstream restrictions.
- Where peak discharge is 10 cfs or less.

Backwater Profile (Gradually Varied Flow):

CFW requires a hand computed or HEC-RAS backwater/frontwater analysis on any proposed open channel to determine the actual tailwater elevations, channel capacity and freeboard, and impacts on adjacent floodplains. If a stream or creek has an effective FEMA model, the engineer will be required to use a computer program for the analysis. If the current effective FEMA model for the stream is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions.

Supercritical Flow Regime

Supercritical flow will not be allowed except under unusual circumstances, with special approval of the City staff, through an accepted variance request Appendix A, form CFW-7. However, for lined channels, the hand computed frontwater or HEC-RAS analysis should include a mixed-flow regime analysis, to confirm no supercritical flow occurs. CFW requires that the computed flow depths in designed channels be outside of the range of instability, i.e. depth of flow should be at least 1.1 times critical depth.

Channel Transitions or Energy Dissipation Structures or Small Dams

A HEC-RAS model or complete hand computed backwater analysis is a standard requirement for design of channel transitions (upstream and downstream), energy dissipation structures, and small dams. A backwater analysis will be required by the CFW, either hand computed or HEC-RAS, to determine accurate tailwater elevation, headlosses, headwater elevations and floodplains affected by the proposed transition into and out of an improved channel, any on-stream energy dissipating structures, and small dams (less than six (6) feet). If the current effective FEMA model for the stream is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions. For larger dams, a hydrologic routing will be required, as well as hydraulic analysis, to determine impacts of the proposed structure on existing floodplains and adjacent properties.

Design Criteria

Lined Channels (Figure 3.11 and Figure 3.12)

1. Channels shall be trapezoidal in shape and lined with reinforced concrete in accordance with City Standards and Specifications with side slopes of two (2) feet horizontal to one (1) foot vertical or otherwise to such standards, shape and type of lining as may be accepted by the TPW. The lining shall extend to and include the water surface elevation of the 100-year design storm plus one (1) foot of freeboard for the fully developed flood mitigation storm.
2. The channel bottom must be a minimum of eight (8) feet in width. (Overflow structures for storm sewer system sumps may have a minimum bottom width of six (6) feet.)
3. The maximum water flow velocity in a lined channel shall be fifteen (15) feet per second except that the water flow shall not be supercritical in an area from 100 feet upstream of a bridge to twenty-five (25) feet downstream of a bridge. Hydraulic jumps shall not be allowed from the face of a culvert to fifty (50) feet upstream from that culvert. In general, channels having supercritical flow conditions are discouraged.
4. Whenever flow changes from supercritical to subcritical channel protection shall be provided to protect from the hydraulic jump that is anticipated (see comment in Item 3, above).
5. The design of the channel lining shall take into account the super elevation of the water surface around curves and other changes in direction.
6. A chain link fence six (6) feet in height or other fence as accepted by the TPW shall be constructed on each side of the concrete or gabion channel lining.
7. TPW may require a geotechnical study and/or an underground drainage system design for concrete lined channels.
8. See CFW Standard Details for concrete lined channel section.

Earthen Channels (Figure 3.13 and Figure 3.14)

1. An earthen channel shall have a trapezoidal shape with side slopes not steeper than a 4:1 (horizontal and vertical) ratio and a channel bottom at least twelve (12) feet in width.
2. One (1) foot of freeboard above the flood mitigation frequency fully developed water surface elevation must be provided within all designed channels at all locations along the channel.
3. The side slopes and bottom of an earthen channel shall be smooth, free of rocks, and contain a minimum of six (6) inches of topsoil. The side slopes and channel bottom shall be re-vegetated with grass. No channel shall be accepted for maintenance by the City until a uniform (e.g., evenly distributed, without large bare areas) vegetative cover with a density of 70% has been established.
4. Each reach of a channel must have a ramp for maintenance access. Ramps shall be at least ten (10) feet wide and have 15% maximum grade. Twelve (12) feet width is required if the ramp is bounded by vertical walls.
5. Minimum channel slope is 0.0020 ft/ft (0.20%) unless accepted by TPW.
6. Erosion protection shall be provided at outfall to the receiving stream. The outfall of the earthen channel shall meet the flowline of the receiving stream or a drop structure shall be provided.

Roadside Ditches (Figure 3.15)

1. A roadside ditch ("rural") street section is permissible only as specifically accepted by TPW. No median ditches are allowed.
2. The design storm for roadside ditches shall be the fully developed conditions for the flood mitigation storm. The flood mitigation storm shall not exceed the right-of-way capacity defined as the natural ground at the right-of-way line or top of roadside ditch, unless contained within a designated drainage easement.

Design Considerations

1. For grass lined sections, the maximum design velocity shall be as defined in Table 3.17 for the flood mitigation design storm (Higher velocities justified by a sealed geotechnical study).
2. A grass lined or unimproved roadside ditch shall have minimum two (2) feet bottom width and side slopes no steeper than four horizontal to one vertical (4:1). There shall be a four (4) foot strip at maximum 2% cross slope between the edge of pavement and the beginning of the ditch.
3. Minimum grades for roadside ditches shall be 0.0040 ft/ft (0.40%).
4. Manning's roughness coefficient for analysis and design of roadside ditches are presented in Table 3.15, Table 3.16, and Table 3.17 and in [Section 3.2.3 in the iSWM Hydraulics Technical Manual](#).
5. Maximum depth will not exceed four (4) feet from center-line of pavement (highest elevation in pavement section) except as specifically accepted by TPW.
6. If the ditch extends beyond the right-of-way line, an additional drainage easement shall be dedicated extending at least two (2) feet beyond the top of bank. Utility easements must be separate and beyond any drainage easements.
7. Hydraulic analysis of roadside ditches will require a HEC-RAS analysis for discharges greater than 10 cfs or where conditions other than normal depth are anticipated.

Culverts in Roadside Ditches

1. Culverts will be placed at all driveway and roadway crossings and other locations where appropriate.
2. Erosion protection will be provided at the upstream and downstream ends of all culverts.
3. The size of culvert used shall not create a head loss of more than two-tenths (0.20) foot greater than the normal water surface profile without the culvert unless one (1) foot of freeboard within the roadside ditch is provided. For rural subdivisions or other specific cases, a HEC-RAS analysis may not be

required with approval from TPW. In this case, roadside culverts are to be sized based on drainage area, assuming inlet control. Calculations are to be provided for each block based on drainage calculations.

4. Roadside ditch culverts will be no smaller than twenty-four (24) inches inside diameter or equivalent for roadway crossings and fifteen (15) inches for driveway culverts.
5. A driveway culvert schedule shall be included on the face of the plat. It shall include, for each lot, culvert flowline depth below top of pavement, number and size of pipe required, and horizontal distance from edge of pavement to center of culvert (based on horizontal control requirements above).

Channel Velocity Limitations

Maximum allowable:

- Lined Channels – Maximum velocities equal to fifteen (15 fps) feet per second. Exceptions can be granted by TPW, with justifiable, technical reasons.
- Grass Lined Channels – Maximum velocities refer to Table 3.17. Higher values can be justified by a sealed geotechnical study/analysis of soil type and conditions.

Critical Flow Calculations

Section 3.2.5 Critical Flow Calculations of the *iSWM Hydraulics Technical Manual* is for reference only.

Vegetative Design

Section 3.2.6 Vegetative Design of the *iSWM Hydraulics Technical Manual* is for reference only.

Stone Riprap Design

Riprap design is to be by Method #2 (Gregory Method) described in *Section 3.2.7 of the iSWM Hydraulics Technical Manual*. A properly designed geotextile material is required under the granular bedding. The CFW standard specifications give guidance on the type of geotextile to be used. Regardless of computed thickness the minimum allowable riprap thickness is twelve (12) inches.

Section 3.2.7 of the iSWM Hydraulics Technical Manual, Stone Riprap Design Method #1: Maynard and Reese, is for reference only.

Grouted Riprap

The CFW will allow grouted stone riprap as an erosion control feature. However, the design thickness of the stone lining will not be reduced by the use of grout. See the U.S. Army Corps of Engineers' design manual ETL 1110-2-334 on design and construction of grouted riprap. The Gregory Method shall be utilized. Table 3.20 shall be used to report results of the rip rap design utilizing the Gregory method.

Uniform Flow – Example Problems

Section 3.2.9 Uniform Flow – Example Problems in the *iSWM Hydraulics Technical Manual* are for reference only.

Rectangular, Triangular, and Trapezoidal Open Channel Design

Section 3.2.11 Rectangular, Triangular, and Trapezoidal Open Channel Design – Example Problems in the iSWM Hydraulics Technical Manual are for reference only.

Table 3.15 City of Fort Worth Manning's Roughness Coefficients for Design		
Lining Type	Manning's n*	Comments
Grass Lined	0.035 0.050	Use for velocity check Use for channel capacity check (freeboard check)
Concrete Lined	0.015	
Rock Riprap	0.040	$n = 0.0395d_{50}^{1/6}$ where d_{50} is the stone size of which 50% of the sample is smaller
Grouted Riprap	0.028	FHWA (Federal Highway Administration)
*Note: For analysis, Manning's coefficients shall be the prevailing condition.		

Table 3.16 Roughness Coefficients (Manning's n) and Allowable Velocities for Natural Channels		
Channel Description	Manning's n	Max. Permissible Channel Velocity (ft/s)
MINOR NATURAL STREAMS		
Fairly regular section		
1. Some grass and weeds, little or no brush	0.030	3.0 to 6.0
2. Dense growth of weeds, depth of flow materially greater than weed height	0.035	3.0 to 6.0
3. Some weeds, light brush on banks	0.035	3.0 to 6.0
4. Some weeds, heavy brush on banks	0.050	3.0 to 6.0
5. Some weeds, dense willows on banks	0.060	3.0 to 6.0
For trees within channels with branches submerged at high stage, increase above values by	0.010	
Irregular section with pools, slight channel meander, increase above values by	0.010	
Floodplain – Pasture		
1. Short grass	0.030	3.0 to 6.0
2. Tall grass	0.035	3.0 to 6.0
Floodplain – Cultivated Areas		
1. No crop	0.030	3.0 to 6.0
2. Mature row crops	0.035	3.0 to 6.0
3. Mature field crops	0.040	3.0 to 6.0
Floodplain – Uncleared		
1. Heavy weeds scattered brush	0.050	3.0 to 6.0
2. Wooded	0.120	3.0 to 6.0
MAJOR NATURAL STREAMS		
Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of "n" for larger streams of mostly regular sections, with no boulders or brush	Range from 0.028 to 0.060	3.0 to 6.0
UNLINED VEGETATED CHANNELS		
Clays (Bermuda Grass)	0.035	5.0 to 6.0
Sandy and Silty Soils (Bermuda Grass)	0.035	3.0 to 5.0

Table 3.16 Roughness Coefficients (Manning's n) and Allowable Velocities for Natural Channels

Channel Description	Manning's n	Max. Permissible Channel Velocity (ft/s)
UNLINED NON-VEGETATED CHANNELS		
Sandy Soils	0.030	1.5 to 2.5
Silts	0.030	0.7 to 1.5
Sandy Silts	0.030	2.5 to 3.0
Clays	0.030	3.0 to 5.0
Coarse Gravels	0.030	5.0 to 6.0
Shale	0.030	6.0 to 10.0
Rock	0.025	15.0
For natural channels with specific vegetation type, refer to Table 3.17 for more detailed velocity control.		

Table 3.17 Maximum Velocities for Vegetative Channel Linings

Vegetation Type	Slope Range (%) ¹	Maximum Velocity ² (ft/s)
Bermuda grass	0-5	6.0
Bahia		4.0
Tall fescue grass mixtures ³	0-10	4.0
Kentucky bluegrass	0-5	6.0
Buffalo grass	5-10 >10	5.0 4.0
Grass mixture	0-5 ¹ 5-10	4.0 3.0
Sericea lespedeza, Weeping lovegrass, Alfalfa	0-5 ⁴	3.0
Annuals ⁵	0-5	3.0
Sod		4.0
Lapped sod		5.0

¹ Do not use on slopes steeper than 10% except for side-slope in combination channel.

² Use velocities exceeding 5 ft/s only where good stands can be maintained.

³ Mixtures of Tall Fescue, Bahia, and/or Bermuda

⁴ Do not use on slopes steeper than 5% except for side-slope in combination channel.

⁵ Annuals - used on mild slopes or as temporary protection until permanent covers are established.

Source: Manual for Erosion and Sediment Control in Georgia, 1996.

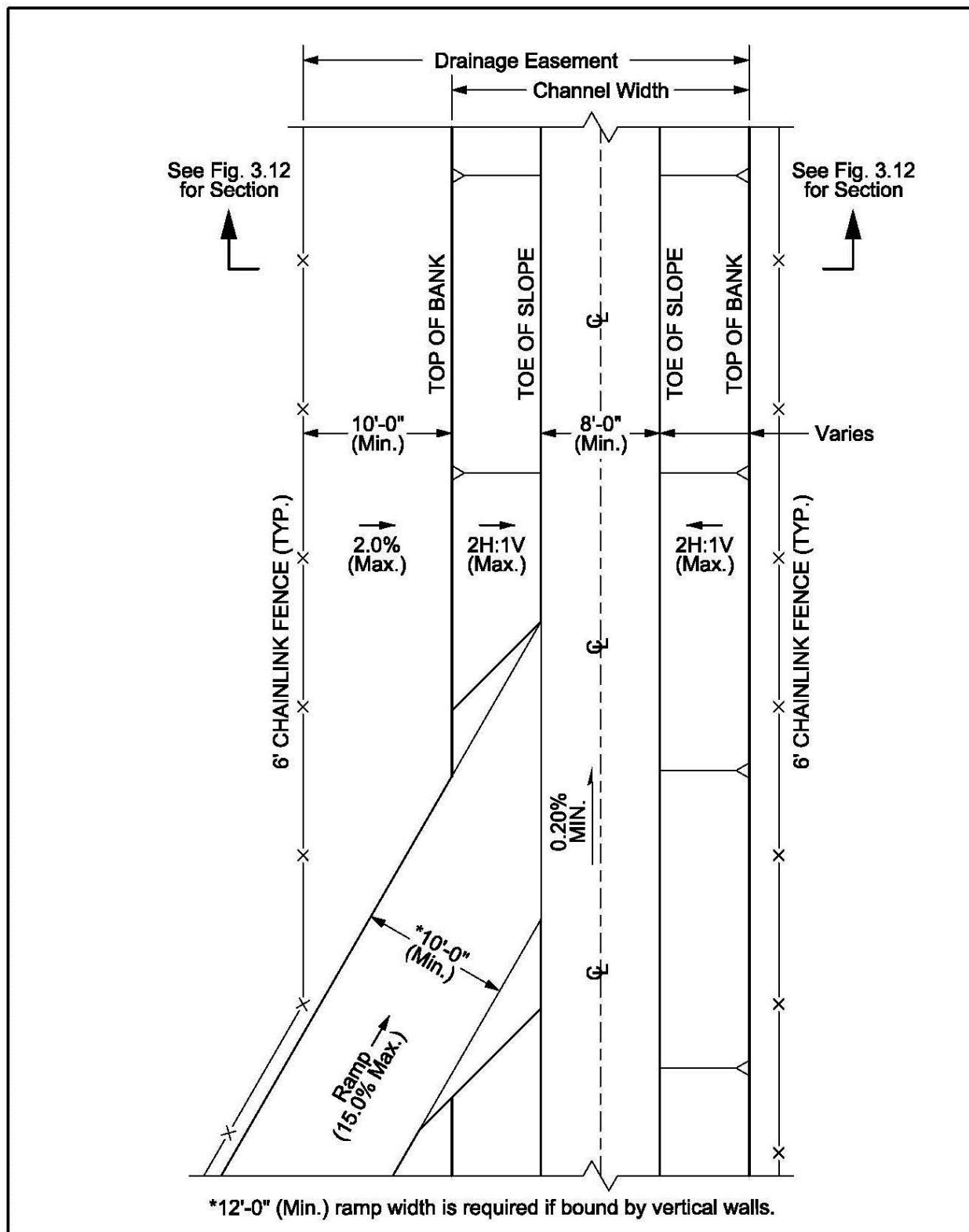


Figure 3.11 Typical Plan – Trapezoidal Concrete-Lined Channel



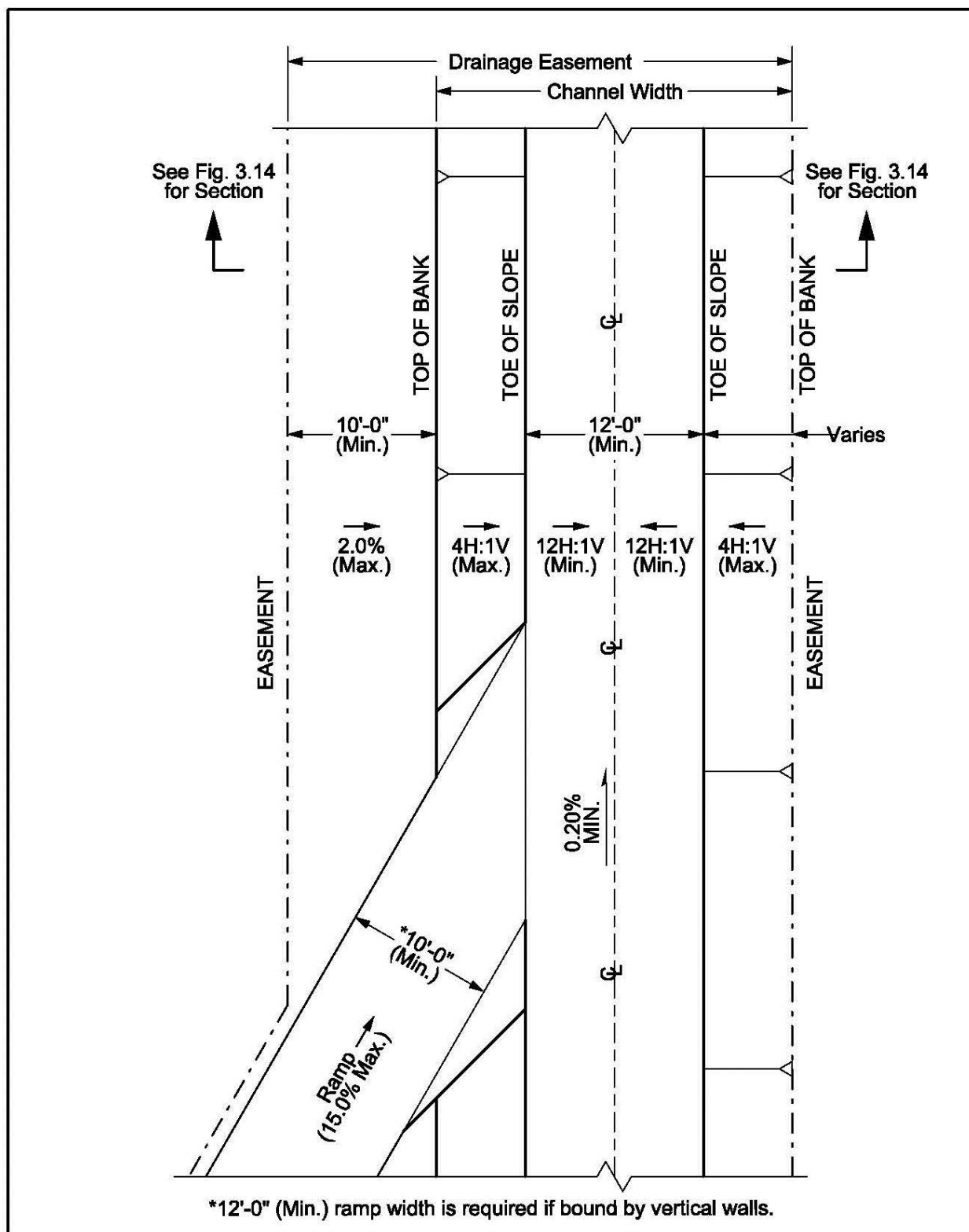


Figure 3.13 Typical Plan – Trapezoidal Earthen Channel

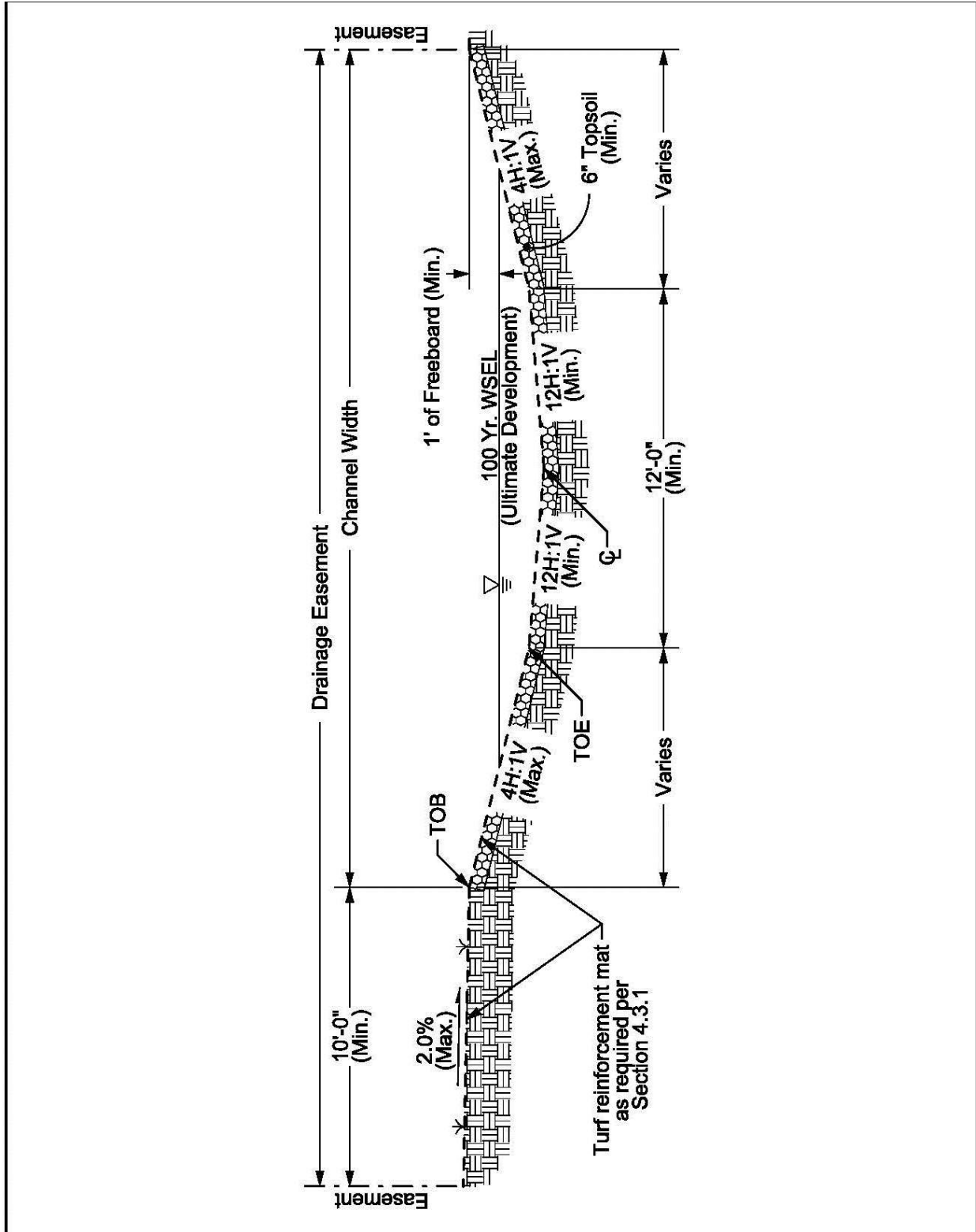


Figure 3.14 Typical Section – Trapezoidal Earthen Channel

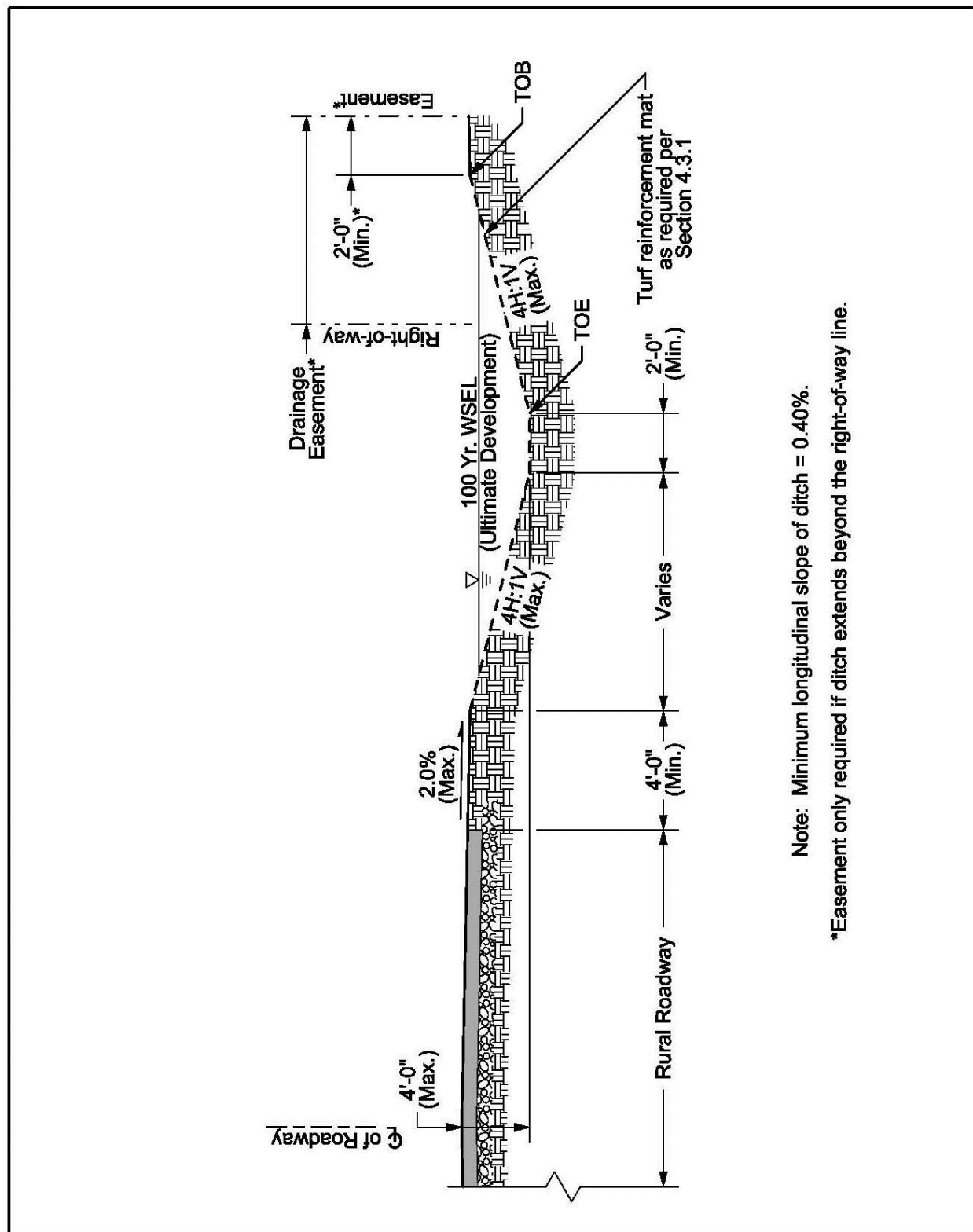


Figure 3.15 Typical Section – Rural Roadside Ditch

Vegetative Design (For Reference Only)

- A two-part procedure is required for final design of temporary and vegetative channel linings.
 - Part 1, the design stability component, involves determining channel dimensions for low vegetative retardance conditions, using Class D as defined in Table 3.18.
 - Part 2, the design capacity component, involves determining the depth increase necessary to maintain capacity for higher vegetative retardance conditions, using Class C as defined in Table 3.18.
- If temporary lining is to be used during construction, vegetative retardance Class E shall be used for the design stability calculations.
- If the channel slope exceeds 10%, or a combination of channel linings will be used, additional procedures not presented below are required. References include HEC-15 (USDOT, FHWA, 1986) and HEC-14 (USDOT, FHWA, 1983).

Table 3.18 Classification of Vegetal Covers as to Degrees of Retardance		
Retardance Class	Cover	Condition
A	Weeping Lovegrass	Excellent stand, tall (average 30")
	Yellow Bluestem Ischaemum	Excellent stand, tall (average 36")
B	Kudzu	Very dense growth, uncut
	Bermuda grass	Good stand, tall (average 12")
	Native grass mixture Little bluestem, bluestem, blue gamma other short and long stem Midwest grasses	Good stand, unmowed
	Weeping lovegrass	Good stand, tall (average 24")
	Laspedeza sericea	Good stand, not woody, tall (average 19")
	Alfalfa	Good stand, uncut (average 11")
	Weeping lovegrass	Good stand, unmowed (average 13")
	Kudzu	Dense growth, uncut
	Blue gamma	Good stand, uncut (average 13")
	Crabgrass	Fair stand, uncut (10 – 48")
C	Bermuda grass	Good stand, mowed (average 6")
	Common lespedeza	Good stand, uncut (average 11")
	Grass-legume mixture: summer (orchard grass redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (6 – 8")
	Centipede grass	Very dense cover (average 6")
	Kentucky bluegrass	Good stand, headed (6 – 12")
	Bermuda grass	Good stand, cut to 2.5"
D	Common lespedeza	Excellent stand, uncut (average 4.5")
	Buffalo grass	Good stand, uncut (3 – 6")
	Grass-legume mixture: fall, spring (orchard grass, redtop, Italian ryegrass, and common lespedeza)	Good stand, uncut (4 – 5")
E	Lspedeza sericea	After cutting to 2" (very good before cutting)
	Bermuda grass	Good stand, cut to 1.5"
	Bermuda grass	Burned stubble

Note: Covers classified have been tested in experimental channels. Covers were green and generally uniform.
Source: HEC-15, 1988.

Culverts

Design Frequency

Culverts are cross drainage facilities that transport runoff under roadways or other improved areas.

- Culverts shall be designed for the fully developed conditions flood mitigation storm or in accordance with TxDOT requirements, whichever is more stringent. Consideration when designing culverts includes: roadway height, tailwater or depth of flow, structures and property subject to flooding, emergency access, and road replacement costs.
- The flood mitigation storm shall be routed through all culverts to confirm building structures (e.g., houses, commercial buildings) are not flooded or increased damage does not occur to the roadway or adjacent property for this design event.
- For multiple barrel culverts the CFW requires the placement of one of the barrels at the flowline of the stream with the other barrels at a higher elevation to create a single flow path for lower flow and reduce sediment and debris accumulation. Where practical the low-flow portion of the low barrel(s) should convey 2% of the design 100-year discharge.

Design Criteria

Velocity Limitations

- The maximum velocity shall be consistent with channel stability requirements at the culvert outlet.
- Refer to Table 3.9 for maximum allowable velocities for reinforced concrete pipe. Outlet protection shall be provided where discharge velocities will cause erosive conditions.
- To ensure self-cleaning during partial depth flow, a minimum velocity of two and a half (2.5 fps) feet per second is required for the streambank protection storm when the culvert is flowing partially full.

Length and Slope

- The maximum slope using concrete pipe is 10% before pipe-restraining methods must be taken.
- Maximum vertical distance from throat of intake to flowline in a drainage structure is ten (10) feet.
- Drops greater than four (4) feet will require additional structural design.

Headwater Limitations

- The allowable headwater is the depth of water that can be ponded at the upstream end of the culvert during the design flood, which will be limited by one or more of the following constraints or conditions:
 1. Headwater will be non-damaging to upstream property.
 2. Culvert headwater plus twelve (12) inches of freeboard shall not exceed top of curb or pavement for low point of road over culvert, whichever is lower.
 3. Ponding depth will be no greater than the elevation where flow diverts around the culvert.
 4. Elevations will be established to delineate floodplain zoning.
- Either the headwater shall be set to produce acceptable velocities or stabilization/energy dissipation shall be provided where these velocities are exceeded.
- In general, the constraint that gives the lowest allowable headwater elevation establishes the criteria for the hydraulic calculations.

Tailwater Considerations

- If the culvert outlet is operating with a free outfall, the critical depth and equivalent hydraulic grade line shall be determined.

- For culverts that discharge to an open channel, the stage-discharge curve for the channel must be determined. See [Section 2.1.4 of the Hydraulics Technical Manual](#) on methods to determine a stage-discharge curve.
- If an upstream culvert outlet is located near a downstream culvert inlet, the headwater elevation of the downstream culvert will establish the design tailwater depth for the upstream culvert.
- If the culvert discharges to a lake, pond, or other major water body, the expected high water elevation of the particular water body will establish the culvert tailwater.

Other Criteria

- In designing debris control structures, the Hydraulic Engineering Circular No. 9 entitled Debris Control Structures or other accepted reference is required to be used.
- If storage is being assumed or will occur upstream of the culvert, refer to [Section 2.0 of the Hydraulics Technical Manual](#) regarding storage routing as part of the culvert design.
- Culvert skews shall not exceed 45 degrees as measured from a line perpendicular to the roadway centerline without approval.
- The minimum allowable pipe diameter shall be twenty-four (24) inches. A minimum diameter of eighteen (15) inches may be used for driveway culverts.
- Erosion, sediment control, and velocity dissipation shall be designed in accordance with [Section 4.0 of the Hydraulics Technical Manual](#).

CFW requires a backwater analysis, by hand, or HEC-RAS to evaluate the proposed structure for final design. The Culvert Hydraulics Checklist Appendix A – City of Fort Worth Detailed Checklists (Form CFW-3) should be completed for each design.

Corrugated Metal Pipe Culvert

CMP culvert is not allowed in the CFW.

Nomographs

Nomographs are not allowed by CFW for final sizing of culverts. The reference for nomographs is FHWA HDS-5. A backwater analysis using HEC-RAS is required.

Culvert Design Example

[Section 3.3.5 Culvert Design Example of the iSWM Hydraulics Technical Manual](#) is adopted with the following modifications. The nomographs procedure is acceptable for preliminary sizing only.

Design Procedures for Beveled-Edged Inlets

[Section 3.3.6 Design Procedures for Beveled-Edged Inlets of the iSWM Hydraulics Technical Manual](#) is adopted with the following modifications. The nomographs procedure is acceptable for preliminary sizing only.

Flood Routing and Culvert Design

Section 3.3.7 Flood Routing and Culvert Design of the [iSWM Hydraulics Technical Manual](#) is for reference only.

Erosion, Sediment Control, Velocity Dissipation

See [Section 3.2.7 iSWM Hydraulics Technical Manual Gregory Method](#), for culvert outfall protection for riprap sizing, gradation, and bedding. Use [Section 4.0](#) of that Manual for spatial dimensions of riprap and other energy dissipation design.

Bridges

Design Frequency

Bridges are cross drainage facilities with a span of twenty (20) feet or larger.

- Bridges shall be designed for the flood mitigation storm for fully developed watershed conditions or in accordance with TxDOT requirements, whichever is more stringent

Design Criteria

- A backwater analysis using HEC-RAS is used for final design of the proposed structure. For bridges up to 100 feet long, measured from abutment to abutment, two (2) feet of freeboard is required from design water surface elevation to low chord. For a bridge greater than one hundred (>100) feet long, one (1) foot of freeboard is required. Exceptions on freeboard must be accepted by TPW. Complete Bridge Hydraulics Documentation Checklist (Appendix A – City of Fort Worth Detailed Checklists, Form CFW-4).
- Backwater analysis will be required using HEC-RAS, for any proposed bridge, to determine accurate tailwater elevations, velocities, head losses, headwater elevations, profiles and floodplains affected by the proposed structure. If the current effective FEMA model is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions.
- The contraction and expansion of water through the bridge opening creates hydraulic losses. These losses are accounted for through the use of loss coefficients. Table 3.19 gives recommended values for the Contraction (K_c) and Expansion (K_e) Coefficients.

Table 3.19 Recommended Loss Coefficients for Bridges		
Transition Type	Contraction (K_c)	Expansion (K_e)
No losses computed	0.0	0.0
Gradual transition	0.1	0.3
Typical bridge	0.3	0.5
Severe transition	0.6	0.8

Additional design guidance is located in [Section 3.4 of the Hydraulics Technical Manual](#).

Detention Structures (Figure 3.17 and Figure 3.18)

Design Frequency

The streambank protection, conveyance, and flood mitigation storms for the 24-hour storm duration shall be used for design of detention structures. Analysis should consider both the existing watershed plus developed site conditions and fully developed watershed conditions.

Design Criteria

Stormwater detention shall be provided to mitigate increased peak flows in the CFW waterways in specific circumstances as defined below. The purpose of the mitigation is to minimize downstream flooding impacts from upstream development. In some instances, detention may be shown to exacerbate potential flooding conditions downstream. Therefore, the Zone of Influence criteria shall be applied in addition to these criteria. Design data for dams will be submitted to the CFW on Form CFW-5, Preliminary and Final Dam Maintenance Emergency Action Plan.

1. Detention Basins may be required when downstream facilities within the Zone of Influence are not adequately sized to convey a design storm based on current City criteria for hydraulic capacity.

Detention basins shall not be required if downstream improvements that will result in sufficient hydraulic capacity are proposed by the City within a relatively short period of time (12 months or less).

2. Proposed stormwater discharge from a site shall not exceed the calculated discharges from existing conditions, unless sufficient downstream capacity above existing discharge conditions is available.
3. The Modified Rational Method (see [Chapter 1.5.2 in the iSWM Hydrology Technical Manual](#)) is allowed for planning and conceptual design for watersheds of 200 acres and less. For final design purposes the Modified Rational Method is allowed only for watersheds of 25 acres and less. Modified Rational Method is not acceptable for basis in series. Note that the only Modified Rational Method allowed is defined in [Chapter 1.5 in the iSWM Hydrology Technical Manual](#). The purpose of the preliminary plat is to denote future improvements that shall be required. Sizing is not exact and may result in undersized detention/retention pond requirements.
4. Detention Basins draining watersheds over 25 acres shall be designed using a detailed unit hydrograph method acceptable to the City of Fort Worth. These include Snyder's Unit Hydrograph (greater than one hundred (>100) acres) and SCS Dimensionless Unit Hydrograph (any size). The SCS method is also allowed for basins with watersheds less than 25 acres (see [Table 1.2 in the iSWM Hydrologic Technical Manual](#)).
5. Detention Basins shall be designed for the Streambank Protection, Conveyance, and Flood Mitigation storms for the 24-hour storm duration. Analysis of additional storm return events may be required where storm sewers are included in the watershed.
6. Detention basin embankments shall have a ten (10) foot crown width. For access to the pond bottom, provide a maintenance ramp of at least ten (10) feet wide with a maximum slope of 15%. Twelve (12) feet width is required next to vertical walls.
7. Detention Basins shall be designed with at least one ten (10) foot wide maintenance access location, with a 15% maximum grade.
8. A freeboard of one (1) foot will be required for all detention ponds.
9. Grassed side slopes shall be 4:1 or flatter and less than twenty (20) feet in height. Slopes protected with concrete riprap shall be no steeper than 2:1. A detailed geotechnical investigation and slope stability analysis is required for grass and concrete slope pavement slopes greater than twelve (12) feet in height. Concrete lined or structural embankment can be steeper with the approval of the TPW. See final stabilization requirements in Chapter 4.3.1.
10. A calculation summary shall be provided on construction plans. For detailed calculations of unit hydrograph studies, a separate report shall be provided to the City for review and referenced with date, engineer and title on the construction plans. Stage-storage-discharge values shall be tabulated and flow calculations for discharge structures shall be shown on the construction plans.
11. An emergency spillway shall be provided at the 100-year maximum storage elevation with sufficient capacity to convey the fully urbanized flood mitigation storm assuming blockage of the closed conduit portion outlet works with six (6) inches of freeboard. Spillway requirements must also meet all appropriate state and federal criteria. Design calculations will be added for all spillways.
12. All detention basins shall be stabilized against significant erosion and shall include a maintenance plan.
13. A landscape plan shall be provided for all detention ponds.
14. Stormwater Facility Maintenance Agreements (SWFMA) will be provided for all detention and retention facilities.
15. Detention basin outlet structures shall be designed to minimize the likeliness of clogging and shall include features to prevent activation of the emergency spillway if such activation would create an

uncontrolled discharge. The use of orifice plates or non-standard structures is subject to the approval of TPW.

16. Dry detention basins are sized to temporarily store the volume of runoff required to provide flood protection up to the flood mitigation storm, if required. Dry detention basin design should consider multiple uses such as recreation. As such, pilot channels should follow the edges of the basin to the extent practical. The bottom of the basin shall have a minimum grade of 1% per Figure 3.17, although swales may have minimum grades of 0.5%. Concrete flumes shall be provided for slopes less than 0.5% and may have slopes as shallow as 0.2%. They shall be at least six (6) feet wide.
17. Extended detention dry basins are sized to provide extended detention of the streambank protection volume over 24 hours and can also provide additional storage volume for normal detention (peak flow reduction) of the flood mitigation storm event.
18. Routing calculations must be used to demonstrate that the storage volume and outlet structure configuration are adequate. See [Section 2.0 of the Hydraulics Technical Manual](#) for procedures on the design of detention storage.
19. State TCEQ rules and regulations regarding impoundments shall be followed. According to current (2009) guidelines, dams fall under the jurisdiction of the TCEQ Dam Safety Program if they meet one or more of the following criteria (See [NCTCOG iSWM Program Guidance – Dam Safety and Water Rights](#)):
 - they have a height greater than or equal to 25-feet and a maximum storage capacity greater than or equal to fifteen (15) acre-feet;
 - they have a height greater than six (6) feet and a maximum storage capacity greater than or equal to fifty (50) acre-feet.
 - they are a high or significant hazard dam as defined in the regulations (relating to Hazard Classification Criteria), regardless of height or maximum storage capacity; or
 - they are used as a pumped storage or terminal storage facility.
20. In accordance with Texas Water Code §11.142, all permanent surface impoundments not used solely for domestic or livestock purposes must obtain a water rights permit from the TCEQ. A completed permit for the proposed use, or written documentation stating that a permit is not required, must be obtained.

Items 6, 9, 11, 12, 19 and 20 also apply to amenity ponds.

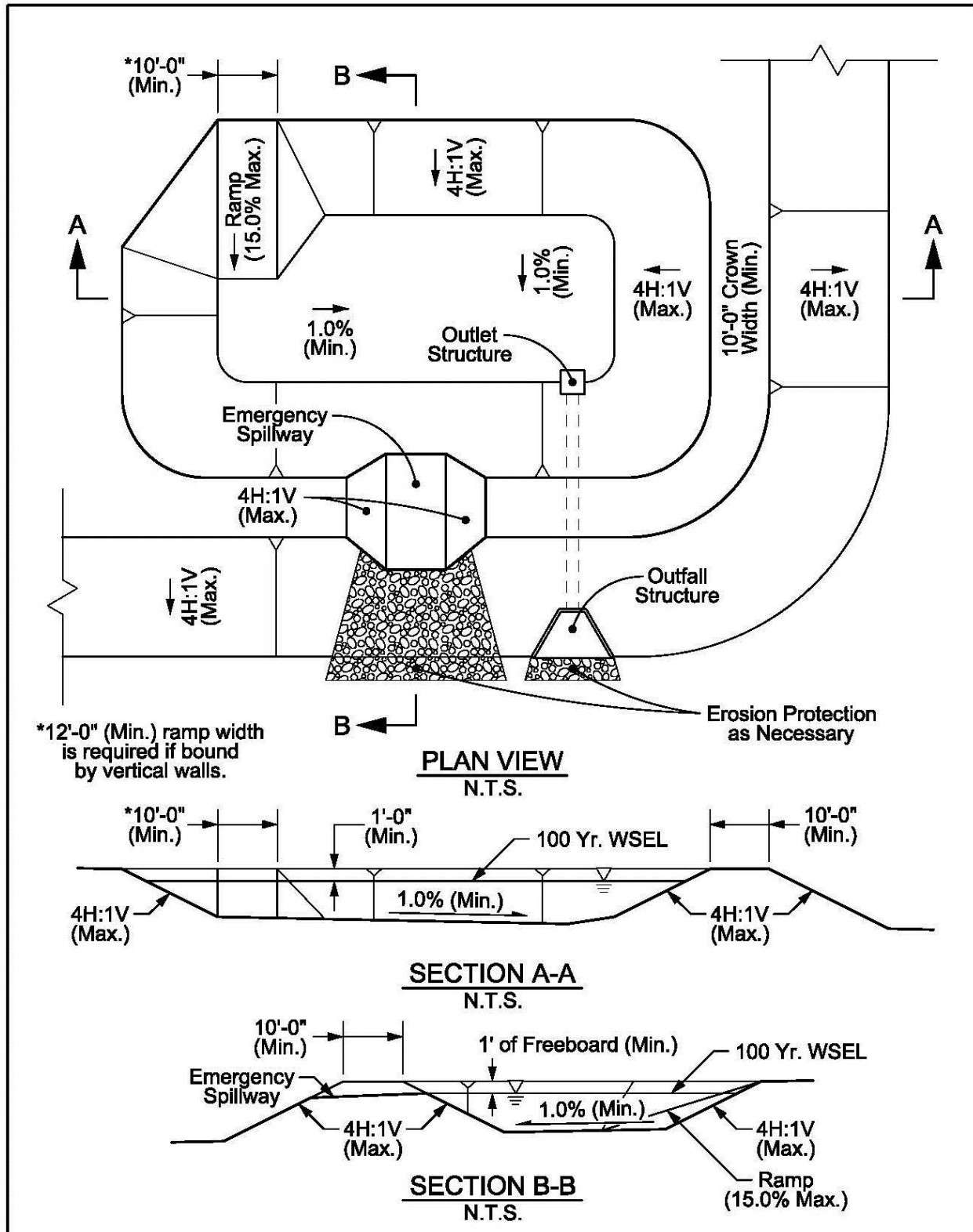


Figure 3.16 Dry Detention Pond Schematic

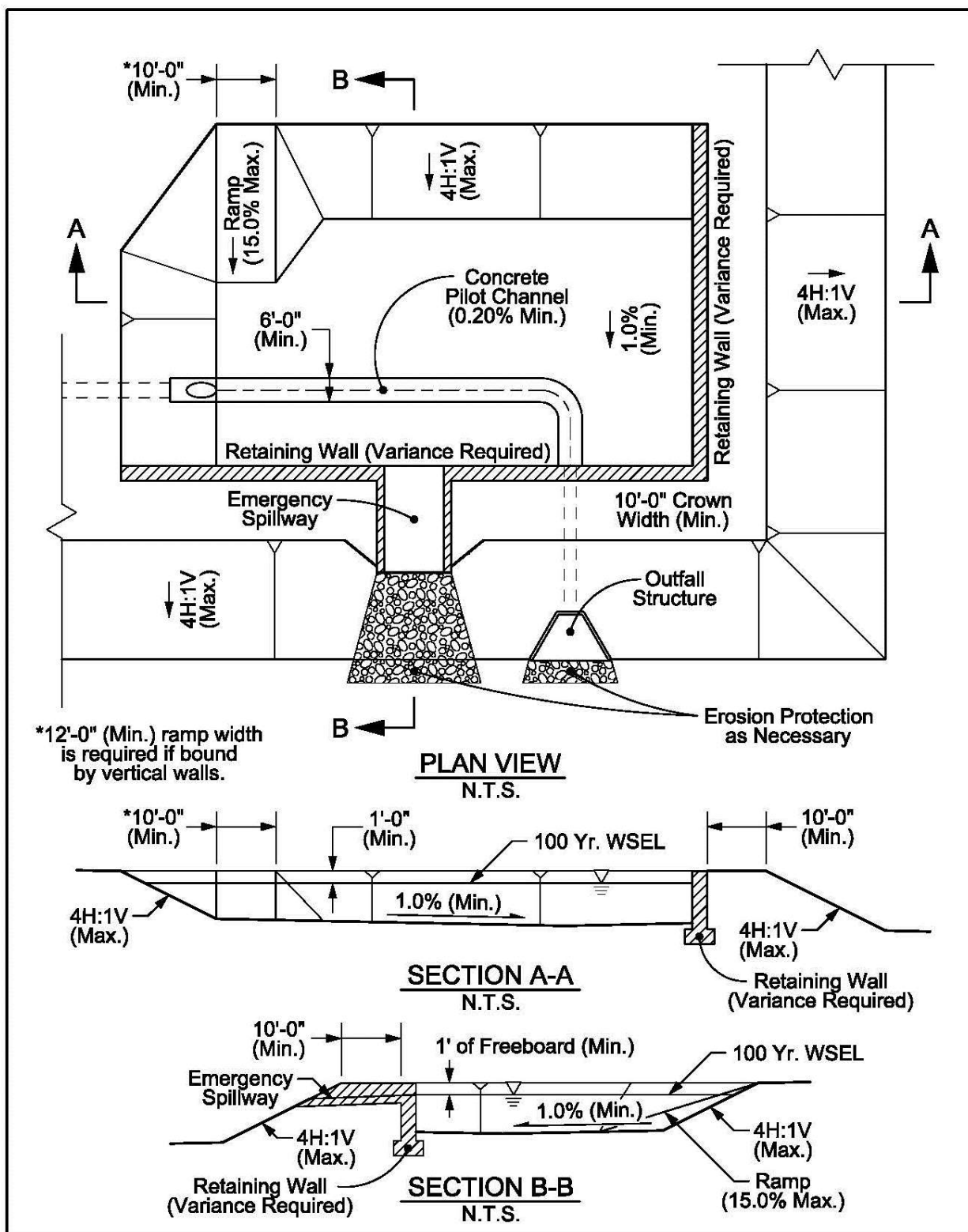


Figure 3.17 Dry Detention Pond W/Pilot Channel Schematic

Outlet Structures

Extended detention (ED) orifice sizing is required in design applications that provide extended detention for downstream streambank protection or the ED portion of the water quality protection volume. The release rate for both the WQ_v and SP_v shall discharge the ED volume in a period of 24 hours or longer. In both cases an extended detention orifice or reverse slope pipe must be used for the outlet. For a structural control facility providing both WQ_v extended detention and SP_v control (wet ED pond, micropool ED pond, and shallow ED wetland), there will be a need to design two outlet orifices – one for the water quality control outlet and one for the streambank protection drawdown.

Design Frequency

- Water quality storm
- Streambank protection storm
- Conveyance storm
- Flood mitigation storm

Design Criteria

- Estimate the required storage volumes for streambank protection, conveyance storm, and flood mitigation.
- Design extended detention outlets for each storm event.
- Outlet velocities shall be within the maximum allowable range based on channel material as shown in Table 3.16 and Table 3.17.
- Design necessary outlet protection and energy dissipation facilities to avoid erosion downstream from outlet devices and emergency spillway(s).
- Perform buoyancy calculations for the outlet structure and footing. Flotation will occur when the weight of the structure is less than or equal to the buoyant force exerted by the water.

Additional design guidance is located in Section 2.2 of the [Hydraulics Technical Manual](#).

Energy Dissipation

Design Frequency

All drainage system outlets, whether for closed conduits, culverts, bridges, open channels, or storage facilities, shall provide energy dissipation to protect the receiving drainage element from erosion.

- Conveyance storm
- Flood mitigation storm (100-year)
- Assume fully developed watershed conditions

Design Criteria

- Energy dissipaters are engineered devices such as rip-rap aprons or concrete baffles placed at the outlet of stormwater conveyance systems for the purpose of reducing the velocity, energy and turbulence of the discharged flow.
- Erosion at culvert, pipe and engineered channel outlets are common. Determination of the flow conditions, scour potential, and channel erosion resistance shall be standard procedure for all designs.
- Energy dissipaters shall be employed whenever the velocity of flows leaving a stormwater management facility exceeds the erosion velocity of the downstream area channel system.
- Energy dissipater designs will vary based on discharge specifics and tailwater conditions.
- Outlet structures shall provide uniform redistribution or spreading of the flow without excessive separation and turbulence.

- Energy dissipaters are a required component of the *iSWM* Construction Plan.

Recommended Energy Dissipaters for outlet protection include the following:

- Riprap apron
- Riprap outlet basins
- Baffled outlets
- Grade Control Structures

The reader is referred to [Section 4.0 of the Hydraulics Technical Manual](#) and the Federal Highway Administration Hydraulic Engineering Circular No. 14 entitled, Hydraulic Design of Energy Dissipaters for Culverts and Channels, for the design procedures of other energy dissipaters.

Channel Transitions, Energy Dissipation Structures, or Small Dams

A backwater analysis is required by the CFW, using HEC-RAS or other accepted computer programs as defined in Appendix B, to determine accurate tailwater elevation and velocities, head losses, headwater elevations, velocities and floodplains affected by the proposed transition into and out of 1) an improved channel, 2) any on-stream energy dissipating structures, and 3) small dams (less than six (6) feet). If the current effective FEMA model for the stream is a HEC-2 model, the engineer has the option to either use that model, or convert to HEC-RAS for analysis of proposed conditions. For larger dams, a hydrologic routing will be required, as well as hydraulic analysis, to determine impacts of the proposed structure on existing floodplains and adjacent properties.

Examples of Open Channel Transition Structures

See drawings in Appendix C – City of Fort Worth Miscellaneous Details and Specifications Straight Drop Structure, Bureau of Reclamation Baffled Chute (Basin IX). The computer program associated with FHWA Hydraulic Engineering Circular No. 14 is “HY8” dated March 2012. This program provides guidance in the selection and sizing of a broad range of energy dissipaters including some of those listed in [Section 4.0 of the iSWM Hydraulics Technical Manual](#).

Stone Rip Rap Design – Gregory Method Results Table

Table 3.20 Rock Rip Rap Sizing – Gregory Method shall be used to report results of the Gregory channel riprap design method. Table 3.21 shall be used to report the results of the Gregory Culvert Outfall Protection Method. A properly designed bedding layer is required under the granular bedding.

Table 3.20 Rock Riprap Sizing – Gregory Method				
From Section 3.2.7 iSWM Hydraulics Technical Manual , September 2014				
Step 1: Calculate Boundary Shear:	Units	Size by Frequency (Select Largest)		
		100-year	5-year	1-year
Q = peak discharge	cfs			
b = bottom width of channel	feet			
y = depth of peak flow	feet			
γ_S = specific weight of stone (150-175 lb/ft ³)	lb/ft ³			
A = cross-sectional area of flow	ft ²			
WP = wetted perimeter	feet			
R = hydraulic radius of channel = A/WP	feet			
S = slope of energy gradient	ft/ft			
To = average tractive stress on channel bottom = $\gamma_w \cdot R \cdot S$ ($\gamma_w = 62.4$ lb/ft ³)	lb/ft ²			
Φ = Angle of side slope (14° for 4:1 slopes)	degrees			
Θ = Angle of repose of rock, usually 40°	degrees			
To' = average tractive stress on channel side slopes = $To[1-(\sin 2\Phi/\sin 2\Theta)]^{1/2}$	lb/ft ²			
Step 2: Determine the tractive stress in a bend in the channel:				
T = the greater of To or To' from above	lb/ft ²			
r = centerline radius of bend (10000' if straight)	feet			
w = water surface width at upstream end of bend	feet			
Tb = local tractive stress in bend = $3.15T(r/w)-1/2$	lb/ft ²			
Step 3: Determine D50 size of riprap stone (size at which 50% of the gradation is finer weight):				
T = Design shear stress (greatest of To, To' or Tb)	lb/ft ²			
D50 = required average stone size = $T/0.04\gamma_S - \gamma_w$	feet			
Maximum d50 (controlling size)	inches			
Step 4: Select minimum riprap thickness from grain size curves (Fig. 3.12 to 3.17 iSWM Hydraulics Technical Manual).				
D50 (max)= (Select from smaller side of band at 50% finer gradation)	lb/ft ²			
Riprap Size = (min thickness is 12")	inches			
Step 5: Select riprap gradations table (Fig. 3.18 to 3.19 iSWM Hydraulics Technical Manual)				
Riprap Gradation Figure based on riprap thickness in Step 4	Figure			
Step 6: Select bedding thickness from grain size curves (Fig. 3.12 to 3.17 iSWM Hydraulics Technical Manual)				
Bedding Gradation Figure	Figure			
Note: See steps 7-10 in the Section 3.2.7 for iSWM Hydraulics Technical Manual additional guidance.				

Table 3.21 Rock Riprap Sizing – Culvert Outfall Protection				
From <i>Section 3.2.7 iSWM Hydraulics Technical Manual</i> , September 2014				
Determine D50 size of riprap stone (size at which 50% of the gradation is finer weight):	Units	Size by Frequency (Select Largest)		
		100-year	5-year	1-year
V = outfall velocity	ft/sec			
γ_s = specific weight of stone (150-175 lb/ft ³)	lb/ft ³			
$D50 = V^{1/2} / [1.8 * (2g(\gamma_s - \gamma_w) / \gamma_w)^{1/2}]$ ($\gamma_w = 62.4$ lb/ft ³)	feet			
Maximum d50 (controlling size)	inches			

3.9 Stormwater Control Selection

3.9.1 Control Screening Process

Outlined below is a screening process for structural stormwater controls that can effectively treat the water quality volume, as well as provide water quantity control. This process is intended to assist the site designer and design engineer in the selection of the most appropriate structural controls for a development site and to provide guidance on factors to consider in their location. *This information is also contained in the iSWM Technical Manual – Site Development Controls section.*

The following four criteria shall be evaluated in order to select the appropriate structural control(s) or group of controls for a development:

- Stormwater treatment suitability
- Water quality performance
- Site applicability
- Implementation considerations

In addition, the following factors shall be considered for a given site and any specific design criteria or restrictions need to be evaluated:

- Physiographic factors
- Soils
- Special watershed or stream considerations

Finally, environmental regulations shall be considered as they may influence the location of a structural control on site or may require a permit.

The following steps provide a selection process for comparing and evaluating various structural stormwater controls using a screening matrix and a list of location and permitting factors. These tools are provided to assist the design engineer in selecting the subset of structural controls that will meet the stormwater management and design objectives for a development site or project.

Step 1 Overall Applicability

The following are the details of the various screening categories and individual characteristics used to evaluate the structural controls.

Table 3.22 - Stormwater Management Suitability

The first category in the matrix examines the capability of each structural control option to provide water quality treatment, downstream streambank protection, and flood control. A blank entry means that the structural control cannot or is not typically used to meet an *integrated* Focus Area. This does not necessarily mean that it should be eliminated from consideration, but rather it is a reminder that more than one structural control may be needed at a site (e.g., a bioretention area used in conjunction with dry detention storage).

Ability to treat the Water Quality Volume (WQv): This indicates whether a structural control provides treatment of the water quality volume (WQv). The presence of "P" or "S" indicates whether the control is a Primary or Secondary control, respectively, for meeting the TSS reduction goal.

Ability to provide Streambank Protection (SPv): This indicates whether the structural control can be used to provide the extended detention of the streambank protection volume (SPv). The presence of a "P" indicates that the structural control can be used to meet SPv requirements. An "S" indicates that the structural control may be sized to provide streambank protection in certain situations, for instance on small sites.

Ability to provide Flood Control (Qf): This indicates whether a structural control can be used to meet the flood control criteria. The presence of a "P" indicates that the structural control can be used to provide peak reduction of the flood mitigation storm event.

Table 3.23 - Relative Water Quality Performance

The second category of the matrix provides an overview of the pollutant removal performance for each structural control option when designed, constructed, and maintained according to the criteria and specifications in this manual.

Ability to provide TSS and Sediment Removal: This column indicates the capability of a structural control to remove sediment in runoff. All of the Primary structural controls are presumed to remove 70% to 80% of the average annual TSS load in typical urban proposed runoff (and a proportional removal of other pollutants).

Ability to provide Nutrient Treatment: This column indicates the capability of a structural control to remove the nutrients nitrogen and phosphorus in runoff, which may be of particular concern with certain downstream receiving waters.

Ability to provide Bacteria Removal: This column indicates the capability of a structural control to remove bacteria in runoff. This capability may be of particular concern when meeting regulatory water quality criteria under the Total Maximum Daily Load (TMDL) program.

Ability to accept Hotspot Runoff: This last column indicates the capability of a structural control to treat runoff from designated hotspots. Hotspots are land uses or activities that produce higher concentrations of trace metals, hydrocarbons, or other priority pollutants. Examples of hotspots might include: gas stations, convenience stores, marinas, public works storage areas, garbage transfer facilities, material storage sites, vehicle service and maintenance areas, commercial nurseries, vehicle washing/steam cleaning, landfills, construction sites, industrial sites, industrial rooftops, and auto salvage or recycling facilities. A check mark indicates that the structural control may be used on hotspot site. However, it may have specific design restrictions. Please see the specific design criteria of the structural control for more details in the Site Development Controls Technical Manual. Local jurisdictions may have other site uses that they designate as hotspots. Therefore, their criteria should be checked as well.

Table 3.24 - Site Applicability

The third category of the matrix provides an overview of the specific site conditions or criteria that must be met for a particular structural control to be suitable. In some cases, these values are recommended values or limits and can be exceeded or reduced with proper design or depending on specific circumstances. Please see the specific criteria section of the structural control for more details.

Drainage Area: This column indicates the approximate minimum or maximum drainage area considered suitable for the structural control practice. If the drainage area present at a site is slightly greater than the maximum allowable drainage area for a practice, some leeway can be permitted if more than one practice can be installed. The minimum drainage areas indicated for ponds and wetlands should not be considered inflexible limits and may be increased or decreased depending on water availability (baseflow or groundwater), the mechanisms employed to prevent outlet clogging, or design variations used to maintain a permanent pool (e.g., liners).

Space Required (Space Consumed): This comparative index expresses how much space a structural control typically consumes at a site in terms of the approximate area required as a percentage of the impervious area draining to the control.

Slope: This column evaluates the effect of slope on the structural control practice. Specifically, the slope restrictions refer to how flat the area where the facility is installed must be and/or how steep the contributing drainage area or flow length can be.

Minimum Head: This column provides an estimate of the minimum elevation difference needed at a site (from the inflow to the outflow) to allow for gravity operation within the structural control.

Water Table: This column indicates the minimum depth to the seasonally high water table from the bottom or floor of a structural control.

Table 3.25 - Implementation Considerations

The fourth category in the matrix provides additional considerations for the applicability of each structural control option.

Residential Subdivision Use: This column identifies whether or not a structural control is suitable for typical residential subdivision development (not including high-density or ultra-urban areas).

Ultra-Urban: This column identifies those structural controls appropriate for use in very high-density (ultra-urban) areas, or areas where space is a premium.

Construction Cost: The structural controls are ranked according to their relative construction cost per impervious acre treated, as determined from cost surveys.

Maintenance: This column assesses the relative maintenance effort needed for a structural stormwater control, in terms of three criteria: frequency of scheduled maintenance, chronic maintenance problems (such as clogging), and reported failure rates. It should be noted that all structural controls require routine inspection and maintenance.

The *Site Development Controls iSWM Technical Manual* contains an exhaustive discussion and detailed examples of stormwater controls that can be implemented in land development to meet the goals of protecting water quality, minimizing streambank erosion, and reducing flood volumes. It is an excellent planning and design resource document and has valuable design examples that the CFW encourages local developers to consider in their site planning. Although it is primarily oriented toward water quality issues, these stormwater controls bring additional and valuable benefits for flood control and streambank protection. Many of the listed stormwater control features and techniques enhance the aesthetics and value of land developments, as well as providing a drainage function.

Although the City of Fort Worth is currently emphasizing the streambank protection and flood control components of the *integrated* stormwater management approach, the Stormwater Control (Chapter 3.9) of applicable features may be implemented in local developments and redevelopments. The CFW does not mandate the use of any of these stormwater controls, but recognizes the inherent values of their application in overall stormwater management.

Therefore, the CFW adopts for design guidance and technical reference sections of the *iSWM Technical Manual*. There are, however, no CFW requirements for achieving Stormwater Quality (WQ_v) or Channel Protection (SP_v) volumes. Stormwater utility fee credits may be available for design practices meeting these standards. See Appendix F for detailed information.

Table 3.22 Stormwater Treatment Suitability					
Category	<i>integrated Stormwater Controls</i>	Stormwater Treatment Suitability			
		Water Quality Protection	Streambank Protection	On-Site Flood Control	Downstream Flood Control
Bioretention Areas	Bioretention Areas	P	S	S	-
Channels	Enhanced Swales	P	S	S	S
	Channels, Grass	S	S	P	S
	Channels, Open	-	-	P	S
Chemical Treatment	Alum Treatment System	P	-	-	-
Conveyance System Components	Culverts	-	-	P	P
	Energy Dissipation	-	P	S	S
	Inlets/Street Gutters	-	-	P	-
	Pipe Systems	-	P	P	P
Detention	Detention, Dry	S	P	P	P
	Detention, Extended Dry	S	P	P	P
	Detention, Multi-purpose Areas	-	P	P	P
	Detention, Underground	-	P	P	P
Filtration	Filter Strips	S	-	-	-
	Organic Filters	P	-	-	-
	Planter Boxes	P	-	-	-
	Sand Filters, Surface/Perimeter	P	S	-	-
	Sand Filters, Underground	P	-	-	-
Hydrodynamic Devices	Gravity (Oil-Grit) Separator	S	-	-	-
Infiltration	Downspout Drywell	P	-	-	-
	Infiltration Trenches	P	S	-	-
	Soakage Trenches	P	S	-	-
Ponds	Wet Pond	P	P	P	P
	Wet ED Pond	P	P	P	P
	Micropool ED Pond	P	P	P	P
	Multiple Ponds	P	P	P	P
Porous Surfaces	Green Roof	P	S	-	-
	Modular Porous Paver Systems	S	S	-	-
	Porous Concrete	S	S	-	-
Proprietary Systems	Proprietary Systems ¹	S/P	S	S	S
Re-Use	Rain Barrels	P	-	-	-
Wetlands	Wetlands, Stormwater	P	P	P	P
	Wetlands, Submerged Gravel	P	P	S	-

P = Primary Control: Able to meet design criterion if properly designed, constructed and maintained.

S = Secondary Control: May partially meet design criteria. May be a Primary Control but designated as a Secondary due to other considerations. For Water Quality Protection, recommended for limited use in accepted community-designated areas.

- = Not typically used or able to meet design criterion.

¹ = The application and performance of propriety commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

Table 3.23 Water Quality Performance					
Category	<i>integrated</i> Stormwater Controls	Water Quality Performance			
		TSS/ Sediment Removal Rate	Nutrient Removal Rate (TP/TN)	Bacteria Removal Rate	Hotspot Application
Bioretention Areas	Bioretention Areas	80%	60%/50%	-	✓
Channels	Enhanced Swales	80%	25%/40%	-	✓
	Channels, Grass	50%	25%/20%	-	
	Channels, Open	-	-	-	
Chemical Treatment	Alum Treatment System	90%	80%/60%	90%	✓
Conveyance System Components	Culverts	-	-	-	
	Energy Dissipation	-	-	-	
	Inlets/Street Gutters	-	-	-	
	Pipe Systems	-	-	-	
Detention	Detention, Dry	65%	50%/30%	70%	✓
	Detention, Extended Dry	65%	50%/30%	70%	✓
	Detention, Multi-purpose Areas	-	-	-	
	Detention, Underground	-	-	-	
Filtration	Filter Strips	50%	20%/20%	-	
	Organic Filters	80%	60%/40%	50%	✓
	Planter Boxes	80%	60%/40%	-	
	Sand Filters, Surface/Perimeter	80%	50%/25%	40%	✓
	Sand Filters, Underground	80%	50%/25%	40%	✓
Hydrodynamic Devices	Gravity (Oil-Grit) Separator	40%	5%/5%	-	
Infiltration	Downspout Drywell	80%	60%/60%	90%	
	Infiltration Trenches	80%	60%/60%	90%	
	Soakage Trenches	80%	60%/60%	90%	
Ponds	Wet Pond	80%	50%/30%	70%	✓
	Wet ED Pond	80%	50%/30%	70%	✓
	Micropool ED Pond	80%	50%/30%	70%	✓
	Multiple Ponds	80%	50%/30%	70%	✓
Porous Surfaces	Green Roof	85%	95%/16%	-	✓
	Modular Porous Paver Systems	²	80%/80%	-	
	Porous Concrete	²	50%/65%	-	
Proprietary Systems	Proprietary Systems ¹	¹	¹	¹	
Re-Use	Rain Barrels	-	-	-	
Wetlands	Wetlands, Stormwater	80%	40%/30%	70%	✓
	Wetlands, Submerged Gravel	80%	40%/30%	70%	✓

✓ = Meets suitability criteria.

- = Not typically used or able to meet design criterion.

¹ = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

² = Porous surfaces provide water quality benefits by reducing the effective impervious area.

Table 3.24 Site Applicability

Category	Integrated Stormwater Controls	Site Applicability				
		Drainage Area (acres)	Space Req'd (% of Tributary imp. Area)	Site Slope	Minimum Head Required	Depth to Water Table
Bioretention Areas	Bioretention Areas	5 max ³	5-7%	6% max	5 ft	2 ft
Channels	Enhanced Swales	5 max	10-20%	4% max	1 ft	Below WT
	Channels, Grass					
	Channels, Open					
Chemical Treatment	Alum Treatment System	25 min	None			
Conveyance System Components	Culverts					
	Energy Dissipation					
	Inlets/Street Gutters					
	Pipe Systems					
Detention	Detention, Dry		2-3%	15% across pond	6 to 8 ft	2 ft
	Detention, Extended Dry		2-3%	15% across pond	6 to 8 ft	2 ft
	Detention, Multi-purpose Areas	200 max		1% for Parking Lot; 0.25 in/ft for Rooftop		
	Detention, Underground	200 max				
Filtration	Filter Strips	2 max ³	20-25%	2-6%		
	Organic Filters	10 max ³	2-3%		5 to 8 ft	
	Planter Boxes		6%			
	Sand Filters, Surface/Perimeter	10 max ³ / 2 max ³	2-3%	6% max	5 ft per 2-3 ft	2 ft
	Sand Filters, Underground	5 max	None			
Hydrodynamic Devices	Gravity (Oil-Grit) Separator	1 max ³	None			
Infiltration	Downspout Drywell					
	Infiltration Trenches	5 max	2-3%	6% max	1 ft	4 ft
	Soakage Trenches	5 max	27 ft per 1000 ft ² imp. area	6% max	1 ft	4 ft
Ponds	Wet Pond		2-3%	15% max	6 to 8 ft	2 ft, if hotspot or aquifer
	Wet ED Pond	25 min ³				
	Micropool ED Pond	10 min ³				
	Multiple Ponds	25 min ³				
Porous Surfaces	Green Roof					
	Modular Porous Paver Systems	5 max	Varies			
	Porous Concrete	5 max	Varies			
Proprietary Systems	Proprietary Systems ¹	¹	¹			
Re-Use	Rain Barrels					
Wetlands	Wetlands, Stormwater	25 min	3-5%	8% max	3 to 5 ft (shallow) 6 to 8 ft (pond)	2 ft, if hotspot or aquifer
	Wetlands, Submerged Gravel	5 min			2 to 3 ft	Below WT

- = Not typically used or able to meet design criterion.

¹ = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

² = Porous surfaces provide water quality benefits by reducing the effective impervious area.

³ = Drainage area can be larger in some instances.

Table 3.25 Implementation Considerations

Category	<i>integrated</i> Stormwater Controls	Implementation Considerations			
		Residential Subdivision Use	High Density/Ultra Urban	Capital Cost	Maintenance Burden
Bioretention Areas	Bioretention Areas	✓	✓	Moderate	Low
Channels	Enhanced Swales	✓		High	Low
	Channels, Grass	✓		Low	Moderate
	Channels, Open	✓		Low	Low
Chemical Treatment	Alum Treatment System	✓	✓	High	High
Conveyance System Components	Culverts	✓	✓	Low	Low
	Energy Dissipation	✓	✓	Low	Low
	Inlets/Street Gutters	✓	✓	Low	Low
	Pipe Systems	✓	✓	Low	Low
Detention	Detention, Dry	✓		Low	Moderate to High
	Detention, Extended Dry	✓		Low	Moderate to High
	Detention, Multi-purpose Areas	✓	✓	Low	Low
	Detention, Underground		✓	High	Moderate
Filtration	Filter Strips	✓		Low	Moderate
	Organic Filters		✓	High	High
	Planter Boxes		✓	Low	Moderate
	Sand Filters, Surface/Perimeter		✓	High	High
	Sand Filters, Underground		✓	High	High
Hydrodynamic Devices	Gravity (Oil-Grit) Separator		✓	High	High
Infiltration	Downspout Drywell	✓	✓	Low	Moderate
	Infiltration Trenches	✓	✓	High	High
	Soakage Trenches	✓	✓	High	High
Ponds	Wet Pond	✓		Low	Low
	Wet ED Pond	✓		Low	Low
	Micropool ED Pond	✓		Low	Moderate
	Multiple Ponds	✓		Low	Low
Porous Surfaces	Green Roof		✓	High	High
	Modular Porous Paver Systems		✓	Moderate	High
	Porous Concrete		✓	High	High
Proprietary Systems	Proprietary Systems ¹	¹	✓	High	High
Re-Use	Rain Barrels	✓	✓	Low	High
Wetlands	Wetlands, Stormwater	✓		Moderate	Moderate
	Wetlands, Submerged Gravel	✓	✓	Moderate	High

✓ = Meets suitability criteria

- = Not typically used or able to meet design criterion.

¹ = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

Step 2 Specific Criteria

The last three categories in the Structural Control Screening matrix provide an overview of various specific design criteria and specifications, or exclusions for a structural control that may be present due to a site's general physiographic character, soils, or location in a watershed with special water resources considerations.

Table 3.26 - Physiographic Factors

Three key factors to consider are low-relief, high-relief, and karst terrain. In the North Central Texas, low relief (very flat) areas are primarily located east of the Dallas metropolitan area. High relief (steep and hilly) areas are primarily located west of the Fort Worth metropolitan area. Karst and major carbonaceous rock areas are limited to portions of Palo Pinto, Erath, Hood, Johnson, and Somervell counties. Special geotechnical testing requirements may be needed in karst areas. The local reviewing authority should be consulted to determine if a project is subject to terrain constraints.

- Low relief areas need special consideration because many structural controls require a hydraulic head to move stormwater runoff through the facility.
- High relief may limit the use of some structural controls that need flat or gently sloping areas to settle out sediment or to reduce velocities. In other cases, high relief may impact dam heights to the point that a structural control becomes infeasible.
- Karst terrain can limit the use of some structural controls as the infiltration of polluted waters directly into underground streams found in karst areas may be prohibited. In addition, ponding areas may not reliably hold water in karst areas.

Table 3.27 - Soils

The key evaluation factors are based on an initial investigation of the NRCS hydrologic soils groups at the site. Note that more detailed geotechnical tests are usually required for infiltration feasibility and during design to confirm permeability and other factors.

The design of structural stormwater controls is fundamentally influenced by the nature of the downstream water body that will be receiving the stormwater discharge. In addition, the designer should consult with the appropriate review authority to determine if their development project is subject to additional structural control criteria as a result of an adopted local watershed plan or special provision.

In some cases, higher pollutant removal or environmental performance is needed to fully protect aquatic resources and/or human health and safety within a particular watershed or receiving water. Therefore, special design criteria for a particular structural control or the exclusion of one or more controls may need to be considered within these watersheds or areas. Examples of important watershed factors to consider include:

Table 3.28 - Special Watershed or Stream Considerations

High Quality Streams (Streams with a watershed impervious cover less than approximately 15%). These streams may also possess high quality cool water or warm water aquatic resources or endangered species. The design objectives are to maintain habitat quality through the same techniques used for cold-water streams, with the exception that stream warming is not as severe of a design constraint. These streams may also be specially designated by local authorities.

Wellhead Protection: Areas that recharge existing public water supply wells present a unique management challenge. The key design constraint is to prevent possible groundwater contamination by preventing infiltration of hotspot runoff. At the same time, recharge of unpolluted stormwater is encouraged to maintain flow in streams and wells during dry weather.

Reservoir or Drinking Water Protection: Watersheds that deliver surface runoff to a public water supply reservoir or impoundment are a special concern. Depending on the available treatment, a greater level of pollutant removal may be necessary for the pollutants of concern, such as bacteria pathogens, nutrients, sediment, or metals. One particular management concern for reservoirs is ensuring stormwater hotspots are adequately treated so they do not contaminate drinking water.

Step 3 Location and Permitting Considerations

In the last step, a site designer assesses the physical and environmental features at the site to determine the optimal location for the selected structural control or group of controls. Table 3.29 provides a condensed summary of current restrictions as they relate to common site features that may be regulated under local, state, or federal law. These restrictions fall into one of three general categories:

- Locating a structural control within an area when expressly prohibited by law
- Locating a structural control within an area that is strongly discouraged, and is only allowed on a case by case basis. Local, state, and/or federal permits shall be obtained, and the applicant will need to supply additional documentation to justify locating the stormwater control within the regulated area.
- Structural stormwater controls must be setback a fixed distance from a site feature.

This checklist is only intended as a general guide to location and permitting requirements as they relate to siting of stormwater structural controls. Consultation with the appropriate regulatory agency is the best strategy.

Table 3.26 Physiographic Factors				
Category	<i>integrated Stormwater Controls</i>	Physiographic Factors		
		Low Relief	High Relief	Karst
Bioretention Areas	Bioretention Areas	Several design variations will likely be limited by low head		Use poly-linear or impermeable membrane to seal bottom
Channels	Enhanced Swales	Generally feasible. However, slope <1% may lead to standing water in dry swales	Often infeasible if slopes are 4% or greater	
	Channels, Grass			
	Channels, Open			
Chemical Treatment	Alum Treatment System			
Conveyance System Components	Culverts			
	Energy Dissipation			
	Inlets/Street Gutters			
	Pipe Systems			
Detention	Detention, Dry		Embankment heights restricted	Require poly or clay liner, Max ponding depth, Geotechnical tests
	Detention, Extended Dry			
	Detention, Multi-purpose Areas			
	Detention, Underground			GENERALLY NOT ALLOWED
Filtration	Filter Strips			
	Organic Filters			
	Planter Boxes			
	Sand Filters, Surface/Perimeter	Several design variations will likely be limited by low head		Use poly-linear or impermeable membrane to seal bottom
	Sand Filters, Underground			

Table 3.26 Physiographic Factors

Category	<i>integrated Stormwater Controls</i>	Physiographic Factors		
		Low Relief	High Relief	Karst
Hydrodynamic Devices	Gravity (Oil-Grit) Separator			
Infiltration	Downspout Drywell	Minimum distance to water table of 4 ft		GENERALLY NOT ALLOWED
	Infiltration Trenches	Minimum distance to water table of 2 ft	Maximum slope of 6%; trenches must have flat bottom	GENERALLY NOT ALLOWED
	Soakage Trenches	Minimum distance to water table of 4 ft	Maximum slope of 6%; trenches must have flat bottom	GENERALLY NOT ALLOWED
Ponds	Wet Pond	Limit maximum normal pool depth to about 4 ft (dugout) Providing pond drain can be problematic	Embankment heights restricted	Require poly or clay liner Max ponding depth Geotechnical tests
	Wet ED Pond			
	Micropool ED Pond			
	Multiple Ponds			
Porous Surfaces	Green Roof			
	Modular Porous Paver Systems			
	Porous Concrete			
Proprietary Systems	Proprietary Systems ¹			
Re-Use	Rain Barrels			
Wetlands	Wetlands, Stormwater		Embankment heights restricted	Require poly-liner Geotechnical tests
	Wetlands, Submerged Gravel			

¹ = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

Table 3.27 Soils

Category	<i>integrated Stormwater Controls</i>	Soils
Bioretention Areas	Bioretention Areas	Clay or silty soils may require pretreatment
Channels	Enhanced Swales	
	Channels, Grass	
	Channels, Open	
Chemical Treatment	Alum Treatment System	
Conveyance System Components	Culverts	
	Energy Dissipation	
	Inlets/Street Gutters	
	Pipe Systems	
Detention	Detention, Dry	Underlying soils of hydrologic group "C" or "D" should be adequate to maintain a permanent pool. Most group "A" soils and some group "B" soils will require a pond liner.
	Detention, Extended Dry	

Table 3.27 Soils		
Category	<i>integrated Stormwater Controls</i>	Soils
	Detention, Multi-purpose Areas	
	Detention, Underground	
Filtration	Filter Strips	
	Organic Filters	
	Planter Boxes	Type A or B
	Sand Filters, Surface/Perimeter	Clay or silty soils may require pretreatment
	Sand Filters, Underground	
Hydrodynamic Devices	Gravity (Oil-Grit) Separator	
Infiltration	Downspout Drywell	Infiltration rate > 0.5 inch/hr
	Infiltration Trenches	Infiltration rate > 0.5 inch/hr
	Soakage Trenches	Infiltration rate > 0.5 inch/hr
Ponds	Wet Pond	"A" soils may require pond liner "B" soils may require infiltration testing
	Wet ED Pond	
	Micropool ED Pond	
	Multiple Ponds	
Porous Surfaces	Green Roof	
	Modular Porous Paver Systems	Infiltration rate > 0.5 inch/hr
	Porous Concrete	
Proprietary Systems	Proprietary Systems ¹	
Re-Use	Rain Barrels	
Wetlands	Wetlands, Stormwater	"A" soils may require pond liner
	Wetlands, Submerged Gravel	

1 = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

Table 3.28 Special Watershed Considerations				
Category	<i>integrated Stormwater Controls</i>	Special Watershed Considerations		
		High Quality Stream	Aquifer Protection	Reservoir Protection
Bioretention Areas	Bioretention Areas	Evaluate for stream warming	Needs to be designed with no exfiltration (ie. outflow to groundwater)	
Channels	Enhanced Swales		Hotspot runoff must be adequately treated	Hotspot runoff must be adequately treated
	Channels, Grass			
	Channels, Open			
Chemical Treatment	Alum Treatment System			
Conveyance System Components	Culverts			
	Energy Dissipation			
	Inlets/Street Gutters			

Table 3.28 Special Watershed Considerations				
Category	<i>integrated</i> Stormwater Controls	Special Watershed Considerations		
		High Quality Stream	Aquifer Protection	Reservoir Protection
	Pipe Systems			
Detention	Detention, Dry			
	Detention, Extended Dry			
	Detention, Multi-purpose Areas			
	Detention, Underground			
Filtration	Filter Strips			
	Organic Filters			
	Planter Boxes			
	Sand Filters, Surface/Perimeter	Evaluate for stream warming	Needs to be designed with no exfiltration (ie. outflow to groundwater)	
	Sand Filters, Underground			
Hydrodynamic Devices	Gravity (Oil-Grit) Separator			
Infiltration	Downspout Drywell			
	Infiltration Trenches		Maintain safe distance from wells and water table. No hotspot runoff	Maintain safe distance from bedrock and water table. Pretreat runoff
	Soakage Trenches			
Ponds	Wet Pond	Evaluate for stream warming	May require liner if "A" soils are present Pretreat hotspots 2 to 4 ft separation distance from water table	
	Wet ED Pond			
	Micropool ED Pond			
	Multiple Ponds			
Porous Surfaces	Green Roof			
	Modular Porous Paver Systems			
	Porous Concrete			
Proprietary Systems	Proprietary Systems ¹			
Re-Use	Rain Barrels			
Wetlands	Wetlands, Stormwater	Evaluate for stream warming	May require liner if "A" soils are present Pretreat hotspots 2 to 4 ft separation distance from water table	
	Wetlands, Submerged Gravel			

¹ = The application and performance of proprietary commercial devices and systems must be provided by the manufacturer and should be verified by independent third-party sources and data if used as a primary control.

Site Feature	Location and Permitting Guidance
Jurisdictional Wetland (Waters of the U.S) U.S. Army Corps of Engineers Regulatory Permit	• Jurisdictional wetlands must be delineated prior to siting structural control. • Use of natural wetlands for stormwater quality treatment is contrary to the goals of the Clean Water Act and should be avoided. • Stormwater should be treated prior to discharge into a natural wetland. • Structural controls may also be restricted in local buffer zones. Buffer zones may be utilized as a non-structural filter strip (i.e., accept sheet flow). • Should justify that no practical upland treatment alternatives exist. • Where practical, excess stormwater flows should be conveyed away from jurisdictional wetlands.
Stream Channel (Waters of the U.S) U.S. Army Corps of Engineers Section 404 Permit	• All Waters of the U.S. (streams, ponds, lakes, etc.) should be delineated prior to design. • Use of any Waters of the U.S. for stormwater quality treatment is contrary to the goals of the Clean Water Act and should be avoided. • Stormwater should be treated prior to discharge into Waters of the U.S. • In-stream ponds for stormwater quality treatment are highly discouraged. • Must justify that no practical upland treatment alternatives exist. • Temporary runoff storage preferred over permanent pools. • Implement measures that reduce downstream warming.
Texas Commission on Environmental Quality Groundwater Management Areas	• Conserve, preserve, protect, recharge, and prevent waste of groundwater resources through Groundwater Conservation Districts • Groundwater Conservation District pending for Middle Trinity. • Detailed mapping available from Texas Alliance of Groundwater Districts.
Texas Commission on Environmental Quality Surface Water Quality Standards	• Specific stream and reservoir buffer requirements. • May be imperviousness limitations • May be specific structural control requirements. • TCEQ provides water quality certification – in conjunction with 404 permit • Mitigation will be required for impacts to existing aquatic and terrestrial habitat.

Table 3.29 Location and Permitting Checklist	
Site Feature	Location and Permitting Guidance
100-year Floodplain Local Stormwater review Authority	- Grading and fill for structural control construction is generally discouraged within the 100-year floodplain, as delineated by FEMA flood insurance rate maps, FEMA flood boundary and floodway maps, or more stringent local floodplain maps. - Floodplain fill cannot raise the floodplain water surface elevation by more than limits set by the appropriate jurisdiction.
Stream Buffer Check with appropriate review authority whether stream buffers are required	- Consult local authority for stormwater policy. - Structural controls are discouraged in the streamside zone (within 25 feet or more of streambank, depending on the specific regulations).
Utilities Local Review Authority	- Call appropriate agency to locate existing utilities prior to design. - Note the location of proposed utilities to serve development. - Structural controls are discouraged within utility easements or rights of way for public or private utilities.
Roads TxDOT or DPW	- Consult TxDOT for any setback requirement from local roads. - Consult DOT for setbacks from State maintained roads. - Approval must also be obtained for any stormwater discharges to a local or state-owned conveyance channel.
Structures Local Review Authority	- Consult local review authority for structural control setbacks from structures. - Recommended setbacks for each structural control group are provided in the performance criteria in this manual.
Septic Drain fields Local Health Authority	- Consult local health authority. - Recommended setback is a minimum of 50 feet from drain field edge or spray area.
Water Wells Local Health Authority	100-foot setback for stormwater infiltration. 50-foot setback for all other structural controls.

3.10 General Design Standards

Utilities

General – In the design of a storm drainage system, the engineer is frequently confronted with the problem of crossings between the proposed storm drain and existing or proposed utilities such as water, gas and sanitary sewer lines.

Water Lines – All existing water lines in the immediate vicinity of the proposed storm drains shall be clearly indicated on both the plan and profile sheets. When design indicates that an intersection of the storm drain line and the water main exists and the proposed storm drain cannot be economically relocated, then the existing water line shall be adjusted per Water Department specifications.

Sanitary Sewers – All existing or proposed sanitary sewers in the immediate vicinity of the proposed storm drains shall be clearly indicated on both plan and profile sheets. When design indicates that an intersection

of the storm drain line and the sanitary sewer exist, then either line should be adjusted by relocation. If neither line can be economically relocated, then an alternative design may be considered, provided it is supported by hydraulic calculations and accepted by TPW and the Water Department. The alternative design may include a box section in the storm drain to go over or under the sanitary sewer, or a sanitary sewer crossing through the storm drain. If the latter is chosen, the crossing must be installed in a manhole or vault to provide both access and additional capacity. In either alternative, the sanitary sewer must be ductile iron pipe or other material accepted by the Water Department.

All Other Utilities – All other utilities in the immediate vicinity of the proposed storm drain shall be clearly indicated on both the plan and profile sheets. Gas lines and other utilities not controlled by elevation shall be adjusted when the design indicates that an intersection of the storm drain line and the utility exists and the proposed storm drain cannot be economically relocated.

Headwalls, Culverts, and Other Structures

For headwalls, culverts and other structures, standard details adopted by the Texas Department of Transportation (TxDOT) shall be used. The appropriate detail sheets should be included in any construction plans. Existing City standard headwalls may be used, provided that all slopes are modified to 4:1 or flatter. All headwalls and culverts should be extended to or beyond the street right-of-way. TxDOT-accepted pedestrian rail shall be used for any headwall within ten (10) feet of a sidewalk or other normal pedestrian area.

Minimum Pipe Sizes

Minimum pipe sizes are twenty-four (24) inch diameter for mains and twenty-one (21) inch diameter for inlet leads. Minimum sizes of conduits of other shapes should have equivalent cross-sectional areas. Any storm drain line with two or more inlets shall be considered a main line.

Pipe Size Changes

Pipe collars or pre-fabricated transition sections shall be provided for all pipe size changes. Pipe invert elevations shall be maintained at pipe size change locations.

Pipe Connections and Curved Alignment

Prefabricated wye and tee connections and other unusual configurations can usually be fabricated by the pipe manufacturer. Radial pipe can also be fabricated by the pipe manufacturer and shall be used through all curved alignments. When field connections or field radii must be used, all joints and gaps must be fully grouted to prevent voids and cave-ins caused by material washout into the storm drain. The City may require the installation of junction boxes at locations where new storm drain pipes are proposed to connect directly to existing storm drain pipes and angle of greater than 60°.

Inlets

All curb inlets shall be five (5), ten (10), fifteen (15) or twenty (20) feet in length and shall have depressed openings. Recessed inlets shall be provided on arterial streets. Proposed inlet lengths greater than twenty (20) feet must be accepted by TPW. Care should be taken in locating inlets to allow for adequate driveway access between the inlet and the far property line. Standard inlet depth is 4.5 feet at the lateral line and 4.0 feet at the opposite end, with the bottom sloped to drain to the lateral line. Manhole steps shall be installed for any inlet over five (5) feet deep. Lateral lines shall be plumbed into the inlet at a manhole opening to expedite mechanical cleaning and inspection. A storm drain main may pass through an inlet if the system configuration allows and may substitute for manhole access.

Drop inlets shall be minimum four (4) foot square and shall have manhole access and steps. Due to excessive clogging, grate inlets are not allowed on any public storm drain except as specifically accepted by TPW.

Streets

To minimize standing water, the minimum street grade shall be 0.50%. Along a curve, this grade shall be measured along the outer gutter line. The minimum grade along a cul-de-sac or elbow gutter centerline

shall be 0.70%. Elbows may be designed with a valley gutter along the normal outer gutter line, with 2% cross slope from curb to the valley gutter. The minimum grade for any valley gutter shall be 0.50%. Where a crest or sag on a residential street, a PVI shall be used instead of a vertical curve where the total gradient change is no more than 1.5% ($\Delta \leq 1.5\%$) for a residential or collector street and no more than 1% for an arterial street.

Flow in Driveways and Intersections

At any intersection, only one street shall be crossed with surface drainage and this street shall be the lower classified street. Where an alley or street intersects a street, inlets shall be placed in the intersecting alley or street whenever the combination of flow down the alley or intersecting street would cause the capacity of the downstream street to be exceeded. Inlets shall be placed upstream from an intersection whenever possible. Surface drainage from a 5-year flood may not cross any street classified as a thoroughfare or collector. Not more than three (3.0 cfs) cubic feet per second in a conveyance storm may be discharged per driveway at a business, commercial, industrial, manufacturing, or school site. In all cases, the downstream storm drainage system shall be adequate to collect and convey the flow, and inlets provide as required. The cumulative flows from existing driveways shall be considered and inlets provided as necessary where the flow exceeds the specified design capacity of the street.

3.11 Easements, Plats, and Maintenance Agreements

Easements

Easements are required for all drainage systems that convey stormwater runoff across a development and must include sufficient area for operation and maintenance of the drainage system. Types of easements to be used include:

Easements for Open Channels and Detention Ponds

- **Drainage easements** shall be required for both on-site and off-site public stormwater drainage improvements, including standard engineered channels, storm drain systems, detention and retention facilities and other stormwater controls (Public Water). The developer shall obtain downstream drainage easements until adequate outfall is determined. Drainage easements shall include a ten (10) foot margin on one side beyond actual top of bank for improved earthen channels. Retaining walls are not permitted within or adjacent to a drainage easement in a residential area in order to reduce the easement width. Retaining walls adjacent to the channel are allowed in non-residential areas only if the property owner provides an agreement for private maintenance.
- **Floodplain easements** shall be provided on sites along natural or improved earthen drainageways (other than standard engineered channels) to encompass the fully developed 100-year floodplain plus a ten (10) foot buffer on one side. The buffer shall be part of the floodplain easement itself and not a separate easement. Floodplain easements are not routinely maintained by the City.
- **Natural creeks** shall have a dedicated floodplain easement containing the inundation area of a 100-year frequency storm based on fully developed conditions, plus a ten (10) foot buffer horizontally adjacent to the inundation area. The minimum finished floor elevation for lots impacted by natural creeks shall be a minimum of two (2) feet above the 100-year fully developed water surface elevation. In addition, a riparian area along the creek may be placed in a drainage easement for perpetual, limited maintenance by the CFW, subject to the approval of the CFW and an agreement to preserve natural conditions and habitat within the riparian area.
- **Concrete-Lined Channels and Gabion-Lined Channels** shall have drainage easements dedicated to meet the requirements of the width of the channel, the one (1) foot freeboard, access easement and the fence.

- **Temporary drainage easements** are not accepted in the CFW.
- **Private drainage easements**, not dedicated to the City, may be required for private stormwater drainage improvements, including private detention ponds, serving multiple lots or for stormwater controls on a property. (No Public Water)
- **Access easements** shall be provided for access to public stormwater drainage improvements where necessary for maintenance.
- **Dam easements** shall be provided to encompass any proposed dams (including any dams already existing) and spillway structures. The 100-year water surface of any impounded lake shall be covered by a floodplain easement as described above. Dams and spillways shall comply with applicable City policy and state regulations.
- No construction shall be allowed within a floodplain easement without the written approval (floodplain permit) of the City of Fort Worth flood plain administrator or designee, and then only after detailed engineering plans and studies show that no increased flooding will result, and that no obstruction to the natural flow of water will result.
- In certain circumstances where detention is in place or a master drainage plan has been adopted, a development may plan to receive less than fully developed flow conditions from upstream with the approval of the TPW.
- Any parallel utility easements must be separate and outside of drainage easements for channels and roadside ditches.
- Easements for stormwater controls including detention basins, sediment traps and retention ponds, shall be negotiated between the City and the Property Owner, but will normally include essential access to all embankment areas and inlet and outlet controls. Essential access is defined as access in at least one location.
- The entire reach or each section of any drainage facility must be readily accessible to maintenance equipment. Additional easement(s) shall be required at the access point(s) and the access points shall be appropriately designed to restrict access by the public (including motorcycles).
- Drainage easements for structural overflows, swales, or berms shall be of sufficient width to encompass the structure or graded area.

Minimum easement width requirements for storm drain pipe are shown in Table 3.30 and shall be as follows:

- The outside face of the proposed storm drain line shall be placed five (5) feet off either edge of the storm drain easement. The proposed centerline of overflow swales shall normally coincide with the centerline of the easement.
- For pipe sizes up to 54", a minimum of five (5) additional feet shall be dedicated when shared with utilities, where a shared easement is approved by variance.
- Box culvert minimum easement width shall be determined using Table 3.30 based on an equivalent box culvert width to pipe diameter.
- For parallel storm drain systems with a combined width greater than eight (8) feet the minimum easement shall be equal to the width of the parallel storm drain system plus twenty (20) additional feet.
- Drainage easements will generally extend at least twenty-five (25) feet past an outfall headwall to provide an area for maintenance operations. Drainage easements along a required outfall channel or ditch shall be provided until the flowline reaches an acceptable outfall. The minimum storm drain shall not be on property line, except where a variance has been granted.

Table 3.30 Closed Circuit Easements	
Pipe Size	Minimum Easement Width Required
39" and under	15 Feet
42" through 54"	20 Feet
60" through 66"	25 Feet
72" through 102"	30 Feet

Easement Requirements for Closed Conduit Systems

- Box culverts shall have an easement width equal to the width of the box plus twenty (20) additional feet. The edge of the box should be located five (5) feet from either edge of the easement.
- Drainage easements shall encompass the entire width of an overflow flume plus five (5) feet on each side. For an easement containing both a concrete flume and a storm drain, the wider of the two easement criteria shall control.
- Alternatively, a drainage right-of way or HOA lot (not part of any adjacent lot) may be dedicated for the width of the flume provided that an additional easement is dedicated for any storm drain pipe to meet the total width requirements specified above.

Plats

All platting shall follow established development standards for the CFW. Plats shall include pertinent drainage information that will be filed with the plat. Elements to be included on the final plat include:

- All public and private drainage easements not recorded by separate instrument
- Easements to be recorded by separate instrument shall be documented on the plat
- Minimum finished floor elevations shall be 2' above the 100 year fully developed condition and shall be shown on plat.
- All floodplain easements
- Legal disclosure for drainage provisions upon sale or transfer of property
- Documentation of maintenance responsibilities and agreements including transfer of responsibility upon sale of the property
- Channel and floodplain easements must be platted as either parks or HOA lots to assure long term maintenance.

Maintenance Agreements

All drainage improvements constructed within a development and any existing or natural drainage systems to remain in use shall require a maintenance agreement that identifies responsible parties for maintenance. Both private and public maintenance responsibility shall be negotiated between the municipality and the owner and documented in the agreement. The maintenance agreement shall be written such that it remains in force upon sale or transfer of the property.

A *Stormwater Facility Maintenance Agreement* must be prepared by the engineer for each stormwater control that will not be wholly maintained by the CFW, as part of the Operations and Maintenance Plan submittal. This agreement must outline both preventive maintenance tasks as well as major repairs, identify the schedule for each task, assign clear roles to affected parties, and provide a maintenance checklist to guide future owners, including an annual self-inspection to be provided to the CFW. Multiple stormwater controls may be contained within a single Stormwater Facility Maintenance Agreement. When areas are identified for detention that also serve other purposes for the development (e.g. parking lots, loading docks) the requirement for a Stormwater Facilities Maintenance Agreement may be waived.

City Maintenance

The CFW will provide for perpetual maintenance, in accordance with adopted city maintenance standards, of all public drainage facilities located within dedicated easements and constructed to the CFW standards. In addition, limited perpetual maintenance may be provided by the CFW for riparian areas placed in a drainage easement preserved in their natural state, subject to the approval of the CFW. Access shall be provided and dedicated by the developer to all public stormwater facilities in developments for maintenance and inspection by the CFW.

Private Maintenance (SWFMA Required)

- Private drainage facilities include those drainage improvements which are located on private property and which handle only private water.
- Private drainage facilities may also include detention or retention ponds, dams, retaining walls adjacent to channels in nonresidential areas, and other stormwater controls which collect public water, as well as drainageways not constructed to City standards but which convey public water. Such facilities must be designed in accordance with sound engineering practices and reviewed and inspected by the City.
- An agreement for perpetual maintenance of private drainage facilities serving public or private water shall be executed with the City prior to acceptance of the final iSWM Plan. This agreement shall run with the land and can be tied to commercial property or to an owner's association, but not to individual residential lots.
- Access shall be provided by the developer/owner to all private drainage facilities.

Maintenance Agreement Requirements

Details of the agreement must be set forth in a series of exhibits:

1. Exhibit A Legal Description-This includes the Metes and Bounds, a Surveyor's Drawing of the area occupied by the facility, and a copy of the preliminary or final plat containing the facility.
2. Exhibit B Design Plan and Specifications-these are summary documents intended for the use of future owners in conducting routine maintenance, inspections and repairs.
 - a. Design Data and Calculations-This can be in the form of a letter or statement from the engineer which summarizes critical design calculations related to the functionality of the facility such as storage volume or TSS removal, and attest to the facility conforming to applicable iSWM standards.
 - b. Schematic Plan-This should be prepared by the engineer from construction drawings to show the general layout of the facility. Major features requiring regular or special maintenance should be shown and labeled in general terms understandable to a layman. A profile should be given

showing critical elevations that control the function and capacity of the facility, and one or more cross-sections should be provided to indicate the general grading of the facility. A typical example of a schematic plan for a simple detention basin is shown in Figure 3.18.

- c. Landscaping-Vegetation should be shown consistent with the accepted Landscape Plan, either on the Schematic Plan or as a separate drawing.
3. Exhibit C Operations and Maintenance Plan-Specific maintenance tasks should be defined for each element of the facility. Maintenance tasks specific to the facility should be described in simple terms consistent with nomenclature contained in the Schematic and Landscape plans. An inspection and maintenance frequency should be established for each task.
4. Exhibit D Maintenance Checklist-A checklist consistent with the Operations and Maintenance Plan shall be provided for the use of future owners in performing routine and special maintenance tasks. This list should describe work required and frequency in language that is easy to understand and specific for the facility to be maintained. This form will be completed by the Owner and submitted to the CFW annually as part of a regular self-inspection program. See Form CFW-6 in Appendix A for an example checklist for a simple detention basin.

Additional guidance for facility maintenance is provided in the *iSWM Technical Manual*, for several types of stormwater controls. The engineer must certify that the construction has been completed in accordance with the general plans and Schematic Plan. After approval of construction by the CFW, an engineer is expected to provide guidance to the owner's representative in implementing the accepted maintenance program and to co-sign the first annual inspection after the construction. A checklist for preparing a Stormwater Facility Maintenance Agreement is provided Appendix A, Form CFW-8.

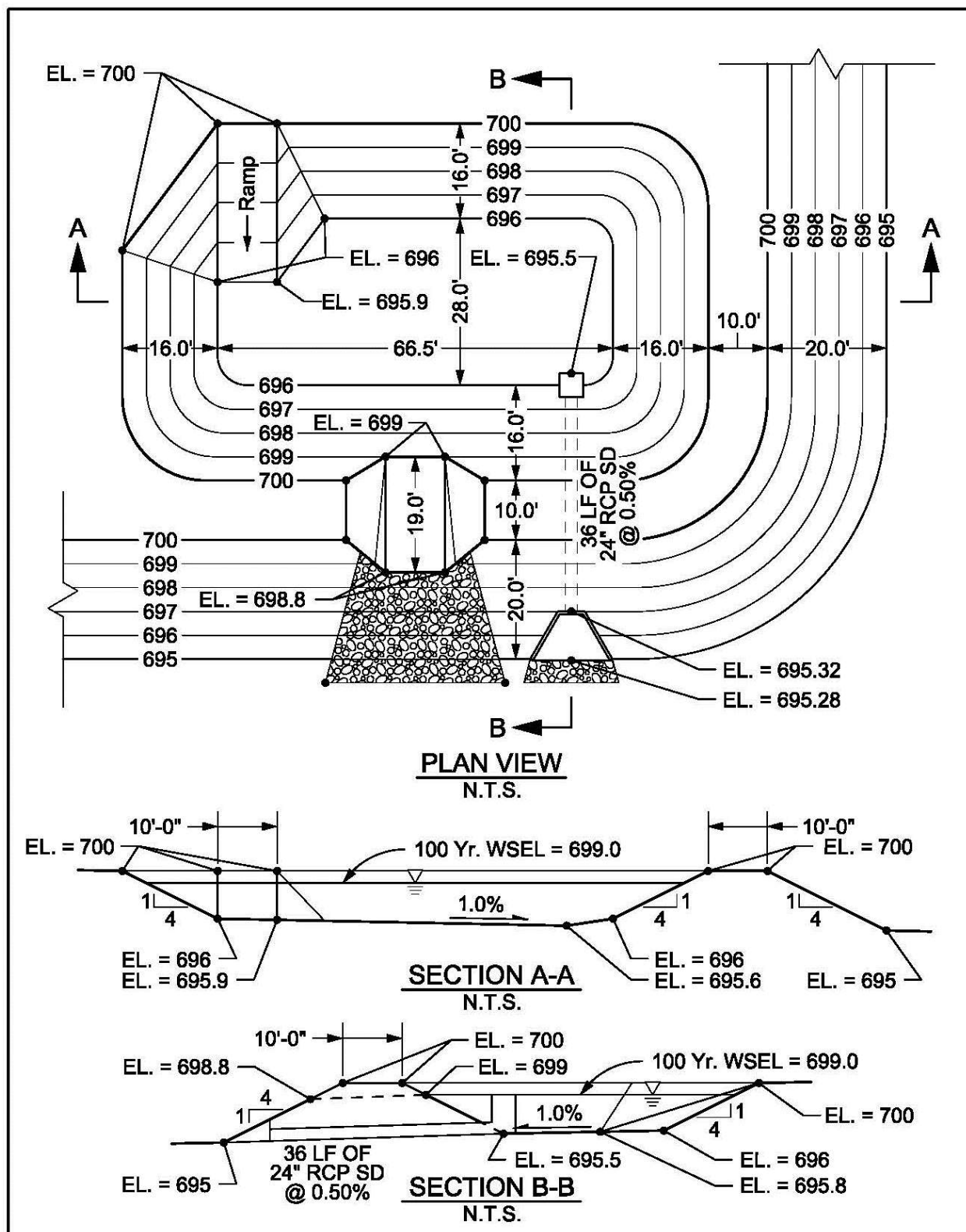


Figure 3.18 Typical Detention Pond Exhibit B - Example

4.0 Stormwater Construction Criteria

This chapter presents an *integrated* approach for reducing the impact of stormwater runoff from construction activities on downstream natural resources and properties. The purpose is to provide design criteria for temporary controls during construction that protect water quality by:

- Preventing soil erosion;
- Capturing sediment on-site when preventing erosion is not feasible due to construction activities; and
- Controlling construction materials and wastes to prevent contamination of stormwater.

Temporary controls to protect water quality are known as Best Management Practices (BMPs). The design of the BMPs is to be coordinated with and done at the same time as the Preliminary and Final iSWM Plans. Construction BMPs complement and work with the site grading and drainage infrastructure.

Erosion Control BMPs are designed to minimize the area of land disturbance and to protect disturbed soils from erosion. Protection can be accomplished by diverting stormwater away from the disturbed area or by stabilizing the disturbed soil. Erosion control BMPs are most important on disturbed slopes and channels where the potential for erosion is greatest. The design of erosion control BMPs must be coordinated with related grading, drainage and landscaping elements. (e.g. channel armoring, velocity dissipaters, etc.)

Sediment Control BMPs are temporary structures or devices that capture soil transported by stormwater. The BMPs are designed to function effectively with the site drainage patterns and infrastructure. An effective design ensures that the sediment control BMPs do not divert flow or flood adjacent properties and structures. Some types of permanent drainage structures, such as retention basins, can also be designed to function as a sediment control BMP during construction.

Material and Waste Control BMPs prevent construction materials and wastes from coming into contact with and being transported by stormwater. These BMPs consist of a combination of notes to direct contractor and temporary construction controls.

The iSWM Construction Criteria are the minimum requirements for temporary controls during construction. The state permit and requirements for stormwater discharges associated with construction activities must also be followed. More information on state requirements is provided in Chapter 4.2.

4.1 Applicability

The CFW has established minimum guidelines for controlling construction runoff for all land disturbance activities, even where there is less than 1.0 acre of disturbed surface.

Construction activities shall comply with the SWPPP requirements in the effective TPDES General permit relating to Stormwater Discharges from Construction Activities, of the Stormwater Pollution Control Ordinance and the appropriate federal (Environmental Protection Agency) and state (Texas Commission on Environmental Quality) regulations. When the ordinance and applicable regulations are in conflict, the most stringent requirements shall apply.

See Appendix D (Sediment and Erosion Control Guidelines for Small Sites).

4.2 Introduction

iSWM requires the use of temporary controls during construction to prevent or reduce the discharge of sediment and other pollutants from the construction site. The temporary controls are known as Best Management Practices (BMPs). BMPs may be activities, prohibitions, maintenance procedures, structural controls, operating procedures and other measures to prevent erosion and control the discharge of sediment and other pollutants.

Construction BMPs shall be considered when developing the Preliminary iSWM Plan and shall be coordinated with the Final iSWM Plan. Construction BMPs fall into three general categories: Erosion

Control, Sediment Control, and Material and Waste Control. The first category prevents erosion, and the second catches soil from erosion that does occur. It is generally more effective and less expensive to prevent erosion than to treat turbid runoff. Material and waste controls are for other sources of stormwater pollutants on a construction site.

The following priorities shall be applied to the selection of construction BMPs:

- Retain native topsoil and natural vegetation in an undisturbed state by incorporating natural drainage features and buffer areas into the site design.
- Limit the area of disturbance and vehicle access to the site.
- Limit the extent of clearing operations, and phase construction operations to minimize the area disturbed at any one time.
- Stabilize disturbed areas as soon as possible (not at the end of construction), particularly in channels and on cut/fill slopes.
- Minimize the disturbance of steep slopes during construction, and minimize slope length and steepness.
- Coordinate stream crossings, and minimize the construction of temporary stream crossings.
- Provide sediment controls, including but not limited to perimeter controls, where stormwater discharges will occur from disturbed areas.
- Prevent tracking of sediment off-site through the establishment of stabilized construction entrances and exits.
- Control sediment and other contaminants from dewatering activities.
- Control discharges of construction materials and wastes.

State Requirements

In addition to the CFW requirements outlined in this chapter, land disturbing activities must comply with the Texas Commission on Environmental Quality (TCEQ) requirements under General Permit Number TXR150000, commonly referred to as the “Construction General Permit.” This permit contains requirements for a Stormwater Pollution Prevention Plan (SWP3), state and local notifications, and installation, maintenance, and inspection of best management practices on construction sites. The [Water Quality Technical Manual](#) contains guidance for preparing a SWP3. However, compliance with the Construction General Permit is beyond the scope of this Criteria Manual and is the sole responsibility of the construction site operator(s).

4.3 Criteria for BMPs during Construction

The iSWM Construction Plan shall include, but shall not be limited to, the following:

- Topography.
- Limits of all areas to be disturbed by construction activity, including off-site staging areas, utility lines, batch plants, and spoil/borrow areas.
- Location and types of erosion control, sediment control, and material and waste control BMPs;
- Construction details and notes for erosion control, sediment control, and material and waste control BMPs.
- Inspections and maintenance notes.

BMPs and notes shall be provided for all the elements listed in this chapter, unless site conditions render an element not applicable. BMPs shall be selected and designed according to the technical criteria in the [Construction Controls Technical Manual](#). Site data gathered and analyzed in Step 1 of the *integrated* Development Process shall be the basis for selecting BMPs.

The minimum design storm for temporary BMPs is the 2-year, 24-hour duration storm event.

Plans for temporary BMPs shall be prepared by a Certified Professional in Erosion and Sediment Control (CPESC) or a licensed engineer or registered landscape architect in the State of Texas who has documented experience in hydrology and hydraulics and erosion and sediment control.

CFW allows flexibility to use BMP's not listed in the *Construction Controls Technical Manual* with approval of TPW.

Capacity calculations shall be included in the iSWM Construction Plan.

It is the responsibility of the engineer to design appropriate BMP's for each site. If the most appropriate BMP is not in the NCTCOG BMP Manual, the engineer shall submit calculations and references for design of the BMP to CFW.

4.3.1 Erosion Controls

Erosion control is first line of defense and the primary means of preventing stormwater pollution. They shall be designed to retain soil in place and to minimize the amount of sediment that has to be removed from stormwater runoff by other types of BMPs. Fact Sheets for different types of Erosion Control BMPs are in the *iSWM Technical Manual*.

Limits of Disturbance

On the iSWM Construction Plans, clearly show the limits of the area to be disturbed and the area in acres draining to each outfall.

Design Criteria

- Minimize the disturbance of steep slopes.
- Constrain the disturbed area to the minimum necessary to construct the project.
- Include the contractor's staging area, borrow/spoil area, utilities and any other areas on or off site that will be disturbed in support of the construction activity.
- Specify construction fencing or similar protective measures to prevent disturbance of natural drainage features, trees, vegetative buffers and other existing features to be preserved.

Slope Protection

Slope protection shall be provided for disturbed or cut/fill slopes that are one vertical on three horizontal (3H:1V) or steeper, fifty (50) feet in length or longer, or on highly erodible soils. Show the location and type of BMPs to be used on the plans.

Design Criteria

- Where feasible, add notes that prohibit disturbing the slope until final site grading.
- Where a stabilized discharge point is available, provide temporary berms or swales to direct stormwater away from the slope until the slope is stabilized.
- Check dams shall be used within swales that are cut down a slope.
- Temporary terraces, vegetated strips or equivalent linear controls shall be specified at regular intervals to break-up slopes longer than fifty (50) feet until the slope is stabilized.
- Specify final stabilization measures to be initiated within 14 days of completing work on the slope.
- Hydromulch is prohibited for slope stabilization unless the slope is one vertical on five horizontal (5H:1V) or less.

Channel Protection

Show the location and type of BMPs used to prevent the erosion of channels, drainage ways, streambanks, and outfalls until permanent structures and final stabilization measures are installed.

Design Criteria

- Provide temporary energy dissipaters at discharge points.
- If final channel stabilization consists of vegetation, anchored erosion control blankets, turf reinforcement mats, or an equivalent BMP that is resistant to channel flow shall be installed until the vegetation is established.
- If the BMPs include check dams, velocity dissipaters or other structures that extend into the channel, the BMPs shall be designed by a licensed engineer to function under the flow conditions produced by the design storm. The engineer shall verify that the BMPs will not divert flow or cause flooding of adjacent properties and structures.
- Specify final stabilization measures to be initiated within 14 days of completing work on the channel.

Temporary Stabilization

Portions of a site that have been disturbed but where no work will occur for more than 21 days shall be temporarily stabilized as soon as possible, and no later than 14 days from cessation of work, except when precluded by seasonal arid conditions or prolonged drought.

Temporary stabilization shall consist of providing a protective cover, without large bare areas, that is designed to reduce erosion on disturbed areas. Temporary stabilization may be achieved using the following BMP's: temporary seeding, soil retention blankets, fibrous mulches, hydro-mulches and other techniques that cover 100% of the disturbed areas until final stabilization can be achieved or until further construction activities take place.

Design Criteria

- Stabilization measures shall be appropriate for the time of year, site conditions, and estimated duration of use.
- Stabilization BMPs shall be provided for soil stockpiles.

Final Stabilization

Final stabilization practices shall be specified for disturbed areas that are not covered by buildings, pavement or other permanent structures upon completion of construction. Final stabilization measures shall be coordinated with the site's landscaping plan.

Design Criteria

- Final stabilization shall be specified to start within fourteen days of completing soil disturbing activities.
- If space is available, top soil shall be stockpiled during construction and distributed onto the surface of disturbed areas prior to final stabilization.
- If top soil has not been stockpiled, soil amendments (compost, fertilizer, etc.) shall be specified with the final stabilization measures.
- Final stabilization measures must provide a perennial vegetative cover with a uniform density of 70% of the native background vegetative cover or equivalent permanent measures (riprap, gabion, or geotextiles).
- Hydro-mulch will not be allowed in vegetated swales, channels or other drainage ways. BMPs may remain in place during stabilization; however, BMPs shall be removed after stabilization is achieved. The plan for final stabilization shall be coordinated with the permanent BMPs in the SWPPP and with the landscaping plan, if applicable.
- Include notes requiring temporary BMPs be removed within 30 days of establishing final stabilization.
- A Notice of Termination must be filed in accordance with the TCEQ TPDES General Permit TXR15000, usually within 30 days after final stabilization of operational control. All parties that submitted a NOI

shall submit a NOT within 30 days after final stabilization is established. When the owner of a residential subdivision transfers ownership of individual lots to builders before final stabilization is achieved, the SWPPP shall include controls for each individual lot in lieu of final stabilization. These controls shall consist of stabilization of the right-of-way and placement of structural BMPs at the low point of each individual lot or equivalent measures to retain soil on each lot during construction. Additionally, the builder must submit a valid NOI before or NOT can be submitted by the owner.

4.3.2 Sediment Controls

Sediment control BMPs shall be designed to capture sediment on the site when preventing erosion is not feasible due to on-going construction activity. Sediment control BMPs and their locations shall be designed to change with the different phases of construction as site conditions and drainage patterns change. Sediment controls for the initial phase of construction shall be installed before any site disturbing activities begin. Fact Sheets for different types of Sediment Control BMPs are in [Section 3.0 of the Construction Controls Technical Manual](#).

Sediment Barriers

Sediment barriers may be linear controls (silt fence, compost socks, sediment logs, wattles, etc.), check dams, berms, sediment basins, sediment traps, active treatment systems and other structural BMPs designed to capture sediment suspended in stormwater.

Design Criteria

- Sediment barriers shall be designed to treat the volume of runoff from the design storm.
- Sediment barriers are not required for areas of the site that are undisturbed.
- If linear controls are used as the only sediment barrier for a project, the linear control shall be provided at a rate of 100 linear feet per quarter-acre of disturbed area. A series of linear controls may be needed throughout the site and are not limited to the perimeter.
- Linear controls shall not be used across areas of concentrated flow, such as drainage ditches, swales and outfalls.
- A sediment basin shall be provided where stormwater runoff from 10 acres or more of disturbed area flows to a common drainage location, unless a basin is infeasible due to site conditions or public safety. The basin shall be designed for the volume of runoff from the total area contributing (on-site and off-site) to the common drainage location, not just the volume from the disturbed portion of the contributing area. Stormwater diversion BMPs may be used to divert stormwater from upslope areas away from and around the disturbed area to minimize the design volume of the sediment basin.
- Both existing topography and graded topography shall be evaluated when determining if 10 acres or more discharges to a common location.
- If a sediment basin is infeasible on a site of 10 acres or more, a series of smaller sediment traps and/or linear controls shall be provided throughout the site to provide an equivalent level of protection.
- Permanent detention and retention basins may be used as a sediment basin during construction if all sediment is removed upon completion of construction.

Perimeter Controls

A linear BMP shall be provided at all down slope boundaries of the construction activity and side slope boundaries where stormwater runoff may leave the site. Linear sediment barriers may be used to satisfy the requirement for perimeter controls.

Storm Drain Inlet Protection

Storm drain inlet protection shall not be used as a primary sediment control BMP unless all other primary controls are infeasible due to site configuration or the type of construction activity. Inlet protection is intended to be a last line of defense in the event of a temporary failure of other sediment controls.

Design Criteria

- Special approval is required by CFW regarding location and design of any inlet controls. Where permitted, the operator will be expected to diligently monitor storm conditions and to remove them when there is a risk of flooding.
- Inlet protection shall only be specified for low point inlets where positive overflow is provided.
- Drainage patterns shall be evaluated to ensure inlet protection will not divert flow or flood the roadway or adjacent properties and structures.

Construction Access Controls

BMPs shall be provided to prevent off-site vehicle tracking of soil and pollutants.

Design Criteria

- Limit site access to one route during construction, if possible; two routes for linear projects.
- Design the access point(s) to be at the upslope side of the construction site. Do not place the construction access at the lowest point on the construction site.
- Specify rock stabilization or an equivalent BMP for all access points.
- Include notes requiring soil tracked onto public roads be removed at a frequency that minimizes site impacts and prior to the next rain event, if feasible.
- Using water to wash sediment from streets is prohibited.

Dewatering Controls

Water pumped from foundations, vaults, trenches and other low areas shall be discharged through a BMP or treated to remove suspended soil and other pollutants before the water leaves the site. The plans shall include notes that prohibit discharging the water directly into flumes, storm drains, creeks or other drainage ways. Where state or local discharge permit requirements exist for the pollutant(s) suspected of being in the water, the plan shall include the discharge permit conditions.

4.3.3 Material and Waste Controls

Notes shall be placed on the iSWM Construction Plan for the proper handling and storage of materials and wastes that can be transported by stormwater. At a minimum, notes shall be provided for the materials and wastes in Table 4.1. Additional notes and BMPs shall be provided if other potential pollutants are expected to be on-site. Construction details shall be provided when necessary to ensure proper installation of a material or waste BMP.

All material and waste sources shall be located a minimum of fifty (50) feet away from inlets, swales, drainage ways, channels and waters of the U.S., if the site configuration provides sufficient space to do so. In no case shall material and waste sources be closer than twenty (20) feet from inlets, swales, drainage ways, channels and waters of the U.S.

Table 4.1 Requirements for Materials and Wastes

Material or Waste Source	Requirements
Sanitary Facilities	Sanitary facilities shall be provided on the site, and their location shall be shown on the iSWM Construction Plan. The facilities shall be regularly serviced at the frequency recommended by the supplier for the number of people using the facility.
Trash and Debris	Show the location of trash and debris storage on the iSWM Construction Plan. Store all trash and debris in covered bins or other enclosures. Trash and debris shall be removed from the site at regular intervals. Containers shall not be allowed to overflow.
Chemicals and Hazardous Materials	The amount of chemicals and hazardous materials stored on-site shall be minimized and limited to the materials necessary for the current phase of construction. Chemicals and hazardous materials shall be stored in their original, manufacturer's containers inside of a shelter that prevents contact with rainfall and runoff. Hazardous material storage shall be in accordance with all Federal, state and local laws and regulations. Storage locations shall have appropriate placards and secondary containment equivalent to 110% of the largest container in storage. If an earthen pit or berm is used for secondary containment, it shall be lined with plastic. Containers shall be kept closed except when materials are added or removed. Materials shall be dispensed using drip pans or within a lined, bermed area or using other spill/overflow protection measures.
Fuel Tanks	On-site fuel tanks shall be provided with a secondary enclosure equivalent to 110% of the tank's volume. If the enclosure is an earthen pit or berm, the area shall be lined with plastic. Show the location of fuel tanks and their secondary containment on the iSWM Construction Plan.
Concrete Wash-out Water	An area shall be designated on the iSWM Construction Plan for concrete wash-out. A pit or bermed area, lined with plastic, or an equivalent containment measure shall be provided for concrete wash-out water. The containment shall be a minimum of 6 CF for every 10 CY of concrete placed plus a one (1) foot freeboard. The discharge of wash-out water to drainage ways or storm drain infrastructure shall be prohibited.
Hyper-chlorinated Water from Water Line Disinfection	Hyper-chlorinated water shall not be discharged to the environment unless the chlorine concentration is reduced to 4 ppm or less by chemically treating to dechlorinate or by on-site retention until natural attenuation occurs. Natural attenuation may be aided by aeration. Water with measurable chlorine concentration of less than 4 ppm is prohibited from being discharged directly to surface water. It shall be discharged onto vegetation or through a conveyance system for further attenuation of the chlorine before it reaches surface water. Alternatively, permission from the sanitary sewer operator may be obtained to discharge directly to the sanitary sewer.
Vehicle/Equipment Wash Water	Vehicle and equipment washing is prohibited on the site unless a lined basin is provided to capture 100% of the wash water. The wash water may be allowed to evaporate or hauled-off for disposal.
Soil Stabilizers	Lime or other chemical stabilizers shall be limited to the amount that can be mixed and compacted by the end of each working day. Stabilizers shall be applied at rates that result in no runoff. Stabilization shall not occur immediately before and during rainfall events. Soil stabilizers stored on-site shall be considered a hazardous material and shall meet all the requirements for chemicals and hazardous materials.
Concrete Saw-cutting Water	Slurry from concrete cutting shall be vacuumed or otherwise recovered and not be allowed to discharge from the site. If the pavement to be cut is near a storm drain inlet, the inlet shall be protected by sandbags or equivalent temporary measures to prevent the slurry from entering the inlet.

4.3.4 Installation, Inspection and Maintenance

The iSWM Construction Plan shall include details and notes that specify the proper installation, inspection and maintenance procedures for BMPs. The BMPs for the initial phase of construction must be implemented before starting any activities that result in soil disturbance, including land clearing. Notes shall indicate the sequence of BMP installation for subsequent phases of construction.

Notes on the iSWM Construction Plan shall indicate the frequency of inspections and the areas to be inspected. Inspections shall include:

- Inspecting erosion and sediment controls to ensure that they are operating correctly;
- Inspecting locations where vehicles enter or exit the site for evidence of off-site tracking;
- Inspecting material and waste controls to ensure they are effective; and
- Inspecting the perimeter of disturbed areas and discharge points for evidence of sediment or other pollutants that may have been discharged.

Erosion, sediment, and material and waste controls shall be repaired, replaced, modified and/or added if inspections reveal the controls were not installed correctly, are damaged, or are inadequate or ineffective in controlling their targeted pollutant.

Notes for maintenance of BMPs shall require the removal of sediment from BMPs when the sediment reaches half of the BMP's capacity or more frequently. Sediment discharged from the site shall be removed prior to the next rain event, where feasible, and in no case later than seven days after it is discovered. Upon completion of construction, sediment shall be removed from all storm drain infrastructure and permanent BMPs before the temporary BMPs are removed from the site.

Refer to Chapter 3.11 for further information on maintenance agreements.

5.0 References

City of Fort Worth Public Works Department, Storm Water Management Design Manual, March 2006 Fort Worth, Texas.

City of Fort Worth Public Works Department, Storm Drainage Criteria and Design Manual, December 10, 1967, amended June 1, 1975, December 17, 1986, and September 20, 1994, Fort Worth, Texas.

Harris County Flood Control District, October 2009, Policy, Criteria and Procedure Manual for Approval and Acceptance of Infrastructure, Houston, Texas.

Integrated Stormwater Management Criteria Manual for Site Development and Construction, December 2009, NCTCOG, Arlington, TX

integrated Stormwater Management Planning Technical Manual, 2010 Edition, Revised September 2014. NCTCOG, Arlington, TX.

integrated Stormwater Management Program Guidance: Dam Safety and Water Rights, 2010 Edition, Revised April 2010. NCTCOG, Arlington, TX.

integrated Stormwater Management Water Quality Technical Manual, 2010 Edition, Revised September 2014. NCTCOG, Arlington, TX.

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Texas Department of Transportation, October 2011, Hydraulic Design Manual, Austin, Texas.

U.S. Army Corps of Engineers, August, 1992, Design and Construction of Grouted Riprap, ETL 1110-2-334.

U.S. Army Corps of Engineers, July 1991/June 1994, Hydraulic Design of Flood Control Channels, EM 1110-2-1601.

U.S. Department of the Interior Bureau of Reclamation , Hydraulic Design of Stilling Basins and Energy Dissipaters, March 1978, Engineering Monograph No. 25.

Appendix A – City of Fort Worth Detailed Checklists and Forms

Form CFW-1 Preliminary iSWM Checklist

Form CFW-2 Final iSWM Checklist

Form CFW-3 Culvert Hydraulics Documentation Checklist

Form CFW-4 Bridge Hydraulics Documentation Checklist

Form CFW-5 Preliminary and Final Dam Maintenance and Emergency Action Plan

Form CFW-6 Inspection Checklist for Simple Detention Basin

Form CFW-7 Request for Variance from City of Fort Worth - Stormwater

Form CFW-8 Engineer's Checklist for Stormwater Facility Maintenance Agreement

Form CFW-9 Grading Permit Application

Form CFW-10 Final Grading Certificate



**TRANSPORTATION AND PUBLIC WORKS DEPT.
STORMWATER MANAGEMENT**

PRELIMINARY iSWM CHECKLIST
Please attach additional sheets as necessary for comments and descriptions.
Fold all sheets to 8½" x 11" or 9" x 12" and bind with a clip.



1. Project Information

- A. Name of Project: _____ B. Date: _____
- C. Location of Project: _____ D. Type of Project (circle one): Development / CIP
- E. Project Description: _____ F. Total Disturbed Area (acres): _____
- G. Proposed land uses (CFW zoning designations (N/A for City CIPs)) _____
- H. Anticipated Start of Construction: _____
- I. Name of Owner (Fort Worth for City CIPs): _____ J. Telephone No.: _____
- K. Owner Contact Name (N/A for City CIPs): _____ L. FAX No.: _____
- M. Owner Address (N/A for City CIPs): _____
- N. Engineer's Name: _____ O. Texas P.E. No.: _____
- P. Engineering Firm: _____ Q. Telephone No.: _____
- R. Engineer Address: _____
- S. Engineer's Email: _____ T. FAX No.: _____

2. Items to be Provided (Identify sheet number if included with plans or write "attached" if included as an attachment with this checklist)

- _____ Preliminary Plat or Site Plan
- _____ Pre-Development Aerial Photo with composite impervious area calculations for site – See #3 below
- _____ Pre-Development Drainage Area Map(s) – See #4 below
- _____ Post-Development Drainage Area Map(s) – See #5 below
- _____ Narrative – See #6 below
- _____ Simplified Methods Utilized and Documentation Provided
- _____ Waiver Requests (Optional)

Additional Notes:

- _____ Developed under manual other than current manual (Identify Year)
- _____ Calculations dependent on a phase developed under previous criteria (Identify Year)

Plan File Number (if available): _____

Note: Highlighted items only required for Conceptual iSWM. All items are required for Preliminary iSWM.

For City Use: Project Manager: _____ Date: _____

_____ Preliminary Plans, Checklist, and Referenced Attachments
Posted on Buzzsaw

Checklist completed correctly and in sufficient detail: Yes / No

Comments: _____

TPW / SW Accepted: Yes / No By: _____ Date: _____

Case No.: _____ CIP No.: _____

Comments: _____

Form CFW-1

3. Pre-Development Impervious Area Map(s)

A. <i>Project boundaries</i>	_____	_____	_____	_____
B. <i>Aerial photo representing existing conditions (no more than 5-years before submittal)</i>	_____	_____	_____	_____
C. <i>Site specific composite C value (use 0.9 for impervious areas, 0.3 for pervious area, and 0.56 for gravel paved areas to calculate composite C. Offsite composite C values can be based on land use)</i>	_____	_____	_____	_____

4. Pre-Development Drainage Area Map(s) containing the following information:

A. <i>Project boundaries</i>	_____	_____	_____	_____
B. <i>Existing topography (2-foot contours)</i>	_____	_____	_____	_____
C. <i>USDA soil types (if using hydrographs). A separate soil map may be submitted</i>	_____	_____	_____	_____
D. <i>Perennial or intermittent stream centerlines</i>	_____	_____	_____	_____
E. <i>Delineation of FEMA floodplains, studied floodplains, floodplain easements and open channels</i>	_____	_____	_____	_____
F. <i>Location of wetlands</i>	_____	_____	_____	_____
G. <i>Locations of dams and impoundments</i>	_____	_____	_____	_____
H. <i>Existing roads, buildings, and other impervious areas</i>	_____	_____	_____	_____
I. <i>Location and size of major utility lines and easements</i>	_____	_____	_____	_____
J. <i>Location, size, and City File Number for existing stormwater conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow</i>	_____	_____	_____	_____
K. <i>Locations and dimension of existing channels, bridges, or culvert crossings</i>	_____	_____	_____	_____
L. <i>Delineation of watershed boundaries with flow areas</i>	_____	_____	_____	_____
M. <i>Delineation of offsite drainage areas</i>	_____	_____	_____	_____

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>Comments and Descriptions</u>
N. Time of concentration calculations for each area and lag time calculations for hydrograph methods. Delineation of longest flow path required unless using the minimum lag time	_____	_____	_____	_____
O. Computation tables showing drainage areas, runoff coefficients or curve number, time of concentration or lag times, rainfall intensities and peak discharges for the 1, 5, and 100-year storms	_____	_____	_____	_____
5. Post Development Drainage Area Map(s) showing the following information for the project site:				
A. Project boundaries	_____	_____	_____	_____
B. Existing topography (2-foot contours) and proposed grading contours or spot elevations.	_____	_____	_____	_____
C. Perennial or intermittent stream centerlines	_____	_____	_____	_____
D. Delineation of FEMA floodplains, studied floodplains, floodplain easements and open channels	_____	_____	_____	_____
E. Locations of dams and impoundments	_____	_____	_____	_____
F. Location and size of major utility lines and easements	_____	_____	_____	_____
G. Location, size, and City File Number for existing stormwater conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	_____	_____	_____	_____
H. Location and dimension of existing channels, bridges or culvert crossings	_____	_____	_____	_____
I. Location of all proposed site outfalls or locations where runoff leaves the site	_____	_____	_____	_____
J. Proposed zoning or land use	_____	_____	_____	_____
K. Delineation of watershed boundaries with flow arrows	_____	_____	_____	_____
L. Delineation of offsite drainage areas	_____	_____	_____	_____
M. Proposed modifications to watershed boundaries	_____	_____	_____	_____

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>Comments and Descriptions</u>
N. Composite runoff coefficients calculations for each drainage area for the rational method or Curve Number (CN) calculations for the hydrograph method.	_____	_____	_____	_____
O. Time of concentration calculations for each area and lag time calculations for hydrograph methods. Delineation of longest flow path required unless using the minimum lag time	_____	_____	_____	_____
P. Computation tables showing drainage areas, runoff coefficients or curve number, time of concentration or lag times, rainfall intensities and peak discharges for the 1, 5, and 100-year storms. Include ultimate conditions if applicable	_____	_____	_____	_____
Q. Delineate the entire zone of influence	_____	_____	_____	_____
R. Show downstream constrictions with runoff controls (Mitigation documentation not required until Final iSWM)	_____	_____	_____	_____
S. Proposed facilities with private maintenance (If detention is proposed, provide volume required)	_____	_____	_____	_____
 6. Written Narrative: Provide a written narrative and supporting methodology to demonstrate zone of influence and adequate outfall determination and conclusions for all design storms. Methodology must be in accordance with Chapter 3 of the Drainage Manual and Chapter 2.0, Downstream Assessment of the Hydrology Section of the Technical Manual . The narrative may be in the form of notes on the iSWM plan, letter report, or formal report, depending on the scope of the project. Note: For conceptual – level submittals, the narrative shall be limited to a summary of the proposed project and expected drainage impacts. Methodology shall be described in a future submittal.				

7. **Planning Concerns:** (Planning concerns may include previous drainage or watershed studies, known history of flooding or excessive erosion downstream, downstream drainage constrictions, wetlands, 404 permit areas, existing dams subject to TCEQ regulations, impoundments subject to TCEQ water rights permitting, and existing environmental concerns)

8. **Low-Impact Design:** (Does this project provide opportunities for low-impact design including preservation of floodplains or natural valley storage, preservation of natural streams and drainage patterns, preservation of steep slopes, preservation of trees and undisturbed natural vegetation, preservation of wetland areas or other natural features, drain runoff to pervious areas, utilization of natural drainage system, reduction of pavement and other impervious covers)

9. **Description of Any Proposed Waiver Requests:** (for informational purposes only; all Waiver Requests must follow the procedure outlined in the Drainage Manual)

10. Other Comments:

(seal)	I certify that this Preliminary iSWM Checklist and referenced documents were prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the City does not waive any City standards or requirements unless a specific waiver request has been submitted and approved.
	Signed _____ Date _____
	Print Name: _____



**TRANSPORTATION AND PUBLIC WORKS DEPT.
STORMWATER MANAGEMENT**

FINAL iSWM CHECKLIST

Please attach additional sheets as necessary for comments and descriptions.

Fold all sheets to 8½" x 11" or 9" x 12" and bind with a clip.



1. Project Information (for Items 1.C to 1.T, N/C = No Change from Preliminary SWM Plan)

- A. Name of Project: _____ B. Date: _____
- C. Location of Project: _____ D. Type of Project (circle one): Development / CIP
- E. Project Description: _____ F. Total Disturbed Area (acres): _____
- G. Proposed land uses (CFW zoning designations (N/A for City CIPs)) _____
- H. Anticipated Start of Construction: _____
- I. Name of Owner (Fort Worth for City CIPs): _____ J. Telephone No.: _____
- K. Owner Contact Name (N/A for City CIPs): _____ L. FAX No.: _____
- M. Owner Address (N/A for City CIPs): _____
- N. Engineer's Name: _____ O. Texas P.E. No.: _____
- P. Engineering Firm: _____ Q. Telephone No.: _____
- R. Engineer Address: _____
- S. Engineer's Email: _____ T. FAX No.: _____

2. References: (Identify sheet number if included with plans or write "Attached" if included as an attachment with this checklist).

- _____ Final Plat or Site Plan
- _____ Final iSWM Construction Plan (with Exhibits)
- _____ Additional Attachments as Specified
- _____ Waiver Requests (As Applicable)

Additional Notes:

- _____ Developed under manual other than current manual (Identify Year)
- _____ Calculations dependent on a phase developed under previous criteria (Identify Year)

Plan File Number (if available): _____

For City Use: Project Manager: _____ Date: _____

_____ Final Plans, Checklist, and Referenced Attachments

Posted on Buzzsaw

Checklist completed correctly and in sufficient detail: Yes / No

Comments: _____

TPW / SW Accepted: Yes / No By: _____ Date: _____

Case No.: _____ CIP No: _____

Comments: _____

Form CFW-2

3. Changes or Modifications to Preliminary iSWM Plan (May be reprinted with changes tracked or highlighted)

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>Comments and Descriptions</u>
4. Additional Study Attachments (include if applicable)				
A. Dam Safety Checklist	—	—	—	—
B. Executed Maintenance Agreement (with Maintenance Plan)	—	—	—	—
C. Landscaping Plan (for Stormwater controls)	—	—	—	—
D. Copy of approved Waiver Request	—	—	—	—
E. Calculation of proposed Stormwater Fee Credits	—	—	—	—
5. Applicable Local, State and Federal Permits (Indicate acquired or application pending)				
A. CLOMR, LOMR or LOMA	—	—	—	—
B. TCEQ water rights permit	—	—	—	—
C. 404 permit	—	—	—	—
D. Urban Forestry Permit	—	—	—	—
E. Floodplain Development Permit	—	—	—	—
6. Hydrologic Analysis and Stormwater Management Design Plan (separate Attachment, <u>either</u> A or B)				
A. Approved Infrastructure Plans (with TPW CFA).	—	—	—	—
B. Site iSWM Plan showing final hydrology, Identification of all stormwater controls with summary calculations, delineation of adequate outfalls, zones of influence, required mitigation, and structural details and specifications as required	—	—	—	—

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>Comments and Descriptions</u>
C. <i>Has the capture and treatment of stormwater been considered in terms of water quality?</i>	—	—	—	_____
7. iSWM Construction Plan				
A. <i>Applicable sheets titled “iSWM Construction Plan” in plans</i>	—	—	—	_____
B. <i>Existing topography and natural drainage features and post project topography and drainage features</i>	—	—	—	_____
C. <i>Limits of disturbance, including off-site areas that will be disturbed and natural features to be protected within the disturbed areas. Disturbed area (ac) shown on plan sheet</i>	—	—	—	_____
D. <i>Location, details, and notes for erosion controls</i>	—	—	—	_____
E. <i>Location, details, and notes for sediment controls</i>	—	—	—	_____
F. <i>Location, details, and notes for waste controls (toilets, demolition material, and other potential sources of pollution)</i>	—	—	—	_____
G. <i>BMP Design Calculations for erosion, sediment, and waste controls</i>	—	—	—	_____
H. <i>Inspection and maintenance notes</i>	—	—	—	_____
I. <i>Sequence of BMP installation based on sequence of construction phases</i>	—	—	—	_____
J. <i>Schedule and phasing of temporary and permanent stabilization on different area of the site</i>	—	—	—	_____
K. <i>Temporary structures that will be converted into permanent stormwater controls</i>	—	—	—	_____
L. <i>If final site drains 10 or more acres are sediment traps being used?</i>	—	—	—	_____

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>Comments and Descriptions</u>
M. <i>Are top soils banked on-site? (If no, then provide comments describing provisions being made for soil amendments)</i>	—	—	—	_____
N. <i>Prepared by an engineer or other qualified professional</i>	—	—	—	_____

8. Landscaping Plan

A. <i>Arrangement of planted areas, natural areas, and other landscaped features</i>	—	—	—	_____
B. <i>Information required to construct landscaping elements</i>	—	—	—	_____
C. <i>Descriptions and standards for methods, materials, and vegetation that are to be used</i>	—	—	—	_____

(Seal)	I certify that this Final iSWM Checklist and referenced documents were prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the City does not waive any City standards or requirements unless a specific waiver request has been submitted and approved.
	It is the intent of the information provided in this checklist and within the plans regarding the iSWM Construction Plan to be used as the general guidelines of the Storm Water Pollution Prevention Plan for this project to establish a minimum basis of compliance with local, state, and federal regulations. The contractor must amend plans whenever there is a change in design, construction, operation, or maintenance of the plan, or when the existing plan proves ineffective. The contractor shall be solely responsible for implementation, maintenance, monitoring, and permitting of all erosion, sediment, and waste control aspects associated with the project. Signed _____ Date _____ Print Name: _____



CULVERT HYDRAULICS DOCUMENTATION CHECKLIST

Project:		Date:
Road:	Watershed:	Stream:
Type of work:		
FEMA considerations (Detailed or Approx. Study?):		
Culvert location:		
Culvert size & shape:		
Culvert material:	Fill height:	Skew angle:
Hydrologic method used: Hydrograph		
USGS Station _____		Other (specify) _____
Design frequency (yrs):		Drainage area:
Channel analysis:	Channel slope (m/m):	N values (channel):
100 Yr Proposed discharge (cfs):	100-Year Fully developed discharge - Q_{100} (cfs):	
100 Yr Proposed tailwater (ft):	100-Year Fully developed tailwater (ft):	
100 YR Proposed headwater (ft):	100-Year Fully developed headwater (ft):	
Allowable highwater (ft):		
100 Yr Proposed velocity thru bridge (fps):	100-Year Fully developed velocity thru bridge (fps):	
Design unconfined velocity (fps)	100-Year unconfined velocity (fps)	
% Flow overtopping road for Q_{100} :	Height of water over road for Q_{100} (ft):	
Est. overtopping frequency (years):		
Headwater computation method: THYSYS-CULVERT HEC-RAS* HEC 2 Other _____		
*Required by CFW		
Comparison with existing hydraulic condition:		
Meets FEMA requirements _____ Yes _____ No _____ N/A		
Outlet velocity excessive _____ Yes _____ No		
Outlet protection/control:		
Safety end treatment:		
Comments:		



BRIDGE HYDRAULICS DOCUMENTATION CHECKLIST

Project:								Date:					
Road:				Watershed:				Stream:					
Type of work:													
FEMA considerations (Detailed or Approx. Study?):													
Bridge Length:								Pier Configuration:					
Bridge Width:								Bridge Low Chord and Roadbed Elev.:					
Hydrologic Method Used: Hydrograph Only Gauged - USGS Station _____ Other _____													
Design Frequency (yrs):*								Drainage Area:					
Channel Dimensions:				Channel slope(ft/ft):				N value:					
STATION	DESIGN PROPOSED			100 YR EXISTING			100 YR PROPOSED			100 YR FULLY DEVELOPED			
	Q (cfs)	V (fps)	WSEL (ft)	Q (cfs)	V (fps)	WSEL (ft)	Q (cfs)	V (fps)	WSEL (ft)	Q (cfs)	V (fps)	WSEL (ft)	
EXIT													
FULL V													
BRIDGE													
APPR (CONSTR)													
APPR (UNCONS)													
Headwater computation method: HEC-RAS _____ OTHER _____													
Bridge/Roadway overtopping: ____Yes ____No								Overtopping Frequency(years):					
% Flow overtopping road:								Height of water over road(ft):					
Existing Bridge Length(ft):								Meets FEMA requirements: Yes_____No_____N/A					
Type of Bridge Rail:								Skew:					
Abutment protection (rock riprap, etc):													
Comments:													
*Complete for cases where "design frequency" (such as TxDOT structures) may be different than 100-year.													



TRANSPORTATION AND PUBLIC WORKS DEPT.
STORMWATER MANAGEMENT

PRELIMINARY AND FINAL
DAM MAINTENANCE AND
EMERGENCY ACTION PLAN

*Please attach additional sheets as necessary for comments and descriptions.
Fold all sheets to 8½" x 11" or 9" x 12" and bind with a clip.*



1. Project Information

- A. Name of Development: _____ B. Case No.: _____
- C. Dam Name, Number or Tributary: _____ D. Date: _____
- E. Name of Owner: _____ F. Telephone No.: _____
- G. Owner Contact Name: _____ H. E-mail: _____
- I. Owner Address: _____
- J. Engineer's Name: _____ K. Texas P.E. No.: _____
- L. Engineering Firm: _____ M. Telephone No.: _____
- N. Engineer Address: _____ O. E-mail: _____

2. Dam Summary Information (Item H not required for Preliminary Submittal)

A dam that meets the TCEQ guidelines must be registered with the TCEQ, have a breach analysis, hazard assessment, and emergency action plan per 30 TAC §299.

- A. Dam height* (feet): _____
- B. Impoundment surface area (acres): _____
- C. Watershed size (acres): _____
- D. Approx. impoundment volume (acre-feet): _____

*Height measured from the crest of the dam to the bottom of the outfall channel

For City Use: Reviewer: _____ Date: _____		
Accepted	Not Accepted	Case No.: _____
Comments: _____		

E. Who will own and maintain dam (HOA, City park, etc.)? _____

F. Was dam previously registered and/or inspected by TCEQ? When? _____

G. TCEQ impoundment size classification (30 TAC §299.12): _____ Exempt _____ Small _____ Intermediate _____ Large

H. Hazard Assessment (from 6.B. below per 30 TAC §299.13): _____ N/A _____ Low _____ Significant _____ High

3. Attachments

_____ Water Rights Permit (where applicable)

_____ Breach Analysis (where applicable)

_____ Emergency Action Plan (final submittal)

Yes No N/A Comments and Descriptions

4. State Water Rights

In accordance with Texas Water Code §11, all surface impoundments not used for domestic or livestock purposes must obtain a water rights permit from the TCEQ. For proposed City-owned dams, a completed permit, or written documentation from TCEQ stating that a permit is not required, must be submitted prior to final acceptance by the City.

Has water rights permit been obtained or applied for? (For proposed City-owned dams, attach permit correspondence)

5. Dam and Pond Site Map(s), showing:

A. Proposed and existing contours, with recent aerial

B. Existing and proposed FEMA floodplain limits

C. Street and lot layout around dam and inundation area

D. Contributing watershed (reduced scale if necessary)

E. Hydrologic calculations for Q100 and PMF

F. Location, size and capacity of proposed spillway

G. Conceptual or final spillway and erosion protection design

Form CFW-5

Yes No N/A Comments and Descriptions

6. Dam Breach Analysis – Attach and Include: (Required for Final Submittal only, for dams meeting the guidelines in Chapter 3.8.4 for Detention Structures in this manual).

A. Breach analysis for “sunny day”, “barely overtopping” or Q100, and Probable Maximum Flood (PMF) conditions

— — — —

B. Hazard Assessment based on potential for loss of life or property damage in breach/non-breach comparison

— — — —

C. Emergency Action Plan per current City standards

— — — —

I certify that this Conceptual Stormwater Management plan, including this checklist, required attachments, and additional comments, was prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the City does not waive any City standards or requirements unless a specific waiver request has been submitted and accepted.

Signed _____ Date _____

Print Name: _____

(seal)



INSPECTION CHECKLIST FOR SIMPLE DETENTION BASIN



Facility Name: _____ Facility Agreement Number: _____

Basin/Pond Number: _____ Inspected By: _____ Date: _____

Type of Inspection: Annual _____, Quarterly _____, Monthly _____, Routine _____, or Storm Event _____, (# days since event _____)

Basin Conditions:

- | | | |
|---|--------------|----------------|
| 1. Is there standing water or wet spots? | Yes___ No___ | Comments _____ |
| 2. Does sides or bottom show signs of erosion, settling, cracking, etc? | Yes___ No___ | Comments _____ |
| 3. Does dam or emergency spillway show signs of erosion, settling, cracking, or other problems? | Yes___ No___ | Comments _____ |
| 4. Is there evidence of animal burrowing in dam? | Yes___ No___ | Comments _____ |
| 5. Is there evidence of changes in shape or volume of basin? | Yes___ No___ | Comments _____ |
| 6. Do vegetated areas need mowing? | Yes___ No___ | Comments _____ |
| 7. Are there trees or woody growth in dam? | Yes___ No___ | Comments _____ |
| 8. Are there areas that need to be re-vegetated? | Yes___ No___ | Comments _____ |
| 9. Is there any accumulation of silt, trash, debris or litter in the basin? | Yes___ No___ | Comments _____ |
| 10. Are there any other basin maintenance activities needed? | Yes___ No___ | Comments _____ |

Structural Components:

- | | | |
|--|--------------|----------------|
| 1. Are pipes, channels, trash racks, etc. free of obstructions? | Yes___ No___ | Comments _____ |
| 2. Are pipes, spillway or trash racks in need of repair? | Yes___ No___ | Comments _____ |
| 3. Is the low flow or trickle channel in need of repair? | Yes___ No___ | Comments _____ |
| 4. Is the outfall channel in need of repair? | Yes___ No___ | Comments _____ |
| 5. Are there any other structural maintenance activities needed? | Yes___ No___ | Comments _____ |

Plan for correcting deficiencies:

Signature:

Owner's Representative
Date: _____

Form CFW-6



REQUEST FOR VARIANCE FROM CITY OF FORT WORTH – STORMWATER

Submitted by: _____ Phone: _____ Email: _____
Company: _____ Date: _____

Proposed Project Description

Name: _____
Type: _____
Location: _____ (include map)

Existing Condition (show information on map or drawing)

CFW Maintained Facilities: _____
Existing Right-of-Way for CFW facility: _____
Topography: _____
Other Pertinent Data Related to Variance Request:

Variance Request

Specific criteria you want to vary: _____

Explain why the criteria needs to be varied or is not applicable: _____

Explain how the basis for the criteria will be satisfied: _____

List attachments supporting variance request (preliminary design report excerpt, construction drawings, calculations, photographs, map, etc.):

Justification of Decision: _____

Notes: _____

Variance Decision: Accepted ☐ Denied ☐

Reviewer Signature: _____ Date: _____



ENGINEER'S CHECKLIST FOR STORMWATER FACILITY MAINTENANCE AGREEMENT



Transportation and Public Works Dept.
Stormwater Management

Please attach additional sheets as necessary for comments and
descriptions. Fit all sheets to 8½" x 11".

ORGANIZATION INFORMATION	
1. Company (Applicant)	Address:
2. Contact's Information: Contact Name Mailing Address Telephone Number(s) Email	3. Execution Information: Signatory's Name Mailing Address Telephone Number(s) Email
4. Property Location: (Note: If the property has not been addressed, please enter the legal description)	
5. Associated Plat Numbers: (Note: if request is related to multiple plat applications, please list each individually)	
6. Associated Building Permit Numbers: (Note: if request is related to multiple permits, please list each individually)	
7. Associated iSWM Master Numbers:	
AGREEMENT & ATTACHMENT INSTRUCTIONS	
If the property owner is a corporation, the agreement must be signed by the President or a Vice-President of the company. If a partnership, the agreement must be signed by the managing partner. If the applicant is a sole proprietor, he/she signs the agreement on behalf of him or herself. Additionally, for corporations and partnerships, a copy of the <i>Articles of Incorporation</i>, showing signature authority for whoever signs the agreement must also be submitted (Note: Applicants may also submit a board resolution or power of attorney authorizing an agent or assign to sign on behalf of the property owner. The agreement must be completely filled out and three copies submitted to the Planning and Development Department. Signatures on all three agreement drafts must be original and notarized. Lastly, please submit a copy of the deed for the noted property. NOTE: Agreement and all attachments should be submitted on 8 ½" x 11".	

	Yes	No	N/A	Comments/Descriptions
1. Legal Agreement – Standard agreement form provided by Department of Law.	☐	☐	☐	
2. Exhibit “A” - Legal Description (Attached)				
A. Metes and Bounds.	☐	☐	☐	
B. Surveyor’s Drawing, with seal affixed and marked as “Drainage Easement”.	☐	☐	☐	
C. Preliminary Plat.	☐	☐	☐	
3. Exhibit “B” - Design Plan and Specifications (Attached)				
A. Design Calculations – in accordance with iSWM.	☐	☐	☐	
B. Schematic Plan (See Example Detention Plan Schematic)- prepared in accordance with approved construction plans:	☐	☐	☐	
• Plan View showing critical structural elements .	☐	☐	☐	
• Critical structural elements are clearly labeled in layman terms.	☐	☐	☐	
• Profile including a longitudinal section showing all critical structural elements with elevations.	☐	☐	☐	
• Cross-sections as needed to show size and general grading.	☐	☐	☐	
NOTE: All Schematics should be submitted on 8 ½” x 11”.				
C. Landscaping shown per approved Landscape Plans.	☐	☐	☐	
4. Exhibit “C” - Operations and Maintenance Plan (Attached)				
A. Routine Maintenance Specifications:				
1. Mowing as needed to control weeds and woody plants.	☐	☐	☐	
2. Trash removal from critical structural elements.	☐	☐	☐	
3. Additional maintenance.	☐	☐	☐	
B. Non-routine Maintenance Activities:				
1. Bank repair and stabilization.	☐	☐	☐	
2. Re-vegetation - required when 30% or more of area is unprotected.	☐	☐	☐	

	Yes	No	N/A	Comments/Descriptions
3. Sediment removal from the detention/retention facility when:	☐	☐	☐	
• Detention basin – when water depth is reduced 25% or more, or basin does not drain within 72 hours.	☐	☐	☐	
• Retention pond – when water depth is 4' or less.	☐	☐	☐	
• Sediment traps/forebay – when depth is reduced by 50% or more.	☐	☐	☐	
4. Structural repair/replacement for all damaged or deteriorated structures, trickle channel, trash rack, etc.	☐	☐	☐	
5. Mechanical equipment repairs.	☐	☐	☐	
6. Other maintenance Activities.	☐	☐	☐	
5. Exhibit "D" - Maintenance Checklist *				
A. Covers ordinary needs, in layman terms.	☐	☐	☐	
B. Structural components labeled consistent with Schematic Plan.	☐	☐	☐	

*See attached Inspection Checklist for Detention Basin

NOTE: All Exhibits should be submitted on 8 ½" x 11".

(seal)	I certify that this Stormwater Facility Maintenance Agreement, checklist, required attachments, and additional comments, was prepared under my responsible supervision and that the information presented on this checklist and attachments is correct to the best of my knowledge. I also understand that an acceptance of this plan by the City does not waive any City standards or requirements unless a specific waiver request has been submitted and approved.
	Signed _____ Date _____
	Print Name: _____



GRADING PERMIT APPLICATION

Applicant to Complete Sections I through VII Below:

Permit No. _____

Questionnaire For: Commercial Construction or Grading activities.

What Type of Grading Permit is being applied for? (circle one) **EARLY** **FINAL**

Note: A Final Commercial Grading Permit is required even if an Early Grading Permit is obtained.

I. Identification:

Project Name: _____

Project Location: _____

Owner:

Name: _____ e-mail: _____

Address: _____ Phone: _____

Contractor:

Name: _____

Address: _____

Emergency Telephone No.: _____ e-mail: _____

II. Do you have an approved iSWM Plan? (circle one) **yes** **no**

An iSWM Plan (integrated Storm Water Management Plan) may have been approved if a Plat, Infrastructure Plans, or a Unified Residential Plan has been approved after March 2006.

If yes provide case/plan number(s), if known:

SWM _____ SWPPP _____

Plat _____ Urban Forestry Plan _____

DOE Number _____ Unified Residential Development Plan _____

III. What is the total land disturbance associated with this permit? _____ Acres

IV. Are you prepared to submit an iSWM plan now? (circle one) **yes** **no**

V. Are you prepared to submit a SWPPP plan now? (circle one) **yes** **no**

VI. Are you prepared to submit an Urban Forestry plan now? (circle one) **yes** **no**

VII. Signature of Applicant or Authorized Agent:

Signature: _____

Name: _____

Name of Company: _____

Address: _____

Phone No.: _____

VIII. Conditions of Approval

Approval is contingent upon compliance with City grading and development requirements including drainage, floodplain management, urban forestry and construction runoff control. A site grading plan sealed by an engineer is required for all land disturbances of 1.0 acre or more.

City Action:

Reviewer _____ Date _____

Accepted / Not Accepted Comments _____

CFW-9



FINAL GRADING CERTIFICATE

Effective Date _____

Case No. (From Early/Final Grading Permit) _____

This certification is required after construction and grading activities are complete and prior to Certificate of Occupancy being issued.

OWNER/ DEVELOPER/ PERMITTEE INFORMATION

Project Name _____

Project Location _____

Project Description _____

Owner/Developer/Permittee _____

Address _____

Phone No. _____ e-mail _____

DESIGN PROFESSIONAL OR CONTRACTOR (Responsible Party)

Name _____

Address _____

Phone No. _____ e-mail _____

License/Certificate No _____ Expiration Date _____

To the best of my knowledge and personal inspection, the above described project has been constructed in substantial compliance with the plans dated _____ as accepted by the City of Fort Worth AND temporary BMPs have been removed.

Signature _____ Date _____

Printed Name _____

(Seal)

Appendix B – City of Fort Worth Stormwater Computer Models

Appendix B: Stormwater Computer Models

B.1 Introduction

Stormwater management is becoming increasingly complex. The simple notion of collecting runoff and sending it efficiently to the nearest stream is being replaced with considerations of stormwater quantity and quality control, infrastructure management, master planning and modeling, financing, complaint tracking, and more. Information needs are critical to a successful local program. North Central Texas communities need to both invest in and be aware of new and emerging technologies that can provide the ability to collect, organize, maintain and effectively use vast amounts of data and information for their community's stormwater management activities.

There is a great deal of computer software that has been developed based on the intensive research effort in urban hydrology, hydraulics and stormwater quality. Computer models use the computational power of computers to automate the tedious and time-consuming manual calculations. Most models also include extensive routines for data management, including input and output procedures, and possibly including graphics and statistical capabilities.

Computer modeling became an integral part of storm drainage planning and design in the mid-1970s. Several agencies undertook major software developments and these were soon supplemented by a plethora of proprietary models, many of which were simply variants on the originals. The proliferation of personal computers in the 1990s has made it possible for virtually every engineer to use state-of-the-art analytical technology for purposes ranging from analysis of individual pipes to comprehensive stormwater management plans for entire cities.

In addition to the simulation of hydrologic and hydraulic processes, computer models can have other uses. They can provide a quantitative means to test alternatives and controls before implementation of expensive measures in the field. If a model has been calibrated and verified at a minimum of one site, it may be used to simulate non-monitored conditions and to extrapolate results to similar ungauged sites. Models may be used to extend time series of flows, stages and quality parameters beyond the duration of measurements, from which statistical performance measures then may be derived. They may also be used for design optimization and real-time control.

A local staff or design engineer will typically use one or more of these pieces of software in stormwater facility design and review, according to the design objectives and available resources. However, it should be kept in mind that proper use of computer modeling packages requires a good knowledge of the operations of the software model and any assumptions that the model makes. The engineer should have knowledge of the hydrological, hydraulic and water quality processes simulated and knowledge of the algorithms employed by the model to perform the simulation.

B.2 Types of Models

In urban stormwater management there are typically three types of computer models that are commonly used: *hydrologic*, *hydraulic* and *water quality* models. There are also a number of other specialty models to simulate ancillary issues (some of which are sub-sets of the three main categories) such as sediment transport, channel stability, lake quality, dissolved oxygen and evapotranspiration, etc.

B.2.1 Hydrologic Models

Hydrologic models attempt to simulate the rainfall-runoff process to tell us “how much water, how often.” They use rainfall information or models to provide runoff characteristics including peak flow, flood hydrograph and flow frequencies. Hydrologic models can be either:

- *Deterministic – giving one answer for a specific input set, or*
- *Stochastic – involving random inputs giving any number of responses for a given set of parameters;*
- *Continuous – simulating many storm events over a period of time, or*
- *Single Event – simulating one storm event;*
- *Lumped – representing a large area of land use by a single set of parameters, or*
- *Distributed – land areas are broken into many small homogeneous areas each of which has a complete hydrologic calculation made on it.*

B.2.2 Hydraulic Models

Hydraulic models take a known flow amount (typically the output of a hydrologic model) and provide information about flow height, location, velocity, direction, and pressure. Hydraulic models share some of the differing characteristics of hydrologic models (continuous vs. single event) and add the following:

- *One-dimensional – calculating flow information in one direction (e.g. downstream) only, or*
- *Multi-dimensional – calculating flow information in several dimensions (e.g. in and out of the channel and downstream);*
- *Steady – having a single unchanging flow velocity value at a point in the system, or*
- *Unsteady – having changing flow velocities with time;*
- *Uniform – assuming the channel slope and energy slope are equal, or*
- *Non-uniform – solving a more complex formulation of the energy and momentum equations to account for the dynamic nature of flows.*

For most problems encountered in hydraulics, a simple one-dimensional, steady model will work well. But if the volume and time distribution of flow are important (for example, in a steeper stream with storage behind a series of high culvert embankments) an unsteady model is needed. If there is a need to predict with accuracy the ebb and flow of floodwater out of a channel (for example in a wide, flat floodplain where there are relief openings under a road) then a 2-dimensional model becomes necessary. If pressure flow and the accurate computation of a hydraulic grade line are important an unsteady, a non-uniform model with pressure flow calculating capabilities is needed.

B.2.3 Water Quality Models

The goal in water quality modeling is to adequately simulate the various processes and interactions of stormwater pollution. Water quality models have been developed with an ability to predict loadings of various types of stormwater pollutants.

Water quality models can become very complex if the complete cycle of buildup, wash-off and impact are determined. These models share the various features of hydrologic and hydraulic models in that it is the runoff flow that carries the pollutants. Therefore, a continuous hydrologic model with estimated pollution concentrations becomes a continuous water quality pollution model. Water quality models can reflect pollution from both point and nonpoint sources.

Water quality models tend to have applications that are targeted toward specific pollutants, source types or receiving waters. Some models involve biological processes as well as physical and chemical processes. Often great simplifications or gross assumptions are necessary to be able to model pollutant accumulations, transformations and eventual impacts.

Detailed short time increment predictions of “pollutographs” are seldom needed for the assessment of

receiving water quality. Hence, the total storm event loads or mean concentrations are normally adequate. Simple spreadsheet-based loading models involve an estimate of the runoff volume which, when multiplied by an event mean concentration, provide an estimate of pollution loading. Because of the lack of ability to calibrate such models for variable physical parameters, such simple models tend to be more accurate the longer the time period over which the pollution load is averaged. An annual pollutant load prediction may tend toward a central estimate, while any specific storm prediction may be grossly in error when compared to actual loadings because antecedent conditions vary widely from week to week. Simulation models have the ability to adjust a number of loading parameters for calibration purposes and can simulate pollution accumulation over a long period. They can then more reliably predict loadings for any specific storm event.

While calibration data is not always needed in hydrologic or hydraulic models for an acceptably accurate answer, in water quality models the non-calibrated prediction is often off by orders of magnitude. Water quality predictions are not credible without adequate site-specific data for calibration and verification. However, even without specifically accurate loading values relative effects of pollution abatement controls can be tested using uncalibrated models.

B.2.4 Computer Model Applications

Stormwater computer models can also be categorized by their use or application:

Screening-level models are typically equations or spreadsheet models that give a first estimate of the magnitude of urban runoff quality or quantity. At times this is the only level that is necessary to provide answers. This is true either because the answer needs to be only approximate or because there is no data to justify a more refined procedure.

Planning-level models are used to perform “what if” analysis comparing in a general way design alternatives or control options. They are used to establish flow frequencies, floodplain boundaries, and general pollution loading values.

Design-level models are oriented toward the detailed simulation of a single storm event for the purposes of urban stormwater design. They provide a more complete description of flow or pollution values anywhere in the system of concern and allow for adjustment of various input and output variables in some detail. They can be more exact in the impact of control options, and tend to have a better ability to be calibrated to fit observed data.

Operational models are used to produce actual control decisions during a storm event. They are often linked with SCADA systems. They are often developed from modified or strongly calibrated design models, or can be developed on a site-specific basis to appropriately link with the system of concern and accurately model the important physical phenomena.

B.3 Summary of Acceptable Models

Computer models can be simple, representing only a very few measured or estimated input parameters or can be very complex involving twenty times the number of input parameters. The “right” model is the one that: (1) the user thoroughly understands, (2) gives adequately accurate and clearly displayed answers to the key questions, (3) minimizes time and cost, and (4) uses readily available or collected information. Complex models used to answer simple questions are not an advantage. However, simple models that do not model key necessary physical processes are useless.

There is no one engineering model or software that addresses all hydrologic, hydraulic and water quality situations. Design needs and troubleshooting for watershed and stormwater management occur on several different scales and can be either system-wide (i.e., watershed) or localized. System-wide issues can occur on both large and small drainage systems, but generally require detailed, and often expensive, watershed models and/or design tools. The program(s) chosen to address these issues should handle both major and minor drainage systems. Localized issues also exist on both major and minor drainage systems, but unlike system-wide problems, flood and water quality solution alternatives can usually be developed quickly and

cheaply using simpler engineering methods and design tools.

Table B.1 lists several widely used computer programs and modeling packages which are acceptable to CFW. The use of a program that is not on this list must be accepted by TPW.

For the purposes of this table, major drainage systems are defined as those draining to larger receiving waters. These are typically FEMA-regulated streams, or lakes or reservoirs. Minor drainage systems are smaller natural and man-made systems that drain to the more major streams. Minor drainage systems can have both closed and open-channel components and can include, but are not limited to, neighborhood storm sewers, culverts, ditches, and tributaries.

Table B.1 Stormwater Modeling Programs and Design Tools							
	Major System Modeling	Minor System Modeling	Hydrologic Features	Hydraulic Features	Water Quality Features	Unsteady Flow	2-D Flow
Hydrology Software							
HEC-1	X		X				
HEC-HMS	X		X				
PondPack		X	X	X			
StormCAD							
GEOPAK		X	X	X			
SWFHYD ¹	X		X				
Hydraulics Software							
HEC-RAS	X	X		X		X	
InfoWorks SD	X	X	X	X	X	X	X
XPSWMM	X	X	X	X		X	X
EPA SWMM	X	X	X	X	X	X	
ICPR	X	X	X	X		X	
Water Quality Software							
HSPF	X		X		X		
BASINS	X		X	X	X		
QUAL2K	X			X	X		
Design Tools							
Macra1(Gabion Channels)	X	X		X			
GeowacWIN (Gabion Retaining Walls)	X	X		X			
HY8 (Culverts and Energy Dissipators)	X	X		X			
CulvertMaster		X		X			
FlowMaster		X		X			
¹ Only where model currently exists							

Appendix C – City of Fort Worth Miscellaneous Details and Specifications

Straight Drop Spillways

Overview

The three parts of a straight drop spillway (see Figure C.1) are:

- Upstream draw down reach
- Drop opening
- Downstream hydraulic jump reach

The drop is usually constructed of steel sheet piling. Reinforced concrete lining and riprap are placed upstream and downstream of the drop structure for erosion and scour protection.

Design Criteria

Design criteria for straight drop spillways are:

- Comply with general design criteria for all transition control structures as described in the “General Design Criteria” below.
- Design steel sheet piling to prevent bending or rotating.
- Coat steel sheet piling in accordance with industry standards to reduce rusting and scaling.
- Use concrete lining on the entire cross-section upstream and downstream of the drop.
- Tie the concrete lining to the steel sheet piling drop structure.
- Use a minimum six (6) inch thick slab on the downstream concrete lining due to the impact load and potential severe turbulence.
- Determine length of concrete lining upstream and downstream of the drop.
- Include twenty (20) feet of riprap at the ends of the concrete slope paving to decrease flow velocities and protect the concrete toe from scour (see Chapter 3.9 Stone Riprap Design)

General Design Criteria

General design criteria for transition control structures are:

- Design for a range of flows and tailwater conditions up to and including the 1% exceedance event.
- Conduct a geotechnical investigation to assist with design of the structure.
- Locate transition control structures where flow is straight. Avoid channel bends and high turbulence areas, if possible.
- Provide structural erosion protection where maximum velocities are exceeded upstream and downstream of the transition control structure and where the hydraulic jump occurs.
- For drop structures in lateral channels at the confluence with the receiving channel:
 - Locate the drop just inside the ultimate right-of-way of the receiving channel.
 - Design the hydraulic jump to occur before it enters the receiving channel.

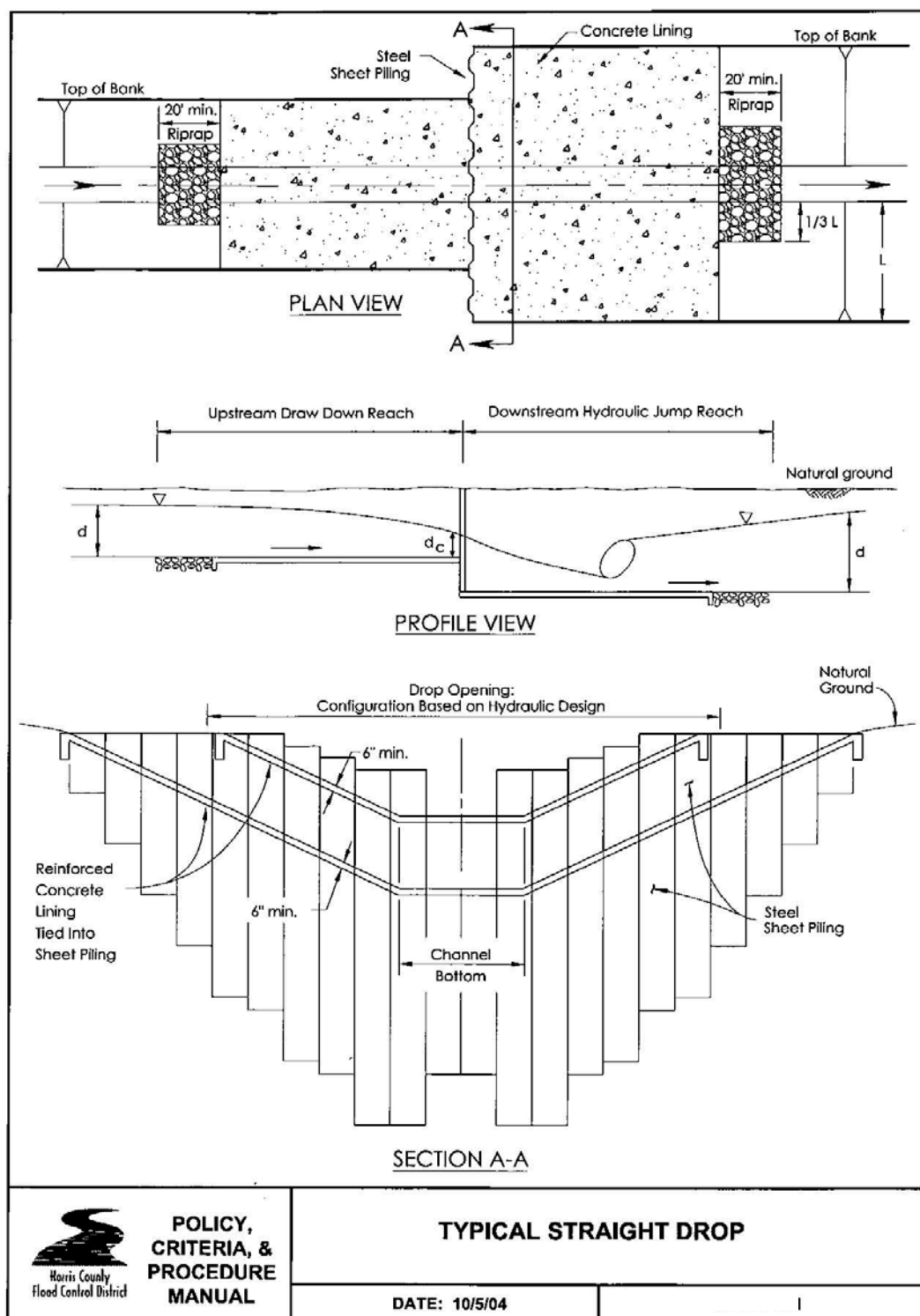


Figure C.1 Typical Straight Drop

Baffled Chutes

Overview

Baffled chutes are used to dissipate energy at abrupt changes in channel flowline and require no tailwater to be effective. They are generally selected over straight drop spillways for larger drop heights and where lateral channels drop into main channels. Baffle blocks prevent undue acceleration of the flow as it passes down the chute. Since the flow velocities entering the downstream channel are low, no stilling basin is needed. A generic baffled chute is shown in Figure C.2.

Design Criteria

Design criteria for baffled chutes:

- Comply with minimum design criteria for all transition control structures in the previous General Design Criteria.
 - Use concrete lining on the entire cross section for the structure.
 - Include twenty (20) feet of riprap at the upstream end of the concrete lining to decrease flow velocities and protect the concrete toe from scour (see Chapter 3.9 Stone Riprap Design).
 - Use an applicable structural and hydraulic design methodology for baffled chutes.
 - Use fully developed watershed conditions for establishing the design flow rate to avoid rebuilding the baffled chute as the watershed develops.
-

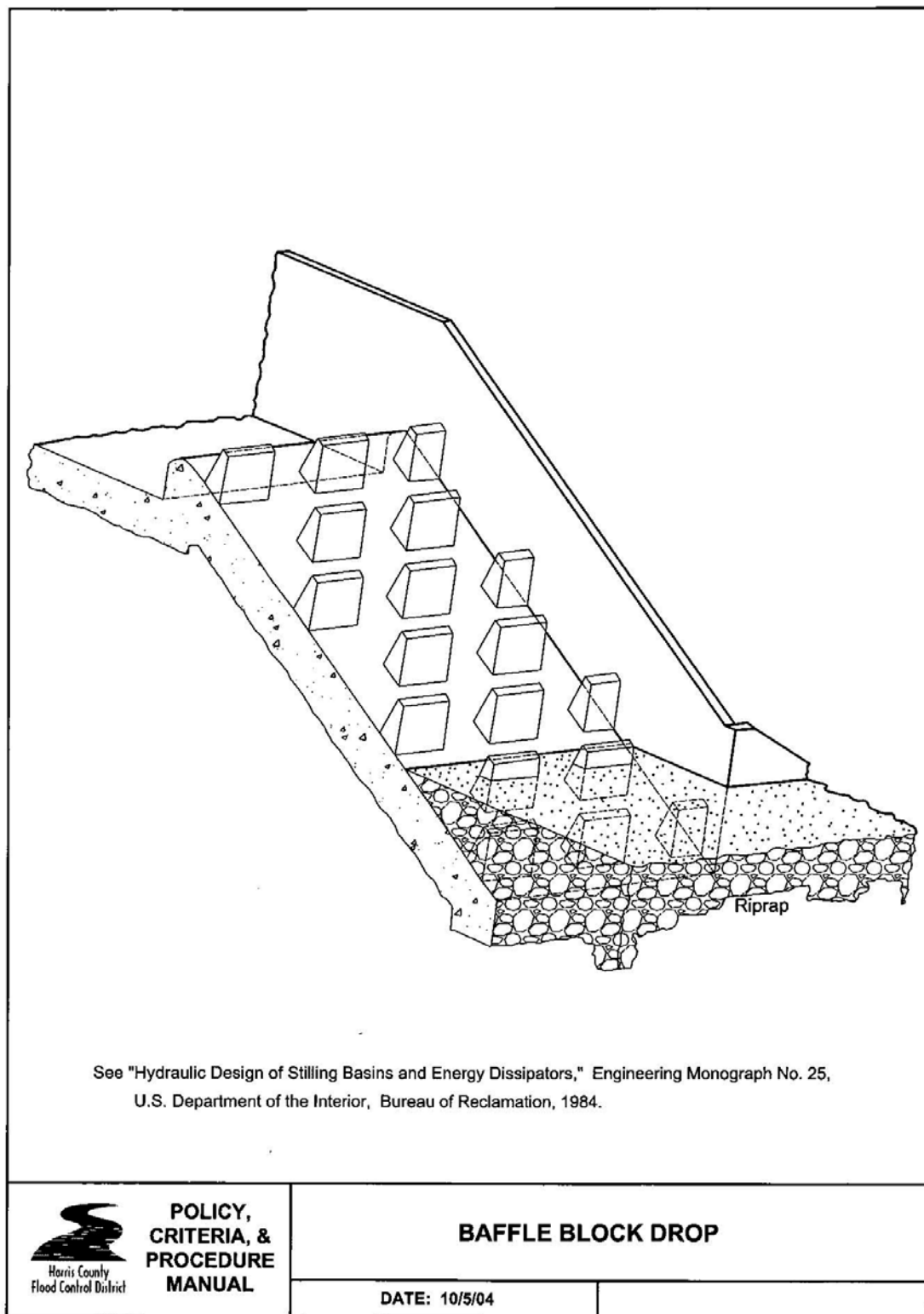


Figure C.2 Baffle Block Drop

Appendix D – Sediment and Erosion Control Guidelines for Small Sites

SEDIMENT AND EROSION CONTROL GUIDELINE FOR SMALL SITES

As a builder, you are responsible for controlling soil and sediment on your job site during construction. This fact sheet provides some general guidelines that may be used for sites that involve construction activity that disturbs less than one acre of soil and are not required to obtain a Construction Stormwater Permit, but have the potential to discharge sediment and other non-stormwater discharges prohibited by city ordinance.

PERIMETER CONTROLS

Perimeter controls are used to capture sediment before it leaves the construction site. These types of controls include vegetative buffers, silt fencing, sediment traps and sediment logs. Sediment traps are small stormwater detention areas that allow sediment to settle out of runoff. A type of trap shown below (see sketch below) is called a cut-back curb. Cut-back curbs are small traps used to pond water behind the curb and gutter system. Frequent monitoring and maintenance of sediment traps is needed to ensure that deposited sediment doesn't reduce their capacity.

INLET PROTECTION

The purpose of inlet protection devices is to reduce the amount of sediment carried into the storm drain system. The device slows runoff and filters out sediment particles at the storm drain. Inlet protection devices are the last line of defense for capturing sediment and should only be used if no other control measures are adequate as they can cause property damage due to flooding if not frequently inspected and maintained.

STABILIZED CONSTRUCTION EXIT

A stabilized construction exit is used to reduce the amount of sediment tracked from a site onto the street by vehicles or equipment. A stabilized construction exit is typically made by creating a driveway from 1.5 inches or larger aggregate on top of a geotextile mat located where vehicles or equipment exit the site.

TEMPORARY COVER

Temporary cover is used to reduce erosion and should be applied immediately to areas where construction activity has ceased and is not planned to resume within 21 days or to temporary stockpiles of materials stored on site. Stockpiled material consists of gravel, sand, excavated soil, topsoil or any other similar material. These piles should never be placed where stormwater is conveyed (e.g., curb and gutter, drainage ditch). Temporary cover may be obtained by planting fast-growing plants like rye, oats, or winter wheat, or it may be obtained by spreading straw, wood chips, erosion control blankets or geotextile fabric over the area.

WASTE DISPOSAL

All waste and construction debris should be properly stored to prevent spills, leaks or discharges and to protect it from being carried away from the site by wind or water. All waste and debris should be properly disposed of in compliance with local, state and federal regulations.

CONCRETE WASH WATER

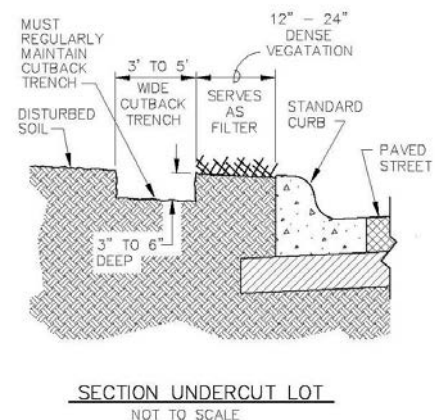
Concrete wash water must never be discharged or allowed to drain into the storm drain or adjacent properties. Wash water disposal must be limited to a defined area of the site or to an area designated by the developer for cement washout. The area must be sufficient to contain all wash water and residual cement.

INSPECTIONS AND HOUSEKEEPING

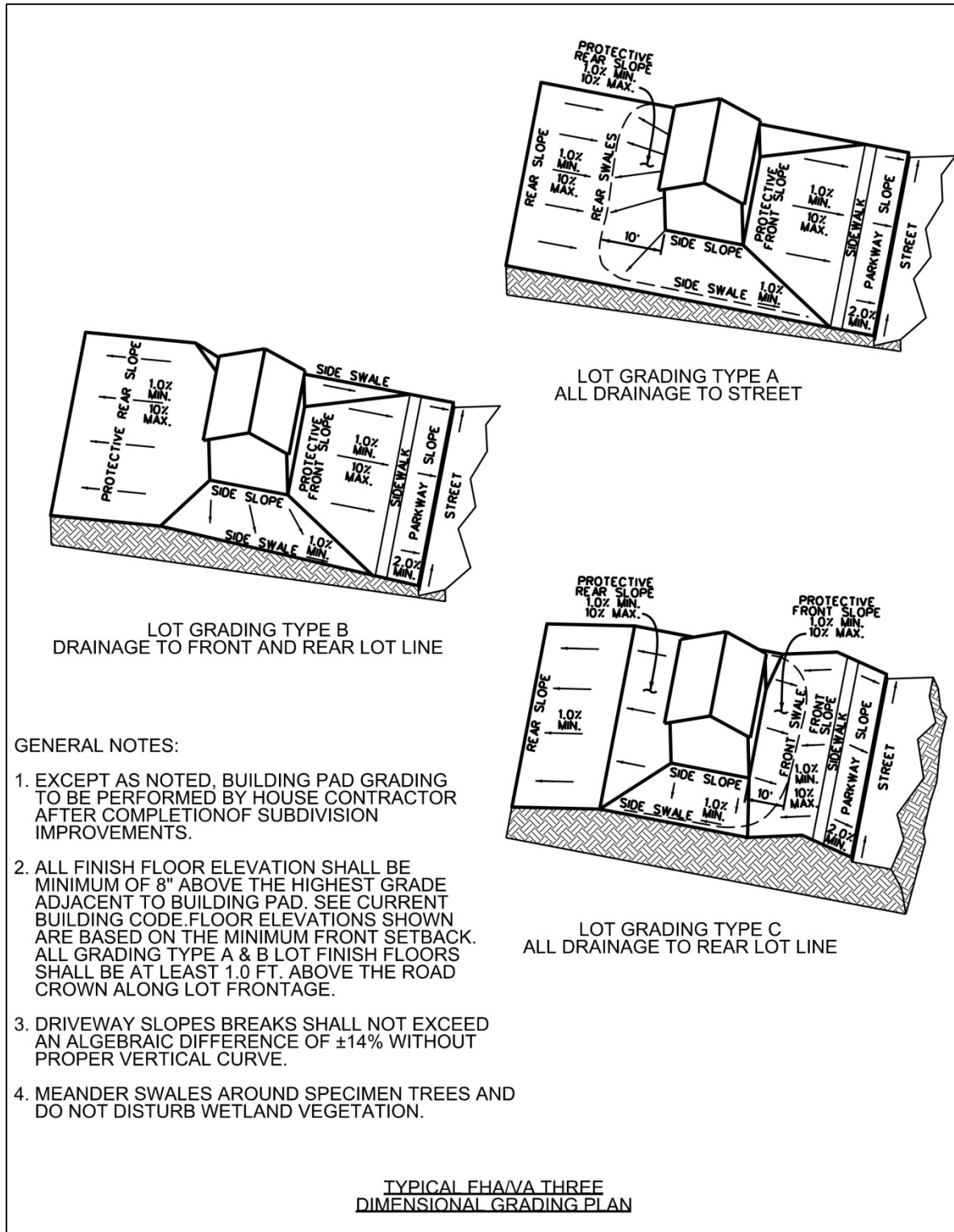
To ensure your control measures are in good condition and working properly, they should be inspected weekly and after any storm event. Good housekeeping should be practiced at all times. Housekeeping includes cleaning and maintaining all erosion and sediment control devices, cleaning sediment off streets, and picking up all debris that has been deposited off site by wind or water. Soil or sediment that has been deposited or tracked onto any street should be removed by the end of the day or before the next rain event.

REMOVAL OF EROSION CONTROLS

Erosion control devices should remain in place and maintained until permanent vegetation is established. Once permanent vegetation is established, the control measures can then be removed.



Appendix E – Single Family Residential Lot Drainage



Single Family Residential Lot Drainage Types (Federal Housing Administration, Land Planning Bulletin No. 3)

Block Grading Types

(Source: Federal Housing Administration Land Planning Bulletin No. 3)

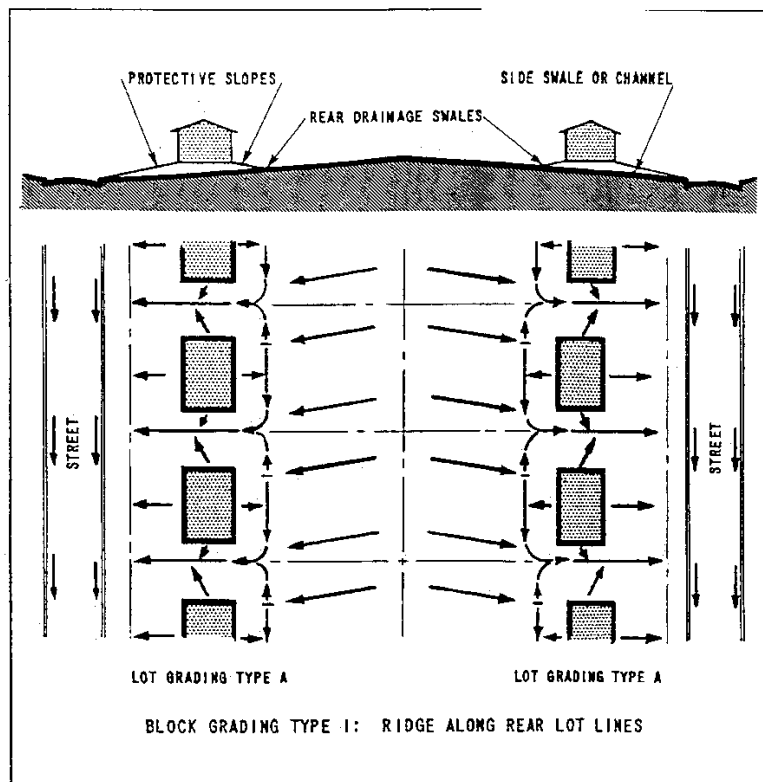
Block Grading Type 1 has a ridge along the rear lot lines and each lot is graded to drain surface water directly to the street independent of other properties. It is the most simple and desirable type of block grading. Topography, however, will often require other types of block grading types.

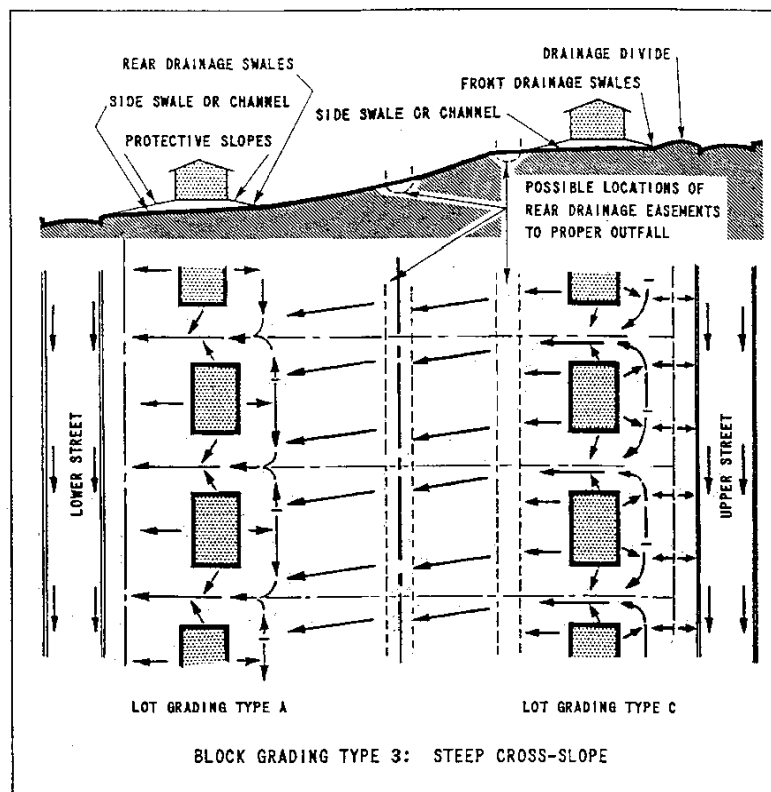
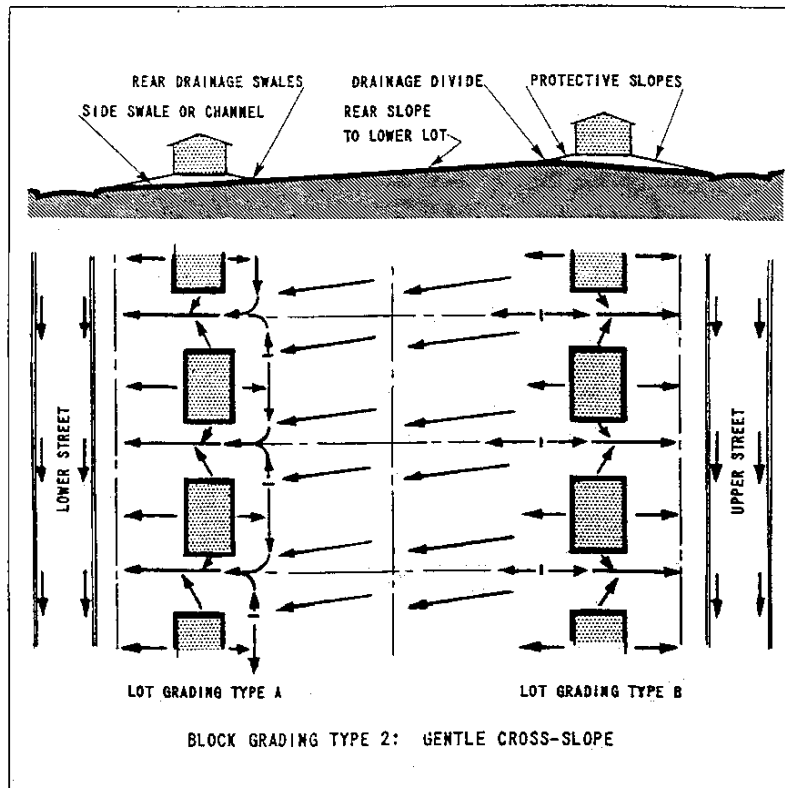
Block Grading Type 2 for a gentle cross-slope involves drainage of some surface water from lots of the high side of the block across the lower tier of lots. Difficulties are not encountered, however, if slopes are gentle and if the water always drains over short routes to the streets and does not concentrate or accumulate in volume at any point inside the block.

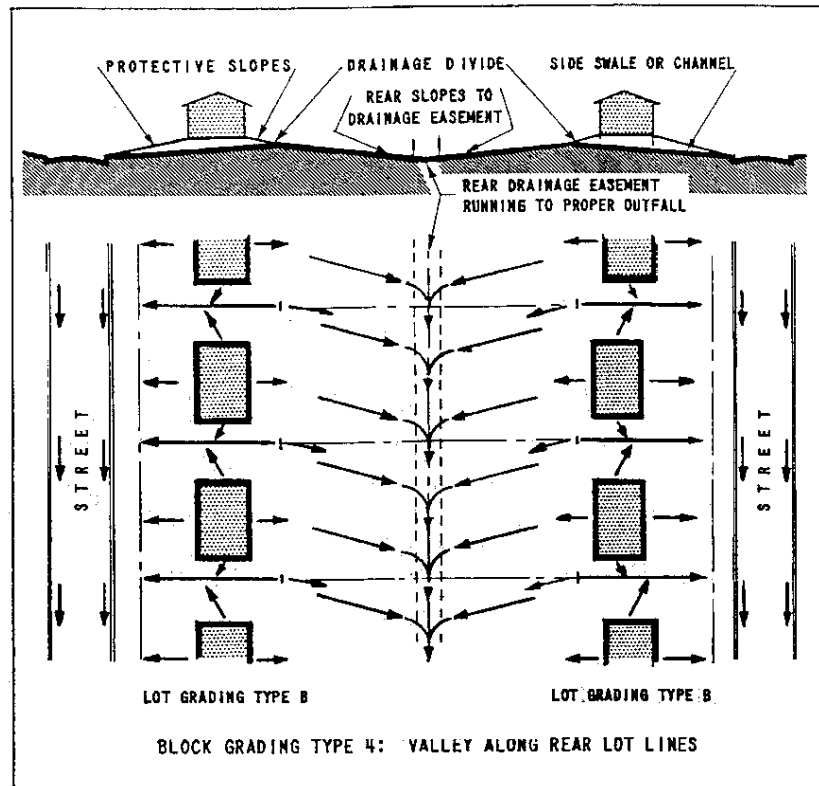
Block Grading Type 3 for steep cross-slopes and Type 4 for a valley along rear lot lines require special provision for block drainage and erosion control.

Erosion is controlled by provision of intercepting drainage swales in easements at the top of the rear lot incline or at intermediate locations along it, and by treatment of the steep slope itself.

Drainage easements in Block Types 3 and 5 must have alignment, width, and improvements appropriate for the expected use and maintenance. Assurance of a permanent outfall is essential. The easements must be permanently established by proper legal methods, with continuous maintenance assured by public authority, property-owners' association or individual owners, as appropriate to the situation. Walls, buildings and any other obstructions to drainage flow, such as dense planting or tight fencing, must be legally prohibited in the easement area.







Appendix F – Stormwater Utility Fee Credit Policy

Stormwater Utility Fee Credit Policy

Development Incentives and *Integrated* Design Point System



Transportation and Public Works Department
STORM WATER UTILITY FEE CREDIT POLICY

Authority and Purpose

The City of Fort Worth (City) adopted a Storm Water Utility in July 2006 to provide stable and equitable funding for its storm water management program. Developed properties are charged monthly fees based primarily on the amount of impervious area on a parcel of property. The ordinance establishing the utility also gives the Transportation and Public Works Director the authority (Section 12.5-343 (C)) to grant credits to rate payers who voluntarily use storm water management techniques or Best Management Practices (BMP's) to offset the impacts of their property on storm water runoff. These credits are applied as percent discounts to regular monthly storm water fees.

A general scheme of granting credits was developed by a citizen task force and presented to the City Council for comment in 2008. The purpose of this Credit Manual is to set out the specific conditions that must be achieved to qualify for these credits and to establish the administrative procedures for applying the credits to individual properties.

Eligibility

Only non-single family residential properties are eligible for a credit.

Types of Credits

Individual properties can be eligible for multiple credits up to a maximum total credit per property of 40%. Individual credits are available for the following BMP's:

- | | |
|--------------------------------|-----|
| • Industrial Permit Compliance | 10% |
| • Detention Maintenance | 5% |
| • Zero Discharge | 40% |
| • Channel Protection Detention | 10% |
| • Water Quality Treatment | 25% |
| • Inlet Trash Collection | 10% |
| • Parking Lot Sweeping | 5% |
| • Student Education | 10% |
| • Adopt a Creek | 10% |

Each credit listed above is given to encourage voluntary practices which will benefit the storm water program. In the case of Industrial Permit Compliance credit, the credit builds upon existing requirements established by the Texas Commission on Environmental Quality (TCEQ) and is available for participating in a voluntary self-assessment and reporting system, and for achieving a higher level of compliance with current regulations. A credit is also given for detention maintenance to encourage self-assessment and reporting related to operating and maintaining those facilities in accordance with adopted O&M plans.

No credit is given for detention per se, since detention is often required by regulations which prohibit increase in discharge rates which adversely impact downstream infrastructure and properties. Under those circumstances, it is sometimes economical to “over-detain” so that the discharge rate is less than pre-developed conditions, in which case the detention might alleviate existing flooding conditions downstream. In those situations, the City may be willing to enter into a cost-share relationship in order to achieve desirable public benefits downstream. These cases, however, will be handled on an individual basis and in accordance with the City’s adopted policies.

Engineering Documentation

Several of the individual credits apply to the treatment of runoff from specific impervious areas and may or may not apply to the property as a whole. Technical information may be required from a licensed Professional Engineer to establish the impervious area served by a particular BMP as well as documenting compliance with City’s design standards. These requirements are cited below as they apply to specific credits.

Administration of Credit Program

The storm water credits program will be administered as follows:

- The Engineering Manager will be responsible for the overall administration of the program.
- The Drainage Review Engineer will be the point of contact for accepting and reviewing applications for all credits except for the Industrial Permit Compliance credit. The Drainage Review Engineer will review and approve applications for these credits and certify the total amount of credit associated with each application.
- The Environmental Services Division (ESD) will be responsible for administering the Industrial Permit Compliance credit. This will include reviewing and approving applications, inspections, and annually certifying that credits should be extended or terminated each year.
- A Storm Water Utility Database Technician (GIS) will be responsible for amending the storm water account records to reflect changes in credits. Credits for Industrial Permit Compliance will be approved by the ESD; all other credits will be approved by the Drainage Review Engineer.
- A Storm Water inspector will receive and review annual self-inspection reports and conduct independent inspections of storm water control features (BMP’s) as appropriate to insure that these facilities are being maintained properly and in accordance with adopted Maintenance Plans.

Annual Reporting

Annual self-reports will be required on March 31 to document program compliance for the preceding calendar year. If the self-reports are incomplete or are not submitted to the City by the required date, the facility shall be considered to be in non-compliance with the credit program requirements and the fee credit will be suspended. Fee credit suspension will remain in effect for a minimum of 3 months

and will not be reinstated until the complete annual report is received with documentation that the program is being implemented as intended.

Industrial Facility Credit

Industrial facilities in the City of Fort Worth that are required by the TCEQ to obtain coverage under the Multi-Sector General Permit (TXR050000) for storm water discharge, or another applicable storm water general permit (TXG110000, TXG340000) or individual permit, may be eligible for a 10% credit applied to the City's storm water utility fee, if:

- (a) The industry facility is consistently in compliance with all permit requirements;
- (b) Permit required water quality testing results are consistently at or below their benchmark levels or permit required effluent limits during each sampling event. For results that exceed benchmarks or effluent limits appropriate actions, documented in the Storm Water Pollution Prevention Plan, must be taken to reduce pollutant discharge. Continued elevated levels may result in suspension from the fee credit program;
- (c) Copies of the water quality test results are submitted to the City, and
- (d) A copy of the facility's annual compliance inspection report and a copy of the facility Storm Water Pollution Prevention Plan required by the permit are provided to the City.

Facilities with a No Exposure Certification (NEC) also are eligible for the fee credit if compliance with all NEC requirements is maintained.

Detention Maintenance Credit

A 5% credit will be given for impervious areas draining into detention basins and retention ponds which are maintained in accordance with a city approved maintenance plan. The owner of the facility must submit an annual self-report every March 31 in order to document that the required maintenance is being provided.

Zero Discharge Credit

A credit of 40% will be given for impervious areas which drain to a retention pond that is designed and operated to contain runoff from a 100 year 24 hour storm without discharge. This credit is intended for those situations where rainwater runoff is stored for later re-use.

Water Quality Treatment Credit

A 25% credit will be given for impervious areas draining to a water quality treatment control that removes 70% or more of the Total Suspended Solids (TSS) for the Water Quality Protection Volume as defined in the City's *Storm Water Management Design Manual (Design Manual)*. Pro-rated credits may be applied where less than 70% TSS removal is achieved. Engineering certification will be required to show that these facilities are designed and constructed in accordance with applicable City standards and meet the level of treatment herein specified.

Channel Protection Detention Credit

A 10% credit will be given for impervious areas draining to a detention or retention facility that is designed to discharge a one year storm over 24 hours. The purpose of this control is to reduce the impact of increased flows and velocities that are normally associated with urban development.

Engineering certification will be required to show that the control complies with applicable City design standards.

Inlet Trash Collection

A 10% credit will be given for impervious areas draining to inlets that are designed and operated to collect litter and sediment for minor flows of less than one year storm frequency. Approval must be given for the specific design of the fitting, including manufacturer's recommended maintenance frequency. Annual self-reporting will be required.

Parking Lot Sweeping

A 5% credit will be given for parking lots swept at least once weekly. Annual self-reporting will be required to document coverage and sweeping frequency.

Student Education

A 10% credit will be given for impervious areas contained within public or private educational facilities for K-12 grades, where an average of one hour/student of age appropriate storm water related teaching is provided each year. Eligible topics include flood protection, public safety and environmental stewardship related to storm water runoff, subject to approval by the City. Annual self-reporting will be required.

Adopt a Creek

A 5% credit will be given for impervious areas associated with a public or private school served by a creek or channel. The purpose of this credit is to reward the removal of litter from along creeks and channels within the City while fostering a greater sense of environmental stewardship on the part of those individual who participate in the clean-up activity. Details have not yet been developed to govern this credit, but semi-annual clean-up projects are envisioned where civic organizations would provide volunteers in a one day/year activity that would be supported by the City providing organization, trash bags, solid waste pick-up, promotion and public recognition including appropriate signage.

Property Owner Associations

In the case of a detention basin or water quality treatment control such as a properly designed wet pond, the credit for that control may be applied to the nearest impervious area owned by the property owner association responsible for maintaining the control even though run-off from the impervious area subject to the credit is not treated by the control. For example, a property owner association parking lot might not drain to a control maintained by the association, but the credit could still be applied as though it did, up to the 40% maximum credit limit.

Fees

No fees are required to submit an application for a storm water credit. The cost of administering this program will be borne solely by the Storm Water Program.

Application for Credits

All applicants must complete the attached Application for Storm Water Fee Credit. Industrial facilities applying for the Industrial Permit Compliance credit must also complete the Supplemental Industrial Permit Information form. All required attachments indicated in the forms or specified above must be included for the application to be considered complete.

The initial review of Storm Water Utility Credit Applications will be completed within 60 days of the receipt of the application form and required documentation. The application forms will be checked for completeness and accuracy. If deficiencies are found during the review, a deficiency letter will be sent to the applicant's contact person. Upon receipt of required additional information, the review will resume and be completed within 60 days of receipt of additional information.

For the Industrial Permit Compliance credit and certain other credits, an inspection may be required. Where this is required, a City inspector will contact the applicant to schedule an initial facility inspection to establish current compliance status, discuss any deficiencies that require correction, and schedule a follow-up inspection if necessary.

Upon initial qualification, a letter will be sent to the applicant notifying them of approval of the credit. The fee reduction will be applied the next regular billing cycle.

Inspections

Upon application for a credit, the applicant shall grant the City a right-of-entry to inspect the site at any time in order to verify the information submitted and to confirm compliance with applicable program requirements. If, after its review or inspection, the City finds the application to be inaccurate or the facility to be out of compliance, the applicant will be notified in writing and given up to 45 days to correct the deficiency. The applicant must provide written documentation to the City within 45 days of the original notice by the City that the facility is now meeting all program requirements along with evidence that the deficiency has been corrected. If the deficiency is not satisfactorily corrected, the fee credit will be terminated on the following billing cycle. The credit suspension will remain in effect a minimum of 6 months, after which time the facility may reapply for the fee credit. The reapplication must include evidence that the deficiency has been corrected and that the facility has been in compliance with program requirements for at least three months prior to reapplication.

APPROVED:

William A. Verkest, P.E.

Date

		Application for Storm Water Fee Credit (Please Type or Print)	
Check One: ☐ This is the first application for credit for this facility. ☐ This is a reapplication for renewed credit after a credit suspension.			
PART I			
A Facility Information			
1. Facility Name:			
2. Physical Address of Facility: (enter in spaces below)			
Street Number:		Street Name:	
		Zip Code:	
3. Mailing Address: Is mailing address same as above? ☐ Yes ☐ If no, provide below			
Street Number:		Street Name:	
		Zip Code:	
City:		State:	
		Zip Code:	
B Applicant Contact Information			
1. Name:		2. Title:	
3. Phone No.: () Ext:		4. Fax No.: ()	
5. E-mail address:			
C Credits applied for (check all that apply)			
☐ Industrial Permit Compliance (complete <i>Supplemental Industrial Permit Information Form</i> and include all required attachments)			
☐ Zero Discharge (submit drainage study by licensed Professional Engineer)			
☐ Detention Maintenance (submit approved Maintenance Plan)			
☐ Channel Protection Detention (submit design and calculations sealed by Professional Engineer)			
☐ Water Quality Treatment (submit design and calculations sealed by Professional Engineer)			
☐ Inlet Trash Collection (submit drainage map, inlet design details and manufacturer's recommendations for operation and maintenance)			
☐ Student Education (submit information regarding curriculum and student hours).			
☐ Adopt a Creek (submit information regarding proposed clean up project, including location of creek or channel, date of activity, number of volunteers expected, and specific support by City forces needed to accomplish project)			
☐ Parking Lot Sweeping (submit map and schedule showing areas and frequency of sweeping to be accomplished)			

Storm Water Fee Credit
Application**PART II Signature and Approval**

I hereby state that the information in this application, including all attachments and supplemental forms, is true to the best of my knowledge and acknowledge that any attempt to purposely supply incorrect information may result in denial of the credit application. I further understand the review of the documents submitted by me may take up to sixty (60) days to complete and that submissions which do not contain the correct information or that are otherwise incomplete will be delayed an additional sixty (60) days after the date the corrected or missing information is provided to the City.

Signature of Applicant_____
Title_____
Date

Submit application and all attachments to:
City of Fort Worth
TPW Storm Water Management Division
1000 Throckmorton St.
Fort Worth TX 76102
ATTN: Storm Water Utility Fee Review

Case No. _____ SW Act No. _____

Credits approved: _____ %

Approved by _____ Date _____



Storm Water Fee Credit Application

Supplemental Industrial Permit Information Form

A Permit Information

1. Facility Name:

(as listed on NOI or NEC)

2. TPDES Permit No.:

3. Primary SIC Code:

4. Industrial Sector:

5. Date Industrial Operations Began:
for current owner/operator

6. Date NOI or NEC Filed with TCEQ:

B Compliance with Current TPDES Storm Water Permit

1. Have all schedules of the current permit relating to monitoring, training, implementation of Best Management Practices (BMPs) and compliance with the Storm Water Pollution Prevention Plan (SWPPP) been met for the preceding 12 month period?

-or-

For facilities with a No Exposure Certification, have all eleven of the no exposure requirements been met for the preceding 12 month period?

☐ Yes ☐ No

If the answer is no, provide a summary description of the current permit requirement/schedule that has not been met, cause for non-attainment, compliance schedule, and current efforts to complete this activity (attach additional pages if necessary).



Storm Water Fee Credit Application

Supplemental Industrial Permit Information Form

C Attachments

All required attachments must be included for the application to be considered complete (not required for facilities with No Exposure Certification).

ATTACHMENT 1	A copy of your Storm Water Pollution Prevention Plan: Include records for spills, Best Management Practice (BMP) maintenance, training, employee education, periodic inspections, and quarterly visual monitoring for the previous 12 month period. A copy of the permit does not need to be included.
ATTACHMENT 2	Most recent Annual Comprehensive Site Compliance Evaluation Report
ATTACHMENT 3	Annual Hazardous Metals Monitoring (Numeric Effluent Limitations) Have you obtained a waiver from hazardous metals testing for all or a portion of the metals and outfalls? Waivers may be obtained on a metal by metal basis, or on an outfall by outfall basis. ☐ A waiver has been obtained for all metals at all outfalls. Attach a copy of the signed waiver (form TCEQ-10425). ☐ A waiver has been obtained for only a portion of the metals and/or outfalls. Attach a copy of the signed waiver (form TCEQ-10425) and a copy of your most recent results (use EPA form 3320-1). ☐ A waiver has not been obtained. Attach a copy of your most recent results (use EPA form 3320-1).
ATTACHMENT 4	Benchmark Monitoring Report. Not all facilities must conduct benchmark monitoring. No SIC codes in Sectors I, P, R, V, W, X, Z, AB, AC, or AD require benchmark monitoring. Is Benchmark Monitoring required for your facility? ☐ Yes ☐ No If yes, attach a copy of your most recent Report of Benchmark Monitoring Data submitted to TCEQ (Form TCEQ-20091).

Point System

All sites that wish to receive CFW stormwater fee credits must provide on-site enhanced water quality protection. Under the *integrated* Site Design Practice option, sites that accumulate a minimum number of points by incorporating *integrated* Site Design Practices are considered to have provided enhanced water quality protection.

The point system is made up of three components:

1. The initial percentage of the site that has been previously disturbed sets the minimum requirement. This is shown in the left-hand column of Table F.1.
2. A minimum required total of Water Quality Protection (WQP) points are needed to meet the basic water quality criteria. This minimum is shown in the center column of Table F.1.
3. Optional additional points can be accumulated through additional use of Site Design Practices to be eligible for developer incentives. Each developer incentive attained requires ten (10) additional Site Design Practice points above the minimum required points as shown in the right-hand column of Table F.1.

As shown in Table F.1, the initial percentage of site disturbance sets the minimum required points necessary to meet Water Quality Protection criteria. If a developer wishes to go beyond this minimum then the number of additional points required to attain specific development incentives is also given.

Table F.1 <i>integrated</i> Site Design Point Requirements		
Percentage of Site(by Area) with Natural Features Prior to Proposed Development	Minimum Required Points for Water Quality Protection (WQP)	Additional Points Above WQP for Development Incentives
> 50%	50	10 points each
20 - 50%	30	10 points each
< 20%	20	10 points each

The minimum number of points required to achieve WQP, as shown in the center column of Table F.1, depends on the proportion of undisturbed natural features that exist on the site before it is developed. It is assumed that disturbing a site that has little previously disturbed area will cause more relative environmental impact than a site that has already incurred significant site disturbance. Therefore, disturbing a “pristine” site carries a higher restoration/preservation requirement.

For the purpose of this evaluation, undisturbed natural features are areas with one or more of the following characteristics:

- Unfilled floodplain
- Stand of trees, forests
- Established vegetation
- Steep sloped terrain
- Creeks, gullies, and other natural stormwater features
- Wetland areas and ponds

The number of points credited for the use of *integrated* Site Design Practices is shown in Table F.2. To determine the qualifying points for a site, the developer must reference Table F.2 and follow the guidance for each practice in the [Planning Technical Manual](#).

Using the area of the site that is eligible for a practice as a basis, points are given for the percent of that area to which the *integrated* Site Design Practice is applied. For example, if a planned site has four (4)

acres of riparian buffer and the developer proposes to preserve two (2) acres, then the site would qualify for 50 percent of the 8 credit points for iSWM Site Design Practice 2 (Preserve Riparian Buffers), because 50 percent of the site design practice was incorporated. The actual points earned for iSWM Site Design Practice 2 would be 4 points ($0.50 \times 8 \text{ pts} = 4 \text{ pts}$). To comply with water quality protection and to apply for site design credits, the developer must submit the completed table and associated documentation or calculations to the CFW.

It should be noted that the Water Quality Protection Volume requirement is encouraged but not mandatory in the CFW, except as may be required by Tarrant Regional Water District for new facilities connecting directly with the Trinity River.

Table F.2 Point System for <i>integrated</i> Site Design Practices				
iSWM Practice No.	Practice	Percent of Eligible Area Using Practice	Maximum Points	Actual Points Earned (% practice used * max. points)
Conservation of Natural Features and Resources				
1	Preserve/Create Undisturbed Natural Areas		8	
2	Preserve or Create Riparian Buffers Where Applicable		8	
3	Avoid Existing Floodplains or Provide Dedicated Natural Drainage Easements		8	
4	Avoid Steep Slopes		3	
5	Minimize Site on Porous or Erodible Soils		3	
Lower Impact Site Design				
6	Fit Design to the Terrain		4	
7	Locate Development in Less Sensitive Areas		4	
8	Reduce Limits of Clearing and Grading		6	
9	Utilize Open Space Development		8	
10	Incorporate Creative Design (e.g. Smart Growth, LEED Design, Form Based Zoning)		8	
Reduction of Impervious Cover				
11	Reduce Roadway Lengths and Widths		4	
12	Reduce Building Footprints		4	
13	Reduce the Parking Footprint		5	
14	Reduce Setbacks and Frontages		4	
15	Use Fewer or Alternative Cul-de-Sacs		3	
16	Create Parking Lot Stormwater "Islands"		5	
Utilization of Natural Features				
17	Use Buffers and Undisturbed Areas		4	
18	Use Natural Drainageways Instead of Storm Sewers		4	

Table F.2 Point System for <i>integrated</i> Site Design Practices				
iSWM Practice No.	Practice	Percent of Eligible Area Using Practice	Maximum Points	Actual Points Earned (% practice used * max. points)
19	Use Vegetated Swale Design		3	
20	Drain Runoff to Pervious Areas		4	
Subtotal – Actual site points earned			100	
Subtract minimum points required (Table F.1)				-
Points available for development incentives				
Add 1 point for each 1% reduction of impervious surface +				
Total Points for Development Incentives				

Development Incentives

The developer can use *integrated* Site Design Practice points in excess of the minimum required for water quality protection to qualify for development incentives provided by the City. Additional points can be earned for redevelopment sites. Each reduction of one (1) percent imperviousness from existing conditions qualifies for one (1) site design point. The total points available for development incentives shall be calculated per Table F.2. Each incentive requires ten (10) additional points above the minimum point required to meet water quality criteria, as stated in Table F.1.

A list of available development incentives includes:

1. Narrower pavement width for minor arterials
2. Use of vegetated swales in lieu of curb and gutter for eligible developments
3. Reduced ROW requirements, i.e. Sidewalk/Utility Easements
4. Increased density in buildable area, floor area ratios, or additional units in buildable area
5. Expedited plans review and inspection
6. Waiver or reduction of fees
7. Local government public-private partnerships
8. Waiver of maintenance, public maintenance
9. Stormwater user fee credits or discounts
10. Rebates, local grants, reverse auctions
11. Low interest loans, subsidies, tax credits, or financing of special green projects
12. Awards and recognition programs
13. Reductions in other requirements

The Development Incentives and *Integrated* Design point system described above are not adopted by CFW. CFW development policies, however, encourage the incorporation of stormwater controls for achieving stormwater quality goals through the acceptance of perpetual, limited maintenance of preserved streams and by affording flexibility in placing stormwater quality treatment controls in land required for other purposes such as parks or commercial landscape areas.

The CFW has adopted a stormwater fee credit system, which provides monthly fee discounts where BMP's are provided. These include credits for the following structural BMP's:

- Water Quality Controls—25% credit

- Channel Protection Detention—10% credit
- Detention Basins—5% credit for maintenance and annual self-inspection in accordance with Private Maintenance Agreement

These credits apply to fees associated with impervious areas treated by these controls. Water quality and channel protection controls must be designed in accordance with standards adopted in this manual.

**CITY OF WATAUGA, TEXAS
ORDINANCE NO. 2024-XXX**

**AN ORDINANCE OF THE CITY COUNCIL OF THE CITY
OF WATAUGA, TEXAS ADOPTING REVISIONS OF
CHAPTER 105, ARTICLE II AND CHAPTER 113;
PROVIDING FOR REPEAL; PROVIDING FOR
SEVERABILITY; PROVIDING AN EFFECTIVE DATE;
AND CONTAINING OTHER PROVISIONS RELATING TO
THE SUBJECT.**

WHEREAS, the City Council of the City of Watauga, Texas (“City”) recognizes that the revisions of Chapter 105, Article II of the Code of Ordinances is required to better enforce the design criteria for Stormwater Construction.

NOW, THEREFORE, BE IT ORDAINED by the City Council of the City of Watauga, Texas that:

I.

The facts and recitations set forth in the preamble of this ordinance are hereby found to be true and correct and adopted herein for all purposes.

II.

The City of Watauga Code of Ordinances is hereby amended by deleting subsection 105-23(a) of Chapter 105 thereof and substituting therefore a new subsection 105-23(a) of Chapter 105 to provide as follows:

(a) Erosion control practices and Sediment control practices shall meet the design criteria set forth in the Stormwater Construction Criteria section of the Fort Worth Stormwater Criteria Manual. Furthermore, grading and waterway crossings shall meet the design criteria set forth in the International Building Code, as adopted by the city, and shall be adequate to prevent transportation of sediment from the site subject to written approval by the director of public works of the city. Cut and fill slopes shall be no greater than a 5:1 ratio, except as approved by the city public works director to meet other community or environmental objectives.

III.

The City of Watauga Code of Ordinances is hereby amended by deleting subsections 105-56(b), 105-56(c), and 105-56(d) of Chapter 105 thereof and substituting therefore new subsections 105-56(b), 105-56(c), and 105-56(d) of Chapter 105 to provide as follows:

(b) Detention facilities shall meet the design criteria set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

(c) Flood routing shall meet the criteria set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

(d) Stormwater facilities shall meet the design criteria set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

IV.

The City of Watauga Code of Ordinances is hereby amended by deleting subsection 113-4(d) of Chapter 113 thereof and substituting therefore a new subsection 113-4(d) of Chapter 113 to provide as follows:

(d) Storm drainage system. The subdivider of any tract of land will be required to construct at his own expense a storm drainage system which shall be adequate to meet or exceed the drainage requirement as set forth by the director of public works and the city engineer. In addition to meeting the above requirement, the drainage system construction shall comply with any one, all or a combination of the below listed approved methods of construction:

1. Underground system. Which shall consist of an enclosed below-grade system adequate to meet the requirements set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

2. Aboveground system. Which shall consist of an open channel adequate to meet the requirements set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual. The system shall be constructed in such a manner that all sloping surfaces and channel base shall be finished with any, all, or a combination of any of the below listed materials:

- a. Concrete. Adequate to prevent the erosion of soil from the slope and base of the drainage channel.
- b. Rock and/or combination rock and concrete. Adequate to prevent the erosion of soil from the slope and base of the drainage channel.
- c. Grass sod. Provided grade does not exceed a five-foot to one-foot ratio and the sod is adequate to prevent the erosion of soil from the slope and base of the drainage channel.
- d. Grass seed hydromulch. Provided the grade does not exceed a five-foot to one-foot ratio and the seeded hydromulch is adequate to prevent erosion of the soil and/or seed prior to its germination from the

slope and base of the drainage channel.

V.

The City of Watauga Code of Ordinances is hereby amended by deleting subsections 113-39(a), 113-39(b), 113-39(c), 113-39(d), 113-39(e), and 113-39(f) of Chapter 113 thereof and substituting therefore new subsections 113-39(a), 113-39(b), 113-39(c), and 113-39(d) of Chapter 113 to provide as follows:

(a) Generally. The design of storm drainage improvements in the city shall be based on discharges determined by the methods specified in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

(b) Runoff Coefficient. The runoff coefficient shall be determined for each drainage area from the current land use plan of the city in accordance with the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

(c) Storm drainage design. Before the construction or reconstruction of any street and before the construction of any building or other structure on a site of three or more acres, an engineering investigation shall be made to determine the necessity of on-site or off-site storm drainage facilities to meet the requirements of this article.

(d) Surface drainage on streets. Storm drainage inlets shall be located and designed in accordance with the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

1. Surface drainage on private property. On lots or tracts of three acres or more, stormwater runoff shall not be permitted to drain onto adjacent property except in existing creeks, channels, or storm sewer. Stormwater runoff may be drained on the surface onto public streets providing that resulting total gutter flow does not exceed the amount specified in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

2. Storm sewer. Stormwater runoff in excess of that permitted to be carried on the surface shall be collected and transported in a storm sewer system. This system must abide by design criteria set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

3. Open channels. When the calculated pipe size for a storm sewer system exceeds 72 inches in diameter, stormwater runoff may be transported in open channels. The design for both lines and earthen channels must follow the criteria set forth in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual.

4. Bridges and culverts. In addition to satisfying the design requirements in the Stormwater Design Criteria section of the Fort Worth Stormwater Criteria Manual, bridges and culverts constructed to provide crossings of streams and open channels shall provide a clear waterway having at least the same width as the downstream channel and shall have a clear height of one foot above the

calculated upstream water depth for the design storm unless otherwise approved by the director of public works. Bridges shall have concrete lined bottoms and slopes and both bridges and culverts shall have upstream and downstream slope protection in the form of headwalls or wingwalls

VI.

This Ordinance shall be and is hereby cumulative of all other ordinances of the City of Watauga, Texas, and this Ordinance shall not operate to repeal or affect any of such other ordinances, except insofar as the provisions thereof might be inconsistent or in conflict with the provisions of this Ordinance, in which event such conflicting provisions, if any, in such other ordinance(s) are hereby repealed.

VII.

If any section, sub-section, sentence, clause or phrase of this Ordinance shall for any reason be held to be invalid, such decision shall not affect the validity of the remaining portions of this Ordinance.

VIII.

This Ordinance shall become effective and be in full force and effect from and after the date of passage and adoption by the City Council and upon approval thereof by the Mayor of the City of Watauga, Texas and publication hereof as prescribed by law.

PASSED AND ADOPTED by the City Council of the City of Watauga, Texas, the 13th day of May, 2024.

APPROVED:

ARTHUR L. MINER, MAYOR

ATTEST:

LINDA PROSKEY, CITY SECRETARY

APPROVED AS TO FORM AND LEGALITY:

DAVID M BERMAN, CITY ATTORNEY
NICHOLS JACKSON LLP

OLD EXISTING ORDINANCE PRE MAY 2024

Sec. 105-23. Design requirements.

- (a) Grading, erosion control practices, sediment control practices, and waterway crossings shall meet the design criteria set forth in the International Building Code, as adopted by the city, and shall be adequate to prevent transportation of sediment from the site subject to written approval by the director of public works of the city. Cut and fill slopes shall be no greater than a 2:1 ratio, except as approved by the city public works director to meet other community or environmental objectives.

Sec. 105-56. Design.

- (b) *Runoff calculations.* Detention/retention facilities or decorative ponds shall be designed based on a 100-year frequency storm runoff for the upstream drainage watershed area.
 - (1) *Rational method.* The rational method can be used to calculate the runoff rate and volume for drainage areas less than 750 acres. The formula for this method is $Q = CIA$.
 - (2) *Hydrograph method.* The hydrograph method will be used to calculate the runoff rate and volume for drainage areas equal to or greater than 750 acres. One of the following unit hydrograph procedures shall be used:
 - a. HEC-1 developed by the Hydrologic Engineering Center (HEC) of the U.S. Army Corps of Engineers.
 - b. TR55 developed by the U.S. Department of Agriculture, Soil Conservation Service.

Use of other hydrograph methods must be approved by the director of public works, or his designee, prior to beginning design.

- (c) *Flood routing methods.* The flood routing computer program to be used shall be either HEC-2 from the U.S. Army Corps of Engineers or TR20 from the Soil Conservation Service. Use of other computer program routing methods must be approved by the director of public works, or approved designee, prior to beginning design.
- (d) *Parameters.*
 - (1) *Inlet.* The inlet structure shall allow for the upstream 100-year runoff to be discharged to the pond in a manner which minimizes erosion.
 - (2) *Outlet.*
 - a. The outlet structure for detention basin, retention basin, or decorative pond will be constructed to minimize erosion and allow for the ten-, 25-, and 100-year storm runoff to be discharged in a controlled manner. An outlet control structure will be installed on detention/retention basins to achieve the design discharge equal to or less than the runoff rate that existed from the watershed prior to this proposed development.
 - b. An emergency outlet valve and pipe shall be installed on the outlet structure for retention basins or decorative ponds for the purpose of draining the pond. The valve and pipe shall be at least eight inches in diameter and meet all city requirements for water system pipe and valves. Installation of the emergency outlet valve and pipe shall allow the basin or pond to be drained to within one foot or less of its design bottom.
 - (3) *Storage.* The detention/retention storage basin shall be designed to store that volume required to reduce the discharge rate out of the basin to not more than the runoff rate which existed from the watershed prior to this proposed development that includes the basin. The detention/retention

-
- storage volume, excluding conservation pool, shall drain out completely within 24 hours of the end of a rainfall runoff event.
- (4) *Freeboard.* A minimum freeboard of one foot shall be required. This will be the difference in elevation between the 100-year storm design water surface elevation, plus increased elevation created by wave action, wind tide or hydraulic jump, anywhere on the detention/retention basin or decorative pond and the lowest point on the surrounding embankment within the drainage easement.
- (5) *Edge treatments.*
- a. *Detention basin.* No edge treatments will be required, but a minimum 12-foot wide, six-inch thick reinforced concrete flume with six-inch curbs along the entire length of the detention basin bottom will be installed. The flume should drain to the outlet with a minimum slope of 0.50 percent grade.
 - b. *Retention basin.* Edge treatments shall be vertical walls made from reinforced concrete, a minimum of six inches wide or brick/stone with concrete core a minimum of eight inches in total width around the entire perimeter of the pool. The bottom of the edge treatment will be designed to be below the normal pool elevation (i.e., outlet flow line) as deep as required but no less than 18 inches and the top of the edge treatment shall be above the normal pool elevation a minimum of 12 inches. The foundation and support edge treatment wall will be designed and sealed by a registered professional engineer and shown on the plans. Any deviation from these requirements must be approved by the director of public works or his authorized representative.
 - c. *Decorative pond.* The edge treatment for the decorative pond shall be the same as that for the retention basin.
- (6) *Side slopes.* The embankment side slopes for the different basins or ponds will be as noted below unless concrete lined. Concrete lined slopes may be 1.5:1 or flatter.
- a. *Detention basin.* Detention basin slopes shall be 5:1 or milder.
 - b. *Retention basin.* Retention basin slopes shall be 4:1 below normal pool depth and 5:1 above.
 - c. *Decorative pond.* Decorative pond slope requirements shall be the same as for retention basin slopes.
- (7) *Overbank.* The overbank shall be hydro-mulched or block sodded with a native grass approved by the director of public works or his authorized representative. The grass must be relatively well established prior to final approval of the construction by the city.
- (8) *Depth.*
- a. The minimum depth of the retention basin or the decorative pond will be four feet from the normal pool elevation to the bottom between the toe of slopes. The maximum depth shall be no greater than ten feet.
 - b. The maximum depth the detention storage in a parking lot can be designed for is one foot. For all other detention storage basins, the maximum depth shall not exceed ten feet.
- (9) *Velocity.* The average velocity of flow through the detention basin, retention basin, or decorative ponds shall be no greater than five feet per second.
- (10) *Erosion control.* Erosion control upstream and downstream of the basins or ponds shall be considered in the design. Erosion control systems shall be installed where necessary as determined by the director of public works, or his approved designee.

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- (11) *Aeration.* All retention basins and decorative ponds will require aeration systems be installed. The aeration system will be designed to keep the standing water from stagnating. All electrical service and maintenance costs for an aeration system shall be the responsibility of the owner/developer.
 - (12) *Water supply.* Provisions shall be made to keep the water surface elevation in a retention basin or decorative pond at the normal pool elevation. This will require the developer to submit plans and specifications for installation of a water well or wells. Another alternative is a separate irrigation service connection to the city's water system to provide the water supply to recharge the basin or pond as needed. The cost of the water used to recharge the basin or pond shall be the responsibility of the owner/developer. Recharge design shall comply with all state and federal requirements.

Sec. 113-4. Underground utilities, street improvements, easements or alleys.

- (d) *Storm drainage system.* The subdivider of any tract of land will be required to construct at his own expense a standard storm drainage system which shall be adequate to meet or exceed the drainage requirement as set forth by the director of public works and the city engineer. In addition to meeting the above requirement, the drainage system construction shall comply with any one, all or a combination of the below listed approved methods of construction:
 - (1) *Underground system.* Which shall consist of an enclosed below-grade system adequate to meet the requirements set forth by the director of public works and the city engineer.
 - (2) *Aboveground system.* Which shall consist of an open channel adequate to meet the requirements set forth by the director of public works and city engineer and that channel shall be constructed in such a manner that all sloping surfaces and channel base shall be finished with any, all, or a combination of any of the below listed materials:
 - a. *Concrete.* Adequate to prevent the erosion of soil from the slope and base of the drainage channel.
 - b. *Rock and/or combination rock and concrete.* Adequate to prevent the erosion of soil from the slope and base of the drainage channel.
 - c. *Grass sod.* Provided grade does not exceed a one-foot to three-foot ratio and the sod is adequate to prevent the erosion of soil from the slope and base of the drainage channel.
 - d. *Grass seed with asphaltic overcoat (mulch).* Provided the grade does not exceed a one-foot to three-foot ratio and the seed and overcoat is adequate to prevent erosion of the soil and/or seed prior to its germination from the slope and base of the drainage channel.

Sec. 113-39. Specifications and design standards for construction of storm sewers.

- (a) *Generally.* The design of storm drainage improvements in the city shall be based on discharges determined from the rational formula. The formula for calculating storm flows in this manner is:

$$Q = CIA$$

Where

Q: Is the storm flow in cubic feet per second, a given point of design.

C: Is a runoff coefficient that is the ratio of the maximum rate of runoff to the average rate of rainfall.

I: Is the average intensity of rainfall in inches per hour for the calculated time of concentration of the design point.

A: Is the drainage area in acres of the design.

- (b) *Quantity of stormwater.* The quantity of stormwater runoff shall be determined for each inlet, bridge, culvert or other designated design point by using the following standards in application of the regional formula.
- (c) *Runoff coefficient.* The runoff coefficient shall be determined for each drainage area from the current land use plan of the city. The runoff coefficient for land uses shall be as follows:

Business areas	95
Industrial areas	90
Residential areas	60
Park areas	30

- (d) *Composite runoff coefficients.* These will be determined by direct proportion when more than one land use exists within a drainage area in computing rainfall intensity. The intensity, I, in the rational formula shall be determined from the time of concentration and design storm frequency.
- (1) The time of concentration shall be calculated for all inlets and pipe junctions in a proposed storm sewer system or other point of analysis. The time of concentration shall consist of inlet time and time of flow in the sewer and the basis of design shall be the longest time of concentration applicable to the point of analysis. For drainage areas of one acre or less, the time of concentration need not be calculated and a storm duration of ten minutes may be used as the basis of design.
- (2) Storm frequencies for the storm drainage improvements in the city are as follows:

Type of Facility Design Frequency Storm Sewers

(A)	For calculated pipe sizes of 27 inches and smaller	5 years
(B)	For calculated pipe sizes of 30 inches to 48 inches	10 years
(C)	For calculated pipe sizes 54 inches and larger	25 years
(D)	Culverts, bridges, channels, and creeks	100 years

- (3) *Area.* The area used in determining flows by the rational formula shall be calculated by subdividing a map into drainage areas within the basin contributing stormwater runoff to the system.
- (e) *Storm drainage design.* Before the construction or reconstruction of any street and before the construction of any building or other structure on a site of three or more acres, an engineering investigation shall be made to determine the necessity of on-site or off-site storm drainage facilities to meet the requirements of this article.
- (f) *Surface drainage on streets.* Storm drainage inlets shall be located and designed so as to limit the depth of water at the face of the curb on any street to five inches and to permit no more than ten cubic feet per second of stormwater to cross an intersection.
- (1) *Surface drainage on private property.* On lots or tracts of three acres or more, stormwater runoff shall not be permitted to drain onto adjacent property except in existing creeks, channels, or storm sewer. Stormwater runoff may be drained on the surface onto public streets providing that resulting total gutter flow does not exceed five inches in depth.
- (2) *Storm sewer.*
- a. Stormwater runoff in excess of that permitted to be carried on the surface shall be collected and transported in a storm sewer system. Such storm sewer systems shall be designed using Manning's equation for pipe and channel capacity:

$$Q = 1.486 AR^{2/3} S^{1/2}$$

Where

O = Discharge in cubic feet per second

N = Coefficient of roughness

A = Cross-sectional area of flow in square feet

R = Hydraulic radius in feet

S = Slope of hydraulic gradient in feet per foot.

b. The coefficient of roughness shall be determined as follows:

Sewer Type	N
Concrete pipe	0.013
Corrugated metal pipe	0.021
Concrete lined channel	0.015
Earth channel	0.033

- c. Storm sewer pipes shall be designed so that the average velocity of flow shall be not less than three feet per second and not more than 15 feet per second. The minimum size of storm sewers shall be 18 inches in diameter or equivalent cross-sectional area. In the design of a storm sewer system, the elevation of the hydraulic gradient of the storm sewer shall be a minimum 1½ feet below the elevation of the adjacent street gutter. In any system, the junction of pipes of different diameter shall be made at inlets, junction boxes or manholes so that the crowns of the pipes are at the same elevation.
- (3) *Open channels.* When the calculated pipe size for a storm sewer system exceeds 72 inches in diameter, stormwater runoff may be transported in open channels. Open channels may be fully lined, partially lined or unlined. Unlined channels will be permitted only in areas designated by the city council. Maximum earth slopes for unlined or partially lined channels shall not exceed 3:1 slope. Partially lined channels shall consist of a concrete paved bottom and either earth slopes or concrete lined slopes to a height less than the design depth of water. Fully lined channels shall consist of concrete lined bottoms and slopes extending at least one foot above the height of design water depth. Maximum side slopes for fully lined channels shall be 1:1 slope.
- (4) *Bridges and culverts.* In addition to satisfying requirements resulting from the application of Manning's formula, bridges and culverts constructed to provide crossings of streams and open channels shall provide a clear waterway having at least the same width as the downstream channel and shall have a clear height of one foot above the calculated upstream water depth for the design storm unless otherwise approved by the director of public works. Bridges shall have concrete lined bottoms and slopes and both bridges and culverts shall have upstream and downstream slope protection in the form of head walls or wing walls.



AGENDA MEMORANDUM

DATE: May 7, 2024

TO: Honorable City Council Members

FROM: Arthur Miner, Mayor

THROUGH: Arthur Miner, Mayor

SUBJECT: Consider the appointment of Darlene Chavious to Place 5 on the Parks Advisory Board and to Place 5 on the Planning and Zoning Commission.

BACKGROUND/INFORMATION:

The purpose of the Parks Advisory Board is to advise the City Council and the city manager regarding: (1) the present and future development of city parks, playgrounds, and recreational facilities; (2) the general welfare of the city's parks, playgrounds, and recreational facilities and their use by the public; and (3) ways and means by which the city's parks, playgrounds, and recreational facilities may be strengthened and supported.. The City of Watauga Parks Advisory Board shall consist of five (5) voting members who shall be appointed by the Mayor, subject to the approval and consent of the City Council. Places on the Board shall be numbered one through five, with all members appointed for two-year terms to expire August 31.

The Planning and Zoning Commission makes recommendations to City Council to guide land development through the Comprehensive Master Plan, Zoning and Subdivision Regulations. The Commission also makes recommendations to City Council regarding platting or subdividing land within the corporate limits of the City. The planning and zoning commission shall consist of seven regular members. Places on the commission shall be numbered one through seven, with all members appointed for two-year terms to expire August 31. Members serving in odd-numbered places shall have their terms expire on each odd-numbered year, and members serving in even-numbered places shall have their terms expire on even-numbered years.

FINANCIAL IMPLICATIONS:

RECOMMENDATION/ACTION DESIRED:

Respectfully recommend the Council review and take action on the item presented.

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Chavious, Darlene_3.24.204_BOA



AGENDA MEMORANDUM

REVIEWED BY:

Sandra Gibson, Director of Finance

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 5/7/2024

Final Approval - 5/7/2024



AGENDA MEMORANDUM

DATE: April 24, 2024
TO: Honorable City Council Members
FROM: Sandra Gibson, Director of Finance
THROUGH:
SUBJECT: Public Hearing on Proposed Fee Schedule Changes

BACKGROUND/INFORMATION:

This public hearing is for public input on proposed changes to the City's user fees and charges for services. Local governments have broad authority to implement user fees that reasonably cover the costs of their operations. User fees differ from taxes, which must be authorized by the State Legislature. Municipal fees are defined as a fee for city services paid by an individual to access a service or facility.

The City strives to follow the Government Finance Officers Association's recommended practices that state that charges and fees should be reviewed and updated periodically based on factors such as the impact of inflation, other cost increases, the adequacy of the coverage of the costs and current competitive rates. Changes in legislation for permit fees were a factor in updating the fee schedule this year.

Local governments have broad authority to implement user fees that reasonably cover the costs of their operations. User fees differ from taxes, which must be authorized by the State legislature. Municipal User Fees are defined as a fee for city services paid by an individual to access a service or facility.

In summary, the proposed fee changes include building permit and development related fees, recreation fees, and a change in the fire hydrant meter deposit fees and increase to wastewater fees. The following sections have proposed fee changes:

- Section 12-2 – Chapter 2, Administration and miscellaneous fees - This section has various changes in wording for damage and lost items for the Library. The document scan fee has been adjusted to free since the City is no longer charged for this service.
- Section 12-4 – Chapter 4, Alcoholic Beverages - This section has been modified by changes in wording to clarify compliance. No fee change is requested



AGENDA MEMORANDUM

- Section 12-6 – Chapter 6, Animals - Fees have been adjusted in various areas and include adjustments for impoundment of animals, boarding fees, quarantine, and surrender of animals, and animal licenses and microchip implants.
- Section 12-10 – Chapter 10, Environment and natural resources - This section has been amended to add a charge for the grease and grit transporter ticket book.
- Section 12-22 – Chapter 22, Licenses, permits, and business regulations - This section has been amended to delete the fee for additional city signs for garage permits.
- Section 12-30. – Chapter 30, Parks and recreational facilities - Fees have been adjusted due to cost of services and include increases in daily walk-in fees and rentals. Splash pad cabana fees were added to the fee schedule to cover the cost of these services. Summer camp fees and preschool fees have been added back to the schedule since these programs were reinstated.
- Section 12-42. – Chapter 42, Utilities - A change in the deposit for Fire Hydrant meters has been recommended to cover the replacement cost of the meter. The meter deposit enables the City to purchase another meter if it is damaged, or not returned by contractors. Wastewater fees are proposed to increase by approximately \$3.20/month due to the wholesale wastewater cost increases from the City of Ft. Worth.
- Section 12-103. – Chapter 103, Buildings and building regulations - Other inspections and fees have been updated to allow for the use of third-party entities for inspections, and adding fees for various plan reviews, and adjusted permits so they are not based on construction value.
- Section 12-111. – Chapter 111, Signs - Sign fees have been adjusted for various categories in this section.
- Section 12-113. – Chapter 113, Subdivisions - Fees for processing and filing plats have been adjusted to reflect increases in providing these services. Fees for developers have been amended to a flat fee structure since recent legislative changes prohibit the inspection and permit fees from being based on construction costs.
- Section 12-115. – Chapter 115, Zoning - Portable storage container permit fee has been increased.

FINANCIAL IMPLICATIONS:

N/A

RECOMMENDATION/ACTION DESIRED:



AGENDA MEMORANDUM

Respectfully recommend the Council allow for public input as posted.

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Proposed Fee Schedule Changes
2. PH User Fees 5-13-2024

REVIEWED BY:

Sandra Gibson, Director of Finance

David Berman, City Attorney

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

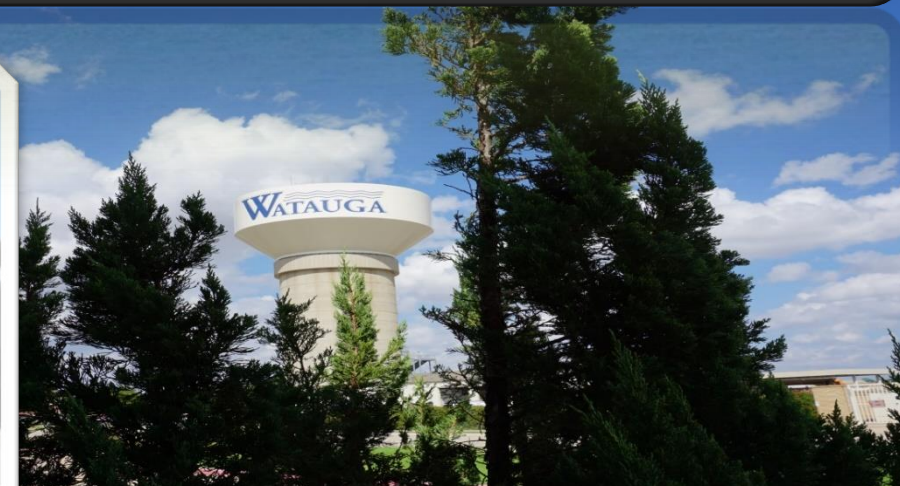
Approved - 5/6/2024

Approved - 5/8/2024

Final Approval - 5/9/2024

CITY OF WATAUGA, TEXAS

FEE SCHEDULE PROPOSED CHANGES-MUNICIPAL SERVICES



Proposed fee changes

Chapter 12 Fee Schedule

City of Watauga Code of Ordinances

Administrative Fees

12-2, 12-4

12-2 Administrative Section

Fee Type	Current Fee	<i>Proposed</i>
Library – damage cost	Rebinding plus cost to repair/replace \$5.00	Replacement cost plus \$5.00 processing fee
Library – lost items	Processing fee \$5.00	Replacement cost plus \$5.00 processing fee
Library self-serve kiosk – Scan	.30/each page	Free

Section 12-4 – Alcoholic Beverages

Fee Type	Current Wording	<i>Proposed wording</i>
Permit for sale of alcohol	<i>Permit for sale of beer and wine.</i> A fee of \$30.00 is hereby imposed upon each application for a permit to sell beer or wine. This fee shall be collected when the application for such permit is requested. Permits shall be available during regular business hours from the city secretary. Such permit must be presented to the city secretary for certification that such permit is in compliance with all city ordinances.	<i>Permit for sale of alcohol.</i> A fee of \$30.00 is imposed upon each application for a city permit to sell beer or wine. This fee shall be collected when the application is submitted and upon permit renewal each year. For mixed beverages and all other alcohol permits, the fee is the maximum local fee allowed by the Texas Alcoholic Beverage Commission. Applications will be accepted through the city secretary's office during regular business hours. All permit applications must be presented to the city secretary's office to ensure compliance with all city ordinances.

Section 12-6 Animals

Chapter 12-6 Animals

Fee Type	Current Fee	<i>Proposed fee</i>
Multiple pet ownership	\$17.00	\$20.00
Impoundment fees – altered animal	First \$17.00 Second \$81.00 Third \$100.00	First \$20.00 Second \$80.00 Third - no change
Impoundment fees – unaltered animal	First \$44.00 Second \$81.00 Third \$100.00	First \$45.00 Second \$80.00 Third – no change
Boarding – per night	\$12.00	\$10.00
Quarantine – per night	\$14.00	\$20.00

Section 12-6 Animals

Fee Type	Current Fee	Proposed Fee
Surrender of animals – per animal	\$27.00	\$30.00
Surrender of animal for rabies analysis	\$52.00	\$55.00
Kennel permit	\$81.00	\$80.00
Fees for animal licenses	Unaltered \$22.00 Altered \$6.00	Unaltered \$20.00 Altered \$5.00
Microchip	\$20.00	<i>No change</i>

Section 12-6 Animals

Fee Type	Current Fee	Proposed Fee
Backyard chicken fees- Initial Registration	\$60.00* *omitted from fee schedule	\$60.00
Annual fee	\$17.00	\$20.00
Impoundment of backyard chicken	First \$17.00 Second \$81.00 Third \$100.00	First \$20.00 Second \$80.00 Third – no change
Surrender of animal by owner	\$27.00	\$30.00

Building and Development Related Proposed Fee changes

Sections 12-10, 12-22, 12-103, 12-111, 12-113,
12-115

HB 3492 – Cities may only consider the City's actual review, processing, and inspection costs related to the public infrastructure project.

Prohibits fees to be based on % of construction costs as currently in fee schedule

Building & Development Fee Change Summary

Fee Type	Current Fee	Proposed Fee
Grease and grit transporter book	N/A	\$15.00 per ticket book
Additional city issue signs – garage sales	\$2.00/sign	Not provided
Other inspection and fees	various	Add “other third party entity verbiage” for providing these services
Residential plan review fee	25% of permit fee for each new constructed residential dwelling unit	25% of permit fee for each newly constructed residential unit, residential addition, remodel, or repair
Civil Plan Review – Private Development	N/A	\$2,500 first 3 review, \$775 each additional review
Grade Plan Review – Single Lot residential	N/A	\$200.00 first review, \$200 each additional
Grading Permit – Private Development: Residential	N/A	\$150.00 per lot
Grading Permit – Commercial or Subdivision	N/A	\$400 per recorded acre, minimum \$600
Fence permit fees	Based on cost of construction	\$150.00
Swimming pool/spa/hot tub fees	Based on cost of construction	\$1,000.00 (above or inground), or \$300 above ground pool wall replacement
Reroofing permit fees – commercial	Based on cost of construction	\$900.00
Carport Construction	Residential \$200.00,	Residential \$200.00

Building & Development Fee Change Summary

Fee Type	Current Fee	Proposed Fee
Permanent Sign fee	\$200.00 plus 3% of cost of sign	\$300.00
Billboard Advertising Permit	\$200.00	\$300.00
Billboard digital	\$232.00	\$300.00
Subdivisions – preliminary plat	\$300.00 plus \$10.00 per lot	\$400.00 plus \$20.00 per lot
Subdivisions – final plat	\$300.00 plus \$20.00 per lot	\$400.00 plus \$20.00 per lot
Subdivisions - Replat	\$300.00 plus \$5.00 per lot	\$300.00 plus \$10.00 per lot
24" x 36" plat	\$67.00	\$120.00
18" x 24" plat	\$52.00	\$100.00

Building & Development Fee Change Summary

Fee Type	Current Fee	Proposed Fee
Easement or alley vacation	\$67.00	\$1,000, plus costs incurred by City
Conveyance/corrected/amended plat	\$200.00	\$275.00
Zoning Verification Letter	\$200.00	\$275.00
Zoning map copy	\$22.00	\$25.00
Plat copy	\$10.00	\$15.00
Construction inspection and permit fee – developer	4% of construction costs	\$24,000 for the first 6 months and \$4,000 per month until final letter of acceptance
Detailed drainage reviews (new)	N/A	Based on third party review cost plus 10% for administration
Pre-construction meeting (new)	N/A	\$300.00
Portable Storage container fee	\$25.00	\$30.00



Parks and Recreation Proposed Fee Changes – Section 12-30

Parks & Recreation Fee Changes

Name of Fee	Resident Fee Current	Non-resident Current	Resident Fee Proposed	Non-resident Proposed
Community Center Fees				
Daily Walk-in (adult)	\$6.00	\$6.00	\$8.00	\$12.00
Daily Walk-in (child 17 and under)	\$3.00	\$3.00	\$5.00	\$10.00
Seniors over 60 Annual	\$15.00	\$15.00	\$15.00	\$30.00
Daily walk-in (seniors)	\$3.00	\$3.00	\$5.00	\$7.00
Pickle Pass	\$40.00	\$60.00	N/A	N/A
Class and Program fees	\$5.00 per class	\$5.00 per class	Instructor agreement	Instructor Agreement
Preschool Tiny Tots			\$100.00/month	\$100.00/month
Preschool – Time for Tots			\$125.00/month	\$125.00/month

Parks & Recreation Fee Changes

Name of Fee	Resident Fee Current	Non-resident Current	Resident Fee Proposed	Non-resident Proposed
Community Center Fees				
Camp Watauga 1 child	N/A	N/A	\$135/week	\$160/week
Camp Watauga 2 child	N/A	N/A	\$243/week	\$288/week
Camp Watauga 3 child	N/A	N/A	\$338/week	\$400/week
Camp Watauga 4 child	N/A	N/A	\$419/week	\$496/week

Parks & Recreation Fee Changes

Name of Fee	Resident Fee Current	Non-resident Current	Resident Fee Proposed	Non-resident Proposed
Facility and Park Rentals				
Foster Village	\$40.00/hr.	\$60.00/hr.	\$45.00/hr.	\$75.00/hr.
Multi-purpose Center E	\$40.00/hr.	\$60.00/hr.	\$50.00/hr.	\$80.00/hr.
Active Adult Center Room	\$60.00/hr.	\$80.00/hr.	\$75.00/hr.	\$125.00/hr.
Gym ½ court	\$25.00/hr.	\$50.00/hr.	\$40.00/hr.	\$65.00/hr.
Gym Full Court	\$50.00/hr.	\$75.00/hr.	\$75.00/hr.	\$125.00/hr.
Capp Smith Park Ampitheatre	\$60.00/3 hr. block	\$80.00/3 hr. block	\$75.00/3 hr. block	\$120.00/3 hr. block
Ampitheatre (each additional hour)	\$20.00/hr.	\$20.00/hr.	\$25.00/hr.	\$40.00/hr.
Pavilion Rental (1 st 2 hours)	\$30.00/2 hr. block	\$40.00/2 hr. block	\$35.00/2 hr. Block	\$60.00/2 hr. block
Pavilion Rental (each additional hour)	\$15.00/hr.	\$20.00/hr.	\$17.50/hr.	\$30.00/hr.

Parks & Recreation Fee Changes

Name of Fee	Resident Fee Current	Non-resident Current	Resident Fee Proposed	Non-resident Proposed
Facility and Park Rentals				
Tables 1-6	\$25.00/hr Mon-Friday \$40.00/hr Sat-Sun	\$50.00/hour Mon-Friday \$60.00/hr. Sat-Sun	Delete	Delete
Splashpad Cabanas 1-3 Mon-Fri	N/A	N/A	\$37.50/hr (2 hr. minimum)	\$62.50/hr (2 hr. minimum)
Splashpad Cabanas 1-3 Sat-Sun	N/A	N/A	\$50.00/hr (2 hr. minimum)	\$75.00/hr (2 hr. minimum)
Splashpad Pavilion Mon-Fri	N/A	N/A	\$50.00/hr (2 hr. minimum)	\$75.00/hr (2 hr. minimum)
Splashpad Pavilion Sat-Sun	N/A	N/A	\$75.00/hr (2 hr. minimum)	\$100.00/hr (2 hr. minimum)

Utilities Proposed Fee Changes Section 12-42

Utility Rate Changes to Customers

Deposits	Current Deposit	Proposed Deposit
Fire Hydrant Meter	\$1,000	\$3,000

Deposit based on replacement cost

Utility Rate Changes to Customers

Rate	Current Fee	Proposed Fee	Annual Impact of Change
Sewer Base Rate 12.6% increase volume			
Residential and Commercial	\$20.52	\$20.52	n/a
Sewer Treatment Volume Rate	\$3.17/100	\$3.57/100	\$248,000

Estimated Residential impact: \$3.50 monthly increase

Fee increases from Ft. Worth are driving this rate change.

Next steps

Ordinance Fee Schedule Updates – attorney review

Public Hearing – May 13th

Ordinance approving amendments to fee schedules
–May 13th



Questions



NOTICE OF PUBLIC HEARING

**CITY OF WATAUGA, TEXAS
CITY HALL COUNCIL CHAMBER
7105 WHITLEY ROAD, WATAUGA, TEXAS 76148
MONDAY, MAY 13, 2024
6:30 P.M.**

Notice is hereby given that the Watauga City Council will hold a Public Hearing on the proposed changes to the City's user fee and charges on Monday, May 13th, 2024, during the Council Meeting which begins at 6:30 p.m. in the Council Chambers at City Hall, 7105 Whitley Road, Watauga, Texas 76148.

The City Council will consider the adoption of new fees and/or changes to fees designed to recoup all or a portion of costs associated with specific services to include permits, licenses, building and development fees, water and wastewater charges, parks and recreation fees, animal fees, and other administrative fees. A detailed listing of these proposed changes can be found on the City's website, www.cowtx.org.

I, Linda Proskey, City Secretary for the City of Watauga, Texas, hereby certify that this notice was posted on the official bulletin board at City Hall, 7105 Whitley Road, Watauga, Texas 76148, on May 10th, before 6:00 p.m.

/s/ Linda Proskey
Linda Proskey, City Secretary



AGENDA MEMORANDUM

DATE: November 17, 2023

TO: Honorable City Council Members

FROM: Sandra Gibson, Director of Finance

THROUGH: Joshua Jones, City Manager

SUBJECT: Consider action on an ordinance of the City of Watauga, Texas, amending Chapter 12 of the Code of Ordinances of the City of Watauga, Texas; amending various rates and fees in Sections 12-2, 12-4, 12-6, 12-10, 12-22, 12-30, 12-42, 12-101, 12-103, 12-111, 12-113, and 12-115 of Chapter 12; providing a repealing clause; providing a savings clause, providing for severability; and providing an effective date

BACKGROUND/INFORMATION:

Local governments have broad authority to implement user fees that reasonably cover the costs of their operations. Municipal User Fees are defined as a fee for city services paid by an individual to access a service or facility. Over the past several months, a user fee analysis has been underway for all City of Watauga municipal user fees. As part of this process, staff considered the costs of providing services and researched comparative City fees. The recommendations are included in the attached proposed Ordinance amending user fees and charges. A workshop was held on April 8, 2024, to provide information on the proposed changes to the fee schedule.

In summary, the proposed fee changes include building permit and development related fees, animal control fees, recreation fees, and an increase in the fire hydrant meter deposit fees and wastewater fees. The following sections have proposed fee changes:

- Section 12-2 – Chapter 2, Administration and miscellaneous fees - This section has various changes in wording for damage and lost items for the Library. The document scan fee has been adjusted to free since the City is no longer charged for this service.
- Section 12-4 – Chapter 4, Alcoholic Beverages - This section has been modified by changes in wording to clarify compliance. No fee change is requested
- Section 12-6 – Chapter 6, Animals - Fees have been adjusted in various areas and include adjustments for impoundment of animals, boarding fees, quarantine, and surrender of animals, and animal licenses and microchip implants.



AGENDA MEMORANDUM

- Section 12-10 – Chapter 10, Environment and natural resources - This section has been amended to add a charge for the grease and grit transporter ticket book.
- Section 12-22 – Chapter 22, Licenses, permits, and business regulations - This section has been amended to delete the fee for additional city signs for garage permits.
- Section 12-30. – Chapter 30, Parks and recreational facilities - Fees have been adjusted due to cost of services and include increases in daily walk-in fees and rentals. Splash pad cabana fees were added to the fee schedule to cover the cost of these services. Summer camp fees and preschool fees have been added back to the schedule since these programs were reinstated.
- Section 12-42. – Chapter 42, Utilities - A change in the deposit for Fire Hydrant meters has been recommended to cover the replacement cost of the meter. The meter deposit enables the City to purchase another meter if it is damaged, or not returned by contractors. Wastewater fees have been increased due to the wholesale wastewater cost increases from the City of Ft. Worth. The increase is estimated at approximately \$3.50 per month for residents. The increase will be passed through on the volume charge only (not base fee and volume as presented during the April 8th workshop).
- Section 12-103. – Chapter 103, Buildings and building regulations - Other inspections and fees have been updated to allow for the use of third-party entities for inspections, and adding fees for various plan reviews, and adjusted permits, so they are not based on construction value. A change was made to the swimming pool/spa/hot tub fees to include a fee for a replacement pool that is lower than the fee for a new pool.
- Section 12-111. – Chapter 111, Signs - Sign fees have been adjusted for various categories in this section.
- Section 12-113. – Chapter 113, Subdivisions - Fees for processing and filing plats have been adjusted to reflect increases in providing these services. Fees for developers have been amended to a flat fee structure since recent legislative changes prohibit the inspection and permit fees from being based on construction costs.
- Section 12-115. – Chapter 115, Zoning - Portable storage container permit fee has been increased.

FINANCIAL IMPLICATIONS:

The fee increases will aid in recovering the costs of services provided to users and comply with HB 3492

RECOMMENDATION/ACTION DESIRED:



AGENDA MEMORANDUM

Respectfully recommend the Council review and approve the ordinance amending Chapter 12 Fee Schedule

ATTACHMENTS/ SUPPORTING DOCUMENTATION:

1. Watauga Ordinance Amending Fee Schedule
2. Exhibit A - Watauga Fee Schedule Revised

REVIEWED BY:

Sandra Gibson, Director of Finance

David Berman, City Attorney

Linda Proskey, City Secretary

Approved as to form for inclusion on Agenda

Approved - 5/3/2024

Approved - 5/4/2024

Final Approval - 5/6/2024

**CITY OF WATAUGA, TEXAS
ORDINANCE NO. 2024-**

**AN ORDINANCE OF THE CITY OF WATAUGA, TEXAS,
AMENDING CHAPTER 12 OF THE CODE OF
ORDINANCES OF THE CITY OF WATAUGA, TEXAS,
AMENDING VARIOUS RATES AND FEES IN SECTIONS
12-2, 12-4, 12-6, 12-10, 12-22, 12-30, 12-42, 12-101, 12-103, 12-
111, 12-113, AND 12-115 OF CHAPTER 12; PROVIDING A
REPEALING CLAUSE; PROVIDING A SAVINGS CLAUSE;
PROVIDING FOR SEVERABILITY; AND PROVIDING AN
EFFECTIVE DATE.**

WHEREAS, pursuant to Chapter 51 of the Texas Local Government Code, the City of Watauga has the full power of local self-government and may adopt and amend ordinances for the good government, peace and order of the City; and

WHEREAS, the City Council finds a revision of the Code of Ordinances to revise various rates and fees throughout the existing fee schedule is merited; and

WHEREAS, the City of Watauga has studied the cost of providing city services and enforcing regulations and has identified that the costs of providing certain services are currently not being met by the existing fees; and

WHEREAS, the City Council of the City of Watauga finds that the fees established herein do not exceed the amount reasonably necessary to provide the services to which they are related; and

WHEREAS, the City Council of the City of Watauga finds that the fees and rates described herein are necessary to provide for the services to which they relate; and

WHEREAS, the City Council finds that it is necessary to amend its fee schedule in order to more effectively provide services to the residents and businesses of the City of Watauga.

NOW, THEREFORE, BE IT ORDAINED by the City Council of the City of Watauga, Texas, that:

I.

The facts and recitations set forth in the preamble of this Ordinance are hereby found to be true and correct and adopted herein for all purposes.

II.

The Code of Ordinances, Watauga, Texas, (the Watauga Code) be and is hereby amended by amending Chapter 12 by repealing and replacing the following sections, without amendment, repeal or change to any other section, provision or part of Chapter 12:

Section 12-2 (Chapter 2, Administration and Miscellaneous Fees),
Section 12-4 (Chapter 4, Alcoholic Beverages),
Section 12-6 (Chapter 6, Animals),
Section 12-10 (Chapter 10, Environment and Natural Resources),
Section 12-22 (Chapter 22, Licenses, Permits and Business Regulations),
Section 12-30 (Chapter 30, Parks and Recreational Facilities),
Section 12-42 (Chapter 42, Utilities),
Section 12-101 (Chapter 101, General and Administrative Provisions),
Section 12-103 (Chapter 103, Buildings and Building Regulations),
Section 12-111 (Chapter 111, Signs),
Section 12-113 (Chapter 113, Subdivisions), and
Section 12-115 (Chapter 115, Zoning)

The foregoing sections shall be and are hereby replaced in their entirety with the provisions attached hereto and incorporated herein as Exhibit “A” (struck-through items are deleted provisions and underlined items are added provisions).

III.

This Ordinance shall be and is hereby cumulative of all other ordinances of the City of Watauga, Texas and this Ordinance shall not operate to repeal or affect any of such other ordinances except insofar as the provisions thereof might be inconsistent or in conflict with the provisions of this Ordinance, in which event such conflicting provisions, if any, in such other Ordinances or Ordinances are hereby repealed.

IV.

An offense committed before the effective date of this ordinance is governed by the prior law and the provisions of the ordinances of the City of Watauga, Texas, as amended, in effect when the offense was committed and the former law is continued in effect for this purpose.

V.

In the event any clause, phrase, provision, sentence or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid, unenforceable or unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Watauga, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any part thus declared to be invalid or unconstitutional, or whether there be one or more parts.

VI.

This Ordinance shall become effective on May 13, 2024, and shall be in full force and effect from and after the date of passage and adoption by the City Council of the City of Watauga, Texas, and upon application of law and in accordance with Sections 3.11 and 3.13 of the Charter of the City of Watauga, Texas.

PASSED AND ADOPTED by the City Council of the City of Watauga, Texas this, the 13th day of May, 2024.

APPROVED:

ARTHUR L. MINER, MAYOR

ATTEST:

LINDA PROSKEY, CITY SECRETARY

APPROVED AS TO FORM AND LEGALITY:

DAVID BERMAN, CITY ATTORNEY

EXHIBIT A

CHAPTER 12 FEE SCHEDULE

Chapter 12 FEE SCHEDULE

Sec. 12-2. Chapter 2, Administration and miscellaneous fees.

- (a) *Returned check fee.* \$30.00 per check.
- (b) *Books and maps.*
 - (1) Zoning and thoroughfare plan\$ 5.00
 - (2) Sign ordinance book10.00
 - (3) Subdivision regulation book12.00
 - (4) Street and storm drain details/plans18.00
 - (5) Zoning ordinance book30.00
 - (6) Street and storm drain specs30.00
 - (7) Standard details book30.00
 - (8) Water and sewer book30.00
- (c) *Fingerprinting service fees.* \$10.00.
- (d) *Accident reports.*
 - (1) Accident report. As provided by V.T.C.A., Transportation Code § 550.065, as amended.
 - (2) Certification of accident report. As provided by V.T.C.A., Transportation Code § 550.065, as amended.
 - (3) Certification of no accident on file. As provided by V.T.C.A., Transportation Code § 550.065, as amended.
- (e) *Convenience fees* \$2.25 per transaction.
- (f) *Fee refunds.*
 - (1) The building official may authorize refunding of any fee paid hereunder which was erroneously paid or collected.
 - (2) The building official may authorize refunding of not more than 80 percent of the permit fee paid when no work has been done under a permit issued in accordance with this code.
 - (3) The building official may authorize refunding of not more than 80 percent of the plan review fee paid when an application for a permit for which a plan review fee has been paid is withdrawn or canceled before any plan reviewing is done.
 - (4) The building official shall not authorize refunding of any fee paid except on written request filed by the original permittee not later than 180 days after the date of fee payment.
- (g) *Non-resident library card.* \$25.00 annual fee.
- (h) *Reservation fee—Meeting room.* \$50.00.
- (i) *Rental fee—Meeting room.* \$30.00/hr.
- (j) *Replacement library card.* \$1.00.

-
- (k) *Damage cost*—~~Rebinding plus cost to repair/replace. \$5.00~~ Replacement cost plus \$5.00 processing fee..
 - (l) *Lost items*—~~Processing fee. \$5.00~~ Replacement Cost plus \$5.00 Processing Fee.
 - (m) *Certified records fee (in state)*. \$75.00.
 - (n) *Certified records fee (out of state)*. \$100.00.
 - (o) *Deposition of records fee*. \$75.00.
 - (p) *Library self-serve kiosk*.
 - (1) Black and white copies and print\$ 0.15/ea page
 - (2) Color copies and print0.35/ea page
 - (3) Tabloid color copies and print0.50/ea page
 - (4) Tabloid black and white copies and print0.30/ea page
 - (5) Scan ~~0.30/ea page~~No cost
 - (6) Fax1.00/ea page (not including cover)
 - (q) *Appeal to board of appeals*. As provided in subsection 12-103 of this Code.

(Code 2010, § A1.001; Ord. No. 1521, § I, 4-22-2013; Ord. No. 1620, § I, 4-25-2016; Ord. No. 2019-009, § II, 8-26-2019; Ord. No. 2020-023, § II, 7-13-2020; Ord. No. 2021-028, § II, 6-28-2021; Ord. No. 2021-030, § III(Exh. B), 8-23-2021; Ord. No. 2021-038, § III(Exh. B), 8-23-2021; Ord. No. 2021-044, § III, 9-13-2021)

Sec. 12-4. Chapter 4, Alcoholic beverages.

Permit for sale of beer and winealcohol. A fee of \$30.00 is imposed upon each application for a city permit to sell -beer or winebeer or wine. This fee shall be collected when the application is submitted and upon permit renewal each year. For mixed beverages and all other alcohol permits, the fee is the maximum local fee allowed by the Texas Alcoholic Beverage Commission. Applications will be accepted through the city secretary's office during regular business hours. All permit applications must be presented to the city secretary's office to ensure compliance with all city ordinances. ~~Permit for sale of beer and wine. A fee of \$30.00 is hereby imposed upon each application for a permit to sell beer or wine. This fee shall be collected when the application for such permit is requested. Permits shall be available during regular business hours from the city secretary. Such permit must be presented to the city secretary for certification that such permit is in compliance with all city ordinances.~~

(Code 2010, § A6.001)

Sec. 12-6. Chapter 6, Animals.

- (a) *Violation notice and fees*.
 - (1) *Issuance; contents*. When violations of the licensing, rabies vaccination, or "animal at large" requirements of chapter 6 are observed by any animal control officer or police officer, the officer may issue a violation notice in lieu of a citation. The violation notice will stipulate a compliance date and an associated fee and late fee, as well as a waiver provision providing that the person to whom the violation notice is issued waives all rights to contest such violation and waives all rights to a hearing on the issues relating to that violation. Failure to pay associated fees and/or late fees by the compliance date shall constitute a violation of chapter 6 and may result in the issuance of a citation.
 - (2) *Fees*.

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- a. Licensing requirements\$ 20.00
 - b. Rabies vaccination requirements40.00
 - c. "Animal at large" violation50.00
- (b) *Multiple pet ownership permit.* Such a permit shall be issued through the office of permits for a fee of ~~\$17.00~~\$20.00 and shall be valid for one year from date of issuance.
- (c) *Dog and cat impoundment fees.*
- (1) *Impoundment of altered animal:*
 - a. First impoundment\$ ~~17.00~~20.00
 - b. Second impoundment~~81.00~~\$80.00
 - c. Third and subsequent impoundments100.00
 - (2) *Impoundment of unaltered animal:*
 - a. First impoundment~~44.00~~\$45.00
 - b. Second impoundment~~81.00~~\$80.00
 - c. Third and subsequent impoundments100.00
 - (3) *Boarding.* Per night~~12.00~~\$10.00
 - (4) *Quarantine.* Per night~~14.00~~\$20.00
 - (5) *Reduction of fee for licensed animal.* A dog or cat bearing a current license tag and impounded for the first time is eligible for a 50 percent reduction of the impoundment fee.
 - (6) *Partial refund.* When an unaltered animal has been impounded, a \$15.00 refund will be provided to the owner in the event written evidence that the animal has been altered is presented to the city within 30 days of the initial impoundment.
- (d) *Surrender of animal by owner; adoption fee.*
- (1) Per animal, whether alive or dead~~\$ 27.00~~\$30.00
 - (2) Surrender for rabies analysis ~~52.00~~\$55.00
 - (3) Adoption fee (includes a voucher for spay/neuter and rabies vaccination, microchip implanting, yearly booster shot and heartworm test) 80.00
- (e) *Kennel permit.* The permit fee shall be ~~81.00~~\$80.00
- (f) *Animal licenses and microchip implanting.*
- (1) *Pet licenses.* Pet license fees are provided for in subsection (b) of this section and shall be valid for a period of one year from the date of issuance.
 - (2) *Fees for animal licenses and microchip implanting.*
 - a. Unaltered animal~~\$ 22.00~~\$20.00
 - b. Altered animal~~—6.00~~\$5.00
 - c. Altered animal whose primary owner is 65 years of age or older at the time of issuance of license
No fee
 - d. Guard dog 25.00

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- e. Service dog No fee
 - f. Microchip implanting 20.00
 - (g) *Dangerous dog registration fees.*
 - (1) The initial registration and permit fee shall be \$350.00 per dangerous dog. For every year thereafter, an owner of a registered dangerous dog must also pay \$200.00 for the city to verify and ensure compliance with the standards and requirements of chapter 6, article III, division 7. This amount is payable on the anniversary date of the initial registration of the dangerous dog.
 - (2) If an owner of a registered dangerous dog sells or moves the dog to a new address, the owner, not later than the 14th day after the date of the sale or move, shall notify the city police department of the new address. On presentation by the current owner of the dangerous dog's prior registration tag and payment of a fee of \$50.00, the city police department shall issue a new registration tag to be placed on the dangerous dog's collar.
 - (h) *Estray impoundment fees.* For each and every estray taken and impounded, there shall be paid to the city by the owner thereof, or his agent, the sum of \$50.00 for the taking and impounding of the estray and the further sum of \$15.00 per day, except for the first day and for every subsequent day that the animal shall remain in the custody of the animal control officer, such fee being charged for the care and feeding of such animal. The owner shall also pay for any veterinarian or drug fees incurred on behalf of the animal while it is in the custody of the city.
 - (i) *Backyard chicken fees.*
 - (1) *Registration fee.* The initial registration fee shall be included with the required permit fee of \$60.00. For every year thereafter, a flat fee of ~~\$17.00~~\$20.00 per household shall be required. This amount is payable on the anniversary date of the initial registration of the backyard chickens.
 - (2) Impoundment of backyard chicken:
 - a. First impoundment ~~\$17.00~~\$20.00
 - b. Second impoundment ~~81.00~~\$80.00
 - c. Third and subsequent impoundments 100.00
 - (3) Surrender of animal by owner.
 - a. Per chicken, whether alive or dead ~~27.00~~\$30.00
 - (4) Adoption fee.
 - a. There is no adoption fee. But adoption of backyard chickens is only available for residents who have completed the education program and requirements per chapter 6, article VII, division 3 (Backyard Chickens).

(Code 2001, app. A, §§ 3.100—3.400, 3.600—3.900; Code 2010, §§ A2.001—A2.008; Ord. No. 1703 , § I, 5-13-2019; Ord. No. 2019-009 , § IV, 8-26-2019)

Sec. 12-10. Chapter 10, Environment and natural resources.

- (a) *Annual burning permit.* The fee for an annual burning permit will be \$18.00 per annum and will be prorated for the number of months issued.
- (b) *Oil and gas well fees.*

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- (1) A permit of \$3,000.00 per wellhead in cashier's check made payable to the city.
 - (2) *Independent registered professional engineer report*: Cost to the applicant not to exceed \$5,000.00.
 - (3) \$300.00 appeal fee.
 - (c) *Grease and grit generator permit fee*. \$75.00 annually with a prorated fee for the actual number of months for which the permit is issued.
 - (d) *Grease and grit transporter fee with book*. \$150.00 annually with a prorated fee for the actual number of months for which the permit is issued.
 - (e) Grease and grit transporter book. \$15.00 per ticket book.

(Code 2001, app. A, §§ 5.1800, 6.200—6.400; Code 2010, §§ A6.015, A7.001, A7.004, A7.005; Ord. No. 1640 , § I, 3-27-2017)

FEES UPDATED SEPARATELY IN FEBRUARY, 2024 DUE TO STATE REQUIREMENT-044 , § IV, 9-13-2021)

Sec. 12-22. Chapter 22, Licenses, permits and business regulations.

- (a) *Fee for release of sealed coin-operated machine*. A fee of \$15.00 is hereby levied for the release of any machine or table sealed as provided in chapter 22, article VIII for the nonpayment of tax.
- (b) *Occasional, estate and garage sales*.
 - (1) *Permit*. The occasional sale permit fee shall be \$5.00 per application.
 - (2) *Permit*. The estate sale permit fee shall be \$20.00 per application.
 - ~~(3) *Additional city issues signs*. Two dollars per sign. Estate sales may use their own signs at no additional cost or purchase up to five signs from city.~~
- (c) *Permit for home child care facility*.
 - (1) Each permit granted pursuant to chapter 22, article III shall expire on December 31 of the year in which the permit is issued. A permit fee of \$75.00 shall be charged for each full year or a prorated fee shall be charged if less than a full year is applicable when the permit is first issued. An additional charge will be payable to cover costs of notification of property owners.
 - (2) An existing permit may be renewed by payment of the \$50.00 annual fee on or before January 15 of each succeeding year unless the permit has been otherwise cancelled by city council. Failure to pay the annual renewal fee on or before January 15 shall act as an automatic cancellation of the permit and the permit holder shall immediately cease its operation.
- (d) *Permit for child care facility in commercial zone*. Said business shall be required to pay a permit fee of \$100.00 for each calendar year ending December 31 of each year or a proration thereof. Said sum is due and payable by January 15 of each year.
- (e) *Itinerant vendor permit*. \$100.00 itinerant vendor's filing fee for the company or individual making the request and an additional \$15.00 per employee licensed under the company name. Valid for a period of 90 days.
- (f) *Door-to-door solicitor permit*. For itinerant vendors limiting their operations to door-to-door solicitation of sales or orders of merchandise and services: \$100.00 filing fee for the company or individual making the request and an additional \$15.00 per solicitor licensed under the company name. Valid for a period of 30 days.

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- (g) *Junk dealer, secondhand dealer license.* \$100.00 per application.
- (h) *Flea market license.* The annual license fee for license under chapter 22, article V shall be \$100.00 paid in advance.
- (i) *Massage establishment license and health certificate.*
- (1) The annual license fee shall be \$125.00 for each such establishment. If said license is obtained between January 1 and June 30 of any year, the full amount of said fee shall be paid. If said license is obtained between July 1 and December 31 of any year, the fee shall be one-half of the said amount. No refund shall ever be made of any such license fee. It is further stipulated that said license fee is for a period of 12 months from January 1 to December 31, and it shall be necessary to renew said license each year at the fee established of \$125.00 per year.
 - (2) Every person who operates a massage establishment and who is required to have a certificate of health, when issued by the city health officer, shall pay the sum of \$2.00 for the issuance of such certificate of health.
- (j) *Sexually oriented business license.* Each initial application for a license or a license renewal shall be accompanied by a cashier's check or money order, payable to the city, in the amount of \$2,000.00, which shall be commensurate with the cost associated with the administration and processing of the permit application. Renewal application fees are set at \$150.00. Such fees shall be nonrefundable.
- (k) *Taxicab street rental fee.* As compensation or a rental or license fee for the privilege of operating upon and using the public streets and thoroughfares of the city, and conducting and carrying on the business of transporting passengers for compensation on and over the streets and thoroughfares in taxicabs, each holder of a franchise granted under the terms of chapter 22, article XII shall pay to the city at the office of the city secretary an amount equivalent to two percent of the gross revenues derived from the operation of the taxicabs operated by him. Such amount shall be paid monthly for each calendar month on or before the 15th of each succeeding calendar month. Such compensation shall be in lieu of all other fees to be paid by taxicab operators imposed by any other ordinance now in force, but shall not be construed to be in lieu of any validity assessed ad valorem taxes.
- (l) *Taxicab driver permit.* If the chief of police of the city deems it advisable, he shall make such additional investigations of the applicant as he deems necessary to ascertain whether or not he is a fit and proper person to drive a taxicab in the city. If, after examining such applicant and obtaining such information as he deems advisable, the chief of police is satisfied that the applicant is a fit and proper person to drive a taxicab in the city, then, upon the payment of a fee of \$5.00 by the applicant, the chief of police of the city shall cause to be issued to such applicant a permit to drive taxicabs in the city. Each permit issued shall expire on December 31 following the date of issuance.
- (m) *Single-family dwelling rental units.*
- (1) *Reinspection fees.* If a reinspection is necessary and the reinspection reveals that violations have not been corrected, subsequent inspection shall result in a reinspection fee of \$50.00 for the initial reinspection, \$75.00 for the next reinspection, if so needed, and \$100.00 for each reinspection thereafter.
 - (2) *Annual permit fee.* Applications for permit shall include an annual permit fee of \$150.00.
 - (3) *Early move-in fee.* A fee of \$150.00 will be due from the owner of the single-family dwelling rental unit if a tenant moves in to the dwelling before inspection or application for permit has been made.
- (n) *Mobile food vendor unit certificate of occupancy permits.* The fees for certificates of occupancy permits for mobile food vendor units shall be:

- (1) *Annual permit.* The fee for an annual permit shall be \$300.00 for the initial issuance of the permit. The fee for a renewal of an annual permit shall be \$150.00. If an annual permit is not renewed within six months of the expiration of the previous annual permit issued for a mobile food vending unit, the applicant must pay the initial issuance fee of \$300.00 to apply for a new annual permit.
 - (2) *Seasonal permit.* The fee for a seasonal permit shall be \$200.00 for the initial issuance of the permit. The fee for a renewal of a seasonal permit shall be \$100.00. If a seasonal permit is not renewed within six months of the expiration of the previous seasonal permit issued for a mobile food vending unit, the applicant must pay the initial issuance fee of \$200.00 to apply for a new seasonal permit.
 - (3) *Temporary permit.* The fee for a temporary permit shall be \$75.00 for each permit, but may be waived if the permit is issued in connection with a city sponsored event.
 - (4) *Amended permit.* The fee to change authorized operating locations or add additional authorized operating locations to a mobile food vendor unit certificate of occupancy permit shall be \$25.00 for each amendment of the permit.
- (o) *Business registration program.*
- (1) Initial registration\$ 15.00
 - (2) Annual renewal10.00

(Code 2001, § 4.503; Code 2010, §§ 4.04.006(7), A3.012, A6.002—A6.011, A6.013, A6.014; Ord. No. 1568, § II, 7-28-2014; Ord. No. 1640, § I, 3-27-2017; Ord. No. 1652, § II, 2-26-2018; ; Ord. No. 2019-009, § III, 8-26-2019; Ord. No. 2021-019, § III, 3-22-2021; Ord. No. 2021-035, § III, 8-23-2021; Ord. No. 2021-044, § V, 9-13-2021)

Sec. 12-30. Chapter 30, Parks and recreational facilities.

(a) *Recreation and community center membership fees:*

Type	Resident Fee	Nonresident Fee
Adult:		
Annual	\$60.00	\$125.00
Daily walk-in	\$6.00 <u>\$8.00</u>	\$6.00 <u>\$12.00</u>
Child 17 and under:		
Annual	\$25.00	\$60.00
Daily walk-in	\$3.00 <u>\$5.00</u>	\$3.00 <u>\$10.00</u>
Seniors over 60:		
Annual	\$30.00	\$65.00
Annual (Senior Center only)	\$15.00	\$15.00 <u>\$30.00</u>
Daily walk-in	\$3.00 <u>\$5.00</u>	\$3.00 <u>\$7.00</u>
Family of four:		
Annual	\$140.00	\$280.00
Each additional child	\$20.00	\$20.00
City employee:		
Annual	\$0.00	\$0.00

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Daily walk-in	\$0.00	\$0.00
City employee spouse:		
Annual	\$20.00	\$20.00
Daily walk-in	\$3.00	\$3.00
City employee child 17 and under:		
Annual	\$10.00	\$10.00
Daily walk-in	\$2.00	\$2.00
Senior Center Membership	\$15.00	\$15.00

Recreational center membership includes access to the gymnasium, fitness room, activity room, entertainment area and locker rooms. Senior center membership is for access to senior center only. Membership is not mandatory to participate in some classes and/or select programs.

(b) *Recreation and community center class fees:*

Type	Resident Fee	Nonresident Fee
Pickle Pass	\$40.00/per year	\$60.00/per year
Class and Program User Fee	\$5.00 per class participant per week <u>Agreed upon by contract instructor & City</u>	\$5.00 per class participant per week <u>Agreed upon by contract instructor & City</u>
League Fees (seasonal)	Based on area user fees for specific activity(City receives 20% of fee or \$20.00 per player per season)	Based on area user fees for specific activity(City receives 20% of fee or \$20.00 per player per season)
<u>Preschool – Tiny Tots</u>	<u>\$100/month</u>	<u>\$100/month</u>
<u>Preschool – Time for Tots</u>	<u>\$125/month</u>	<u>\$125/month</u>
<u>Camp Watauga – 1 child</u>	<u>\$135/week</u>	<u>\$160/week</u>
<u>Camp Watauga – 2 children</u>	<u>\$243/week</u>	<u>\$288/week</u>
<u>Camp Watauga – 3 children</u>	<u>\$338/week</u>	<u>\$400/week</u>
<u>Camp Watauga - 4 children</u>	<u>\$419/week</u>	<u>\$496/week</u>
Concession Stand Rental	\$500 per season	\$500.00 per season

(c) *Recreation and community center rental of facility fees:*

Type	Resident Fee	Nonresident Fee
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Foster Village	\$40.00 <u>\$45.00</u> /hr. (3 hr. minimum)	\$60.00 <u>\$75.00</u> /hr. (3 hr. minimum)
Recreation Center		
Multi-purpose Room (A)	\$20.00/hr.	\$40.00/hr.
Multi-purpose Room (B)	\$20.00/hr.	\$40.00/hr.
Multi-purpose Room (C)	\$40.00/hr.	\$60.00/hr.
Multi-purpose Room (E)	\$40.00 <u>\$50.00</u> /hr.	\$60.00 <u>\$80.00</u> /hr.
Active Adult Center Room	\$60.00 <u>\$75.00</u> /hr.	\$80.00 <u>\$125.00</u> /hr.
Gym ½ Court	\$25.00 <u>\$40.00</u> /hr.	\$50.00 <u>\$65.00</u> /hr.
Gym Full Court	\$50.00 <u>\$75.00</u> /hr.	\$75.00 <u>\$125.00</u> /hr.
After hours fee	\$40.00/hr. additional charge	\$40.00/hr. additional charge
<u>Sports Field Rentals</u>	<u>\$20.00/hr.</u>	<u>\$40.00/hr.</u>
Capp Smith Park		
Amphitheatre (1 st 3 hours)	\$60.00 <u>\$75.00</u> (3 hr. block)	\$80.00 <u>\$120.00</u> (3 hr. block)
Amphitheatre (each additional hour)	\$20.00 <u>\$25.00</u> /hr. (each additional hour)	\$20.00 <u>\$40.00</u> /hr. (each additional hour)
Pavilion Rental (1 st 2 hours)	\$30.00 <u>\$35.00</u> (2 hr. block)	\$40.00 <u>\$60.00</u> (2 hr. block)
Pavilion Rental (each additional hour)	\$15.00 <u>\$17.50</u> /hr.	\$20.00 <u>\$30.00</u> /hr.
<u>Sports Field Rentals</u>	<u>\$20.00/hr.</u>	<u>\$40.00/hr.</u>
Tables 1—6	\$25.00/hr. Mon—Fri.	\$50.00/hr. Mon—Fri.
Tables 1—6	\$40.00/hr. Sat—Sun.	\$60.00/hr. Sat—Sun.
<u>Splashpad Cabanas 1-3</u>	<u>\$37.50/hr (2 hr. minimum) Mon-Fri</u>	<u>\$62.50/hr (2 hr. minimum) Mon-Fri</u>
<u>Splashpad Cabanas 1-3</u>	<u>\$50.00/hr (2 hr minimum) Sat-Sun</u>	<u>\$75.00/hr (2 hr. minimum) Sat-Sun</u>
<u>Splashpad Pavilion</u>	<u>\$50.00/hr (2 hr. minimum) Mon-Fri</u>	<u>\$75.00/hr (2 hr. minimum) Mon-Fri</u>
<u>Splashpad Pavilion</u>	<u>\$75.00/hr (2 hr. minimum) Sat-Sun</u>	<u>\$100.00/hr (2 hr. minimum) Sat-Sun</u>

(d) *Other camps and miscellaneous fees:*

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Type	Resident Fee	Nonresident Fee
Youth Fire Camp	\$75.00	\$75.00

All rental fees are due immediately upon placing a reservation for rental. Any reservations cancelled at least two weeks (14 days) prior to the reservation date will be entitled to a full refund. Cancellations less than two weeks prior to the reservation date will cause forfeiture of the entire rental fee.

(Code 2001, app. A, arts. 12.000, 14.000; Code 2010, §§ A12.001, A12.002; Ord. No. 1522, § I, 4-22-2013; Ord. No. 1620, § I, 4-25-2016; Ord. No. 1688, § I, 3-7-2019; Ord. No. 1697, § I, 5-13-2019; Ord. No. 2019-009, § V, 8-26-2019; Ord. No. 2021-024, § II, 4-26-2021; Ord. No. 2021-044, § VI, 9-13-2021; Ord. No. 2022-07, § II, 5-9-2022)

Sec. 12-42. Chapter 42, Utilities.

(a) *Water rates.*

(1) *Billing policy where only one user or building is tied to the same meter.*

- a. The monthly bill will be computed as follows: The minimum bill taken from schedule A plus a volume charge of \$5.16 per 100 cubic feet on monthly volume greater than the minimum volume from schedule A for all customers.
- b. Residential customers who have attained the age of 65 and reside in owner-occupied or rental property within the city will be eligible for a \$5.00 discount for water service on their monthly bill when proof of eligibility is provided to the city.

SCHEDULE A WATER RATE SCHEDULE Effective October 1, 2021

Meter size (inches)	¾"	1"	1¼"	1½"	2"	3"	4"	6"/8"
Minimum bill (*)	\$18.23	\$24.68	\$32.89	\$67.05	\$87.10	\$159.22	\$264.18	\$673.26
Volume(*)	267	345	460	937	1,300	2,400	4,000	10,000

(*) Volume included in minimum bill (base charge).

- (2) *Billing policy where more than one user or building is tied onto the same meter.* It shall be the policy of Watauga to bill each home, homes, duplex, triplex, offices or any other buildings where more than one user is tied onto the same water meter at \$18.23 per month for each customer unit for water, plus a monthly volume charge of \$5.16 per 100 cubic feet of water used by the building.
- (3) *Billing for apartment complexes and mobile home parks.*
 - a. \$18.23 per month per apartment or mobile home plus a monthly volume charge of \$5.16 per 100 cubic feet of water used by the apartment complex or park.
 - b. Apartment or mobile home park owner shall furnish a certified statement of occupancy prior to the tenth of each month. Failure to file occupancy statement will result in billing for 100 percent occupancy.

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- (4) As used herein, single-family residential unit is defined as any residential dwelling unit that is designed for, and inhabited by, a single person or family unit and that generates and accumulates household hazardous waste and that is located within the city's corporate limits and is billed by the city for water and sewer services.

- a. Household hazardous waste collection service fee\$ 0.89 per month per single family residential unit.

(b) *Sewer rates.*

- (1) *Minimum monthly service charge.* The monthly bill will be computed as follows: The minimum monthly service charge will be \$20.52 for all customers. Residential customers who have attained the age of 65 and reside in owner-occupied or rental property within the city are eligible for a \$5.00 discount for sewer service on their monthly bill when proof of eligibility is provided to the city.

(2) *Volume charge.*

- a. A monthly volume charge shall also be charged to all customers in the amount of ~~\$3.17~~\$3.57 per 100 cubic feet of water used or wastewater produced.
- b. The monthly volume charge for residential customers will be based on the lesser of the calculated average monthly water consumption billed during the winter quarter months of December, January and February, or actual water usage during the month. The volumes used to compute these charges are based on the amount of water used by the residential customer as measured by a meter. Where the previous winter quarter average is not available from the records, the volume to be used for the monthly volume charge shall be 900 cubic feet.

- (3) *Determination of water use for commercial and industrial customers.* The monthly charges to commercial and industrial customers will be based on water use for each month as measured by appropriate meters, with the provision that, if a customer can show to the satisfaction of the director of public works that a significant portion of the metered water usage does not enter the sanitary sewer system, the customer will be charged only for that volume entering the wastewater system, as determined by a method approved by the director of public works.

- (4) *Industrial waste.* All industrial users: To be served on the system only by specific contract approved by the city council for the particular industrial sewage or water involved.

- (5) *Waste creating unusual conditions or problems.* In the event a commercial customer is introducing sewage into the wastewater system that creates unusual conditions or problems such as excessive oils, grease or chemicals, the director of public works shall advise the customer of his options which are available to the commercial customer to remedy the existing condition. Those options include the following:

- a. To correct at his own expense the conditions causing the excess.
- b. To pay a monthly rate, to be determined by the director of public works, to the city equal to the expense of maintaining and/or treating the excessive waste.

- (6) *Billing policy where more than one user or building is tied onto the same water meter.* It shall be the policy of the city to bill each home, homes, duplex, triplex, offices, or any other buildings where more than one user is tied onto the same water meter at \$20.52 per month for each customer unit for sewer, plus a monthly charge to be calculated as noted in subsection (2)(a) above.

(7) *Billing for apartment and mobile home parks.*

- a. \$20.52 per month per apartment or mobile home plus a monthly volume charge of ~~\$3.17~~\$3.57 per 100 cubic feet of water used by the apartment complex or park.

- b. The apartment or mobile home park owner shall furnish a certified statement of occupancy prior to the tenth of each month. Failure to file the occupancy statement will result in billing for 100 percent occupancy.
- (c) *Deposits.*
- (1) *Calculation of deposit.* The required deposit will be based on historical average consumption using not less than 12 consecutive months of data, computed using the current city water and wastewater rates. The required deposit will be 1.5 times the average bill. If no recent historical data is available, the deposit will be taken from schedule B. All residential customers will use schedule B.

SCHEDULE B. WATER AND SEWER DEPOSITS

Effective ~~October 1, 2021~~ May 13, 2024

Customer Type	Water	Sewer	Garbage
Renter-occupied residential	\$100.00	\$75.00	\$25.00
Owner residential	\$75.00	\$50.00	\$25.00
Commercial:			
¾"	\$150.00	\$100.00	
1"—1½"	\$150.00	\$100.00	
2"	\$600.00	\$600.00	
4"	\$1,500.00	\$1,500.00	
6"—8"	\$4,500.00	\$2,900.00	
Multifamily: All sizes/per unit (unless owner deposit on file)	\$150.00	\$100.00	
Fire hydrant meter	\$1,000.00	<u>\$3,000.00</u>	

- (d) *Leak adjustments for hidden leaks.*
- (1) A hidden leak shall be defined as a leak that cannot be detected until a higher than normal water bill is received. A hidden leak includes water leaks in the interior plumbing of a structure such as walls, slabs, in sprinkler system heads, and other undetectable areas. A hidden leak is not defined as a leak in hot water heaters, toilets, dripping faucets or frozen plumbing. In the event of a hidden leak, the city shall share the cost up to a maximum of \$150.00 of the excess water attributable to the hidden leak that has passed through the meter. A leak adjustment will be made:
- Only once in a calendar year.
 - Only after proof (usually a statement from a licensed plumber) has been received that the leak has been repaired.
 - Only to the highest month consumption affected by the leak.
- (2) The amount of adjustment, not to exceed \$150.00, is determined by the following formula:
- Calculate the amount of "normal" consumption.
 - Averaging the previous six months before the leak occurred; or
 - Using volume from the same month of the previous year, whichever is greater.

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- b. Subtract calculated "normal" consumption from actual consumption.
 - c. Divide the difference by two.
 - d. Apply the rate to the result in subsection (d)(2)c of this section.
 - e. The resulting dollar amount, up to \$150.00, shall be the amount of credit to the customer's account.
- (3) Customer costs associated with the leak repair are not reimbursable by the city. The city will only assist with the cost of excess water flowing through the meter as a result of a hidden leak.
- (e) *Billing; delinquency penalty.* All charges for services furnished or rendered by the city under this article shall include water, wastewater, sewer surcharge, EPA, storm drain and garbage service. Payment for such services shall be due and payable 21 days from the billing date on the bill. In the event the billing statement is not paid in full by the 25th day after the billing date on the bill, a fee of ten percent of the unpaid balance will be added to the next billing statement. (The minimum fee for failure to pay in full within the 25 days after the billing date is \$2.50 for residential accounts and \$15.00 for commercial accounts.)
- (f) *Water and sewer connection fees.*
- (1) *Developed service.* A developed service is a service where the developer installed the tap, service line and meter box for water and tapping saddle and service line stub-out for wastewater service.
 - (2) *Undeveloped service.* An undeveloped service is a service where the city has to install the tap, service line, meter box and meter for water and tapping saddle and service line stub-out for wastewater service.
 - (3) *Additional services.* Additional services which are not included in the service connection fees are boring costs, service line costs in excess of 50 feet and street cut costs.
 - (4) *Special conditions taps.* Taps larger than eight inches or requiring a special tapping crew. Fee will be charged according to tap installation costs.

Size	Developed	Undeveloped
WATER SERVICE CONNECTION FEES		
$\frac{5}{8}" \times \frac{3}{4}"$	\$300.00	\$500.00
1"	\$350.00	\$565.00
2"	\$700.00	\$965.00
3"	\$1,400.00	**
4"	\$1,950.00	**
SANITARY SEWER SERVICE CONNECTION FEES		
4"	\$75.00	\$305.00
6"	\$75.00	**
8"	\$75.00	**

** These service connections shall be installed by a utility contractor for the developer at developer's cost.

Reconnect fee. When customer water or wastewater service has been disconnected, payment must be made by cash, check, credit card, or money order to restore service. Where water service has been disconnected for failure to pay for services rendered, a charge of \$45.00 shall be made for each meter on the final disconnection report and the utility account must be paid in full before such service is restored. An additional charge of \$50.00 for each meter shall be made if service is restored after 5:00 p.m. and before 8:00 a.m. on Monday through Friday or anytime on Saturday or Sunday.

(g) *Water meters serving multiple units; fire protection system meters.*

- (1) *Multifamily residential buildings.* Water meters that service a multiple-tenant residential building may have individual water meters dedicated to each individual unit to be serviced.
 - a. Multifamily residential buildings where one or more residential units is serviced by one meter: If a developer/owner/manager elects not to meter each residential unit (create individual taps and install city-approved meters to be read monthly by city staff), the developer/owner/manager may post a surety bond or cash deposit in the amount equal to six times \$75.00 times the number of units, regardless of the number of meters installed to service the total complex.
 - b. Multifamily residential buildings where one or more residential units is serviced by one meter: If within the specified period of time a developer/owner/manager of existing systems cannot (or elects not to) individually meter each residential unit (create individual taps and install city-approved meters to be read monthly by the city staff), such developer/owner/manager may post a surety bond or a cash deposit in the amount equal to six times the number of units times the average bill for that customer during the previous calendar year, regardless of the number of meters installed to service the total complex.
 - c. Requirements for surety bond:
 1. The surety bond payable to the city shall be issued by an authorized insurance company licensed to do business in the state and approved in writing by the city attorney.
 2. A power of attorney from the insurance company must accompany the surety bond.
 3. The surety bond must be filled out completely and executed by both the surety and principal.
 4. The surety bond must be filed with the city within 30 days from the date of commencement of service.

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- (2) *Commercial property.* Water meters that service a multiple-tenant commercial building may have water meters dedicated to individual units to be served.
- a. Multi-unit commercial property where one or more commercial units serviced by one meter: If a developer/owner/manager elects not to meter each commercial unit (create individual taps and install city-approved meters to be read monthly by city staff), such developer/owner/manager may post a surety bond or cash deposit in the amount equal to six times the number of units times the average monthly bill of like-kind establishments, regardless of the number of meters installed to service the total complex.
 - b. Multi-unit commercial property where one or more commercial units serviced by one meter: If a developer/owner/manager of existing systems cannot individually meter each commercial unit (create individual taps and install city-approved meters to be read monthly by city staff), such developer/owner/manager may post a surety bond or cash deposit in the amount equal to six times the number of units times the average monthly bill for that location during the previous calendar year, regardless of the number of meters installed to service the total complex.
 - c. Requirements for surety bond:
 1. The surety bond payable to the city shall be issued by an authorized insurance company licensed to do business in the state and approved in writing by the city attorney.
 2. A power of attorney from the insurance company must accompany the surety bond.
 3. The surety bond must be filled out completely and executed by both the surety and principal.
 4. The surety bond must be filed with the city within 30 days from the date of commencement of service.
- (h) *Fire protection water supply.* All water lines that supply a fire protection system shall be metered for water usage. These meters shall be installed at the point of connection from the underground to the above-ground piping.
- (i) *Existing systems.* All occupancies, residential or commercial, that are existing must be within compliance of this article within two years of its effective date or when repairs or remodels are made that would involve changing, moving, relocating or altering the metering device.
- (j) *Fee for printed account history.* There shall be a fee of \$15.00 charged to provide a printed account history of information that is available on the city's customer information system, to cover the cost of time and materials necessary to provide the information.
- (k) *Activation/transfer fee.* There shall be a nonrefundable activation/transfer fee of \$20.00 to be charged for all water/sewer accounts.
- (l) *Meter investigation fees.*
- (1) Should any customer demand that a meter investigation be performed by the city in order to read the meter, verify readings or conduct leak investigations, a fee of \$10.00 will be assessed to the customer account exceeding two times in one calendar year (January 1 to December 31) if no problem is detected by the city in the investigation.
 - (2) Upon a second trip to a location made at the request of the customer for assistance, if the customer fails to meet his responsibility in order for a city representative to complete the service request, a fee of \$20.00 will be imposed on the customer account for each additional customer assistance call or dispatch.

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- (3) Should any customer demand that a meter be tested by a third party for accuracy, he shall make a cash deposit with the city utility department of \$60.00.
 - (4) Should any customer demand that a meter be replaced and such meter is under the age of seven years, a fee of \$100.00 will be imposed on the customer account.

(m) *Tampering with or damaging meters.*

- (1) Locking device\$ 60.00
..... per device
- (2) ¾-inch meter100.00

Fees for larger meters will vary and shall be imposed based on cost to the city plus 20 percent for installation and purchase.

- (3) Curb stop/cut-off valve.
 - a. First offense100.00
 - b. Second offense200.00
 - c. Third offense300.00
- (4) Setter150.00
- (5) ¾-inch meter box and lid85.00

Fees for larger meter boxes and lids will vary and shall be imposed based on cost to the city plus 20 percent for installation and purchase.

- (6) Meter bypass/jumper400.00
- (7) Pull meter75.00

(n) Reserved.

(o) *Drainage charges.*

- (1) *Basic drainage charge.* The rate set forth herein is calculated on the basis of a drainage charge of \$11.00 per ERU (equivalent residential unit) which is equal to \$118.60 per impervious acre of land. Runoff coefficients and corresponding rates per acres for various land uses may be modified by the city council from time to time by a modification of said basic drainage charge.
- (2) *Residential property.* The city council finds that the residential lots within the city based upon a runoff coefficient of 0.50 will be charged at a rate of \$11.00 per month, per platted lot, tract and parcels of land when a building exists on the platted lot, tract and parcel of land.
- (3) *Other property.* All other lots, tracts and parcels of land within the city shall be charged on the basis of the acreage contained in said lot, tract or parcel of land, and the use made of such property, in accordance with the following schedule of drainage charges which are hereby levied against all such remaining lots, tracts and parcels of land within the city.

Land Use	Runoff Coefficient	Rate Per Acre
Commercial	0.90	\$106.74
Industrial	0.80	94.88
School	0.50	59.30
Churches	0.65	77.09
Vacant Land	0.30	0.00

Calculation: Land use rate per acre × total acreage of property = monthly fee.

Example: Land use rate per acre × Total Acreage of Property = Monthly Fee

Calculation: \$106.74 × 1.50 acres = \$160.11 fee per month.

- (4) *Changes to rates and charges.* The city council may later change, adjust, and readjust the rates and charges established herein for drainage services from time to time by ordinance. Prior to adjusting any drainage service rates and charges, the city council shall hold a public hearing in accordance with V.T.C.A., Local Government Code § 552.045(c), as now or hereafter amended. No action may be taken upon the proposed rate changes or adjustments by the city council until the following meeting of the city council.
- (5) *Review.* Following the initial five years of substantial continuous operations of the municipal drainage utility system, a review and public hearing (requiring notice pursuant to the Texas Open Meetings Act, V.T.C.A., Government Code ch. 551, as now or hereafter amended) shall be conducted every three years addressing revenues, necessity for increases or decreases of the schedule of charges for drainage service, facilities, costs of service, drainage system, service area, and all other aspects of the operation of the MDUS.
- (6) *Discontinuance of system.* If, after at least five years of substantially continuous operation of the municipal drainage utility system, the city council determines that the system should be discontinued, and that the provision for municipal drainage should be made by other revenues, the city council may adopt an ordinance in accordance with V.T.C.A., Local Government Code § 552.052 to that effect after providing notice and a public hearing as required by V.T.C.A., Local Government Code § 552.045.
- (7) *Disclaimer.* By the passage of this section, the city makes no representation that all of the city drainage problems will be immediately remedied, and the city council is given full discretion in establishing time and quantitative priorities in expending funds as the same become available to meet the drainage needs of the city on a reasonable basis. The passage of this section shall not be construed to relieve private landowners, developers or other individuals or entities from providing drainage improvements pursuant to the ordinances of the city and the laws of this state which relate to drainage or drainage improvements.
- (8) *Use of income.* All income from the city municipal drainage utility system shall be segregated and completely identifiable in municipal accounts. If drainage charges are solely for the cost of service, the city may transfer the charges in whole or in part to its general fund except for any part collected outside the city boundary and except for any part pledged to retire any outstanding indebtedness or obligation incurred or as a reserve for future construction, repair, or maintenance of the drainage system. Any sum levied in the drainage charges for contribution to the funding's of future system improvements including replacement, new construction, or extension of the system shall be used for such improvements and shall not be transferred to the general fund.
- (9) *Adoption of additional rules.* The city council may, by subsequent ordinance, adopt rules for the operation and conduct of the city municipal drainage utility system, including exemptions, if any, from the drainage charges levied therein, consistent with its authority and state law.

Editor's note(s)—Ord. No. 1662 , § 2, adopted June 15, 2018, did not specify manner of inclusion. Therefore, at the discretion of the editor, these provisions have been included as § 12-42(a)(4) and (b)(8).

Sec. 12-101. Chapter 101, General and administrative provisions.

Planning and zoning commission hearing fee. \$150.00 plus costs incurred by the city for postage, mailing, copying and other related expenses.

(Code 2001, app. A, § 11.400; Code 2010, § A11.004)

Sec. 12-103. Chapter 103, Buildings and building regulations.

(a) *Fees.* Fees required by chapter 103 are as follows:

- (1) *Construction investigation—Work without a permit.* Whenever any work for which a permit is required by code or ordinance has commenced without first obtaining said permit, a special investigation shall be made before a permit may be issued for such work.
- (2) *Construction investigation fee.* An investigation fee, in addition to the permit fee, shall be collected whether or not a permit is subsequently issued. The investigation fee shall be \$200.00.
- (3) *Building/structure moving or relocating.* Fee shall be the cost of regulating the activity (processing the application, staff manpower for escorts, etc.) but in no case less than \$200.00.

(b) *Building permits; building contractor registration; miscellaneous permit and registration fees.*

(1) *Table 1-A.*

\$1.00—\$500.00	\$36.00
\$501.00—\$2,000.00	\$36.00 for the first \$500.00 plus \$3.86 for each additional \$100.00, or fraction thereof, to and including \$2,000.00
\$2,001.00—\$25,000.00	\$94.00 for the first \$2,000.00 plus \$18.14 for each additional \$1,000.00, or fraction thereof, to and including \$25,000.00
\$25,001.00—\$50,000.00	\$512.00 for the first \$25,000.00 plus \$13.04 for each additional \$1,000.00, or fraction thereof, to and including \$50,000.00
\$50,001.00—\$100,000.00	\$838.00 for the first \$50,000.00 plus \$9.06 for each additional \$1,000.00, or fraction thereof, to and including \$100,000.00
\$100,001.00—\$500,000.00	\$1,291.00 for the first \$100,000.00 plus \$7.24 for each additional \$1,000.00, or fraction thereof, to and including \$500,000.00
\$500,001.00—\$1,000,000.00	\$4,187.00 for the first \$500,000.00 plus \$6.16 for each additional \$1,000.00, or fraction thereof, to and including \$1,000,000.00
\$1,000,001.00 and up	\$7,267.00 for the first \$1,000,000.00 plus \$3.99 for each additional \$1,000.00, or fraction thereof

(2) a. *Commercial plan review fee.* 65 percent of permit fee.

b. *Residential plan review fee.* 25 percent of permit fee for each newly constructed residential dwelling unit, residential addition, remodel, or repair.

(3) *Other inspection and fees.*

a. *Inspections outside normal business hours (minimum charge, two hours):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved, or other third party entity for those services involved.

- b. *Reinspection fees:* \$70.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees or other third-party entity for those services involved.
- c. *Inspections for which no fee is specifically indicated (minimum charge, one hour):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees or third-party entity for those services involved
- d. *Additional plan review required by changes, additions or revisions to plans (minimum charge, one hour):* ~~\$70.00~~\$100.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees or third-party entity for those services involved.
- e. *For use of outside consultants for checking plans and inspections, or both:* Actual costs. Actual costs include administrative and overhead costs.
- f. Civil Plan Review – Private Development: - \$2500.00 first 3 reviews, \$775.00 each additional review thereafter.
- g. Grading Plan Review Fee: - Single Lot Residential \$200.00 for first review, \$200.00 each additional review thereafter.
- h. Grading Permit – Private Development: Residential \$150.00/lot.
- i. Grading Permit – Commercial or Subdivision: \$400.00 per recorded acre, minimum \$600.00.

(4) *Building valuation data.* Occupancy and type based on cost per square foot.

(5) Group (2015 International Building Code)	IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
A-1 Assembly, theaters, with stage	226.92	219.10	213.80	205.04	192.95	187.36	198.56	176.18	169.73
A-1 Assembly, theaters, without stage	207.97	200.15	194.85	186.09	174.15	168.55	179.61	157.38	150.92
A-2 Assembly, nightclubs	177.49	172.34	167.98	161.18	151.95	147.76	155.52	137.58	132.93
A-2 Assembly, restaurants, bars, banquet halls	176.49	171.34	165.98	160.18	149.95	146.76	154.52	135.58	131.93
A-3 Assembly, churches	209.94	202.13	196.83	188.07	176.32	170.72	181.59	159.54	153.09
A-3 Assembly, general, community halls, libraries, museums	175.12	167.31	161.01	153.25	140.50	135.90	146.77	123.72	118.27

A-4 Assembly, arenas	206.97	199.15	192.85	185.09	172.15	167.55	178.61	155.38	149.92
B Business	181.12	174.43	168.67	160.26	146.18	140.70	153.97	128.34	122.72
E Educational	192.29	185.47	180.15	172.12	160.72	152.55	166.18	140.46	136.18
F-1 Factory and industrial, moderate hazard	108.53	103.54	97.56	93.81	84.17	80.36	89.86	70.57	66.08
F-2 Factory and industrial, low hazard	107.53	102.54	97.56	92.81	84.17	79.36	88.86	70.57	65.08
H-1 High Hazard, explosives	101.60	96.60	91.63	86.88	78.44	73.62	82.93	64.84	0.00
H234 High Hazard	101.60	96.60	91.63	86.88	78.44	73.62	82.93	64.84	59.35
H-5 HPM	181.12	174.43	168.67	160.26	146.18	140.70	153.97	128.34	122.72
I-1 Institutional, supervised environment	180.72	174.14	169.28	161.12	149.06	145.04	161.12	133.69	129.43
I-2 Institutional, hospitals	304.80	298.11	292.36	283.95	268.92	0.00	277.65	251.09	0.00
I-2 Institutional, nursing homes	211.20	204.51	198.75	190.34	177.26	0.00	184.05	159.42	0.00
I-3 Institutional, restrained	206.08	199.38	193.63	185.22	172.62	166.14	178.93	154.78	147.16
I-4 Institutional, day care facilities	180.72	174.14	169.28	161.12	149.06	145.04	161.12	133.69	129.43
M Mercantile	132.23	127.09	121.73	115.92	106.18	102.99	110.26	91.82	88.16
R-1 Residential, hotels	182.28	175.70	170.83	162.68	150.87	146.84	162.68	135.49	131.23
R-2 Residential, multiple family	152.86	146.27	141.41	133.25	122.04	118.01	133.25	106.66	102.41
R-3 Residential, one-and two-family	143.93	139.97	136.51	132.83	127.95	124.61	130.57	119.73	112.65
R-4 Residential, care/assisted living facilities	180.72	174.14	169.28	161.12	149.06	145.04	161.12	133.69	129.43
S-1 Storage, moderate hazard	100.60	95.60	89.63	85.88	76.44	72.62	81.93	62.84	58.35

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S-2 Storage, low hazard	99.60	94.60	89.63	84.88	76.44	71.62	80.93	62.84	57.35
U Utility, miscellaneous	77.82	73.48	69.04	65.52	59.23	55.31	62.58	46.83	44.63
a. Private Garages use Utility, miscellaneous									
b. Unfinished basements (all use group) = \$15.00 per sq. ft.									
c. For shell only buildings deduct 20 percent									
d. Not permitted									

Add 0.5 percent to total cost for each story over three.

- (5) *Building valuation data formula.* Cost per square foot multiplied by the Texas regional modifier of 0.77.

Example: Type IIA, B business of average construction is \$168.67 × .77 modifier = \$129.88 adjusted cost per square foot.

- The administrative official having jurisdiction for the city shall determine all building or construction valuations.
- Valuations shall be the greater of the valuation as established from table 1-A or using the formula from the building valuation data list.

- (6) *Contractor registration fees.*

- Contractor builder or remodeler registration fee, yearly\$ 100.00
- Contractor roofer registration fee, yearly100.00
- Contractor irrigator registration fee, yearly100.00
- Contractor journeyman electrician registration fee, yearly100.00
- Contractor fence registration fee, yearly100.00
- Contractor general registration fee, yearly100.00

- (7) *New single-family construction permit fees.* Shall be based on square footage. The cost shall be \$1.30 per square foot.

- Electrical permit fees for new single-family construction shall be 15 percent of the building permit fee. (Note: Temporary power pole fee for new single-family construction is \$25.00.)
- Plumbing permit fees for new single-family construction shall be five percent of the building permit fee.

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- c. Mechanical permit fees for new single-family construction shall be three percent of the building permit fee.
 - d. Single-family remodel construction permit fees. Shall be based on square footage. The cost shall be \$0.85 per square foot.
- (8) *Fence permit fees.* Fees for fence permits shall be ~~\$150.00 based on cost of construction as determined in table 1-A.~~
- (9) *Swimming pool/spa/hot tub fees.* Fees for swimming pool, spa and hot tub construction, excluding electrical, shall be ~~\$1,000.00 based on cost of construction as determined in table 1-A.~~ Fees for above ground pool wall replacement in same location, shall be \$300.00.
- (10) *Reroofing permit fees.*
- a. For reroofing single-family structures or fractions thereof, each 100.00
 - b. Fees for commercial reroofing shall be ~~\$900.00 based on cost of construction as determined in table 1-A.~~
- (11) *Demolition permit fee.* For the demolition of each structure of building, including accessory buildings \$100.00
- (c) *Carport construction.* Residential carport permit fees shall be \$200.00. Commercial carport permit fees shall be ~~\$350.00 based on cost of construction as determined in table 1-A, but in no instance shall be less than \$350.00.~~
- (d) *Electrical permits.*
- (1) *Permit issuance.*
- a. For the issuance of each permit \$ 70.00
 - b. For issuance of each supplemental permit 15.00
- (2) *System fee schedule.* (Note: The following do not include permit issuing fees.)
- a. *New multi-family residential buildings (apartments or condominiums).*
 - 1. Fees for this type of construction will be based on the fee schedule.
 - 2. For all other types of residential occupancies and alterations, additions, and modifications to existing residential buildings, use the unit fee schedule.
 - b. *Private swimming pools.*
 - 1. For new private residential in-ground and above ground swimming pools for single-family and multi-family occupancies including a complete system of necessary branch circuit wiring, bonding, grounding, underwater lighting, water pumping, and other similar electrical equipment directly related to the operation of a swimming pool, each 175.00
 - 2. For therapeutic whirlpools, spas, and alterations to existing swimming pools, use the unit fee schedule.
 - c. *Carnivals and circuses.* Utilizing transportable-type rides, booths, displays and attractions.
 - 1. For electric generators and electrically driven rides, each 25.00
 - 2. For mechanically driven rides and walk-through attractions or displays having electric lighting, each 10.00
 - 3. For a system of area and booth lighting, each 10.00

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4. For permanently installed rides, booths, displays and attractions, use the unit fee schedule.
 - d. *Temporary power service.*
 1. Temporary service power pole and attachments, each 25.00
 2. Temporary distribution system and temporary lighting, each 10.00
 - (3) *Unit fee schedule.* (Note: The following do not include permit-issuing fees.)
 - a. *Receptacle, switch and lighting outlets.* For receptacle, switch, lighting, or other outlets at which current is used or controlled, except services, feeders, and meters:
 1. First ten 2.50 each
 2. Additional outlets 1.00 each

Note: for multi-outlet assemblies, for each five feet or fraction thereof, may be considered one outlet.

- b. *Lighting fixtures.*
 1. For lighting fixtures, sockets or other lamp-holding devices:
 - (i) First ten 2.50 each
 - (ii) Additional fixtures 1.00 each
 2. For pole or platform mounted lighting fixtures 1.00 each
 3. For theatrical type lighting fixtures or assemblies 1.00 each
- c. *Residential appliances.*
 1. For fixed residential appliances or receptacle outlets; electric ovens; counter-mounted cooking tops; electric ranges; self-contained room, console or through-wall air conditioners; space heaters; food waste grinders; dishwashers; washing machines; water heaters; clothes dryers; or other motor-operated appliances not exceeding one horsepower (hp) in rating 10.00 each
 2. For other types of air conditioners and other motor-driven appliances having larger electrical ratings, see "power apparatus."
- d. *Nonresidential appliances.*
 1. For residential appliances and self-contained factory-wired nonresidential appliances, not exceeding one horsepower (hp), kilowatt (kW) or kilovolt-ampere (kVA) in rating, including medical and dental devices; food, beverage and ice cream cabinets; illuminated showcases; drinking fountains; vending machines; laundry machines; or similar types of equipment 7.50 each
 2. For other types of air conditioners and other motor-driven appliances having larger electrical ratings, see "power apparatus."
- e. *Power apparatus.* For motors, generators, transformers, rectifiers, synchronous converters, capacitors, industrial heating, air conditioners and heat pumps, cooking or baking equipment and other apparatus, as follows:

Rating in horsepower (hp), kilowatts (kW), kilovolt-amperes (kVA) or kilovolt-amperes reactive (kVAE):

Up to and including 110.00 each

Over 1 and not over 1015.00 each

Over 10 and not over 5020.00 each

Over 50 and not over 10040.00 each

Over 10055.00 each

Notes:

1. For equipment or appliances having more than one motor, transformer, heater, etc., the sum of the combined ratings may be used.
2. These fees include all switches, circuit breakers, contractors (conductors), thermostats, relays, and other directly related control equipment.

f. *Busways.* For trolley and plug-in busways: \$7.50 each 100 feet or fraction thereof.

Note: An additional fee will be required for lighting fixtures, motors and other appliances that are connected to trolley and plug-in type busways. No fee is required for portable tools.

g. *Signs, outline lighting and marquees.*

1. For signs, outline lighting systems or marquees supplied from one branch circuit40.00 each
2. For additional branch circuits within the same sign, outline light system or marquee5.00 each
3. For CEVMS type signs100.00

h. *Services or subpanels.*

1. For services or subpanels 100 amps in rating or less, each40.00
2. For services or subpanels 101 amps to 150 amps in rating, each80.00
3. For services or subpanels over 150 amperes in rating, each120.00

i. *Solar systems.*

1. For each solar system up to 25 panels375.00
2. For each solar system from 26 to 40 panels475.00
3. For each solar system of 41 panels or more800.00
4. For each upgrade to an electrical panel with the addition of a solar system180.00

j. *Miscellaneous apparatus, conduits and conductors.*

1. *For electrical apparatus, conduits and conductors for which a permit is required but for which no fee is herein set forth:* \$25.00. Note: This fee is not applicable when a fee is paid for one or more services, outlets, fixtures, appliances, power apparatus, busways, signs or other equipment.
2. *Inspections outside normal business hours (minimum charge, two hours):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.
3. *Reinspection fees:* \$70.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employee involved.

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4. *Inspections for which no fee is specifically indicated, per hour (minimum charge, one hour): \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages, and fringe benefits of the employees involved.*

(e) *Plumbing permits.*

(1) *Permit issuance.*

- a. For issuing each permit\$ 70.00
- b. For issuing each supplemental permit30.00

(2) *Unit fee schedule.* (In addition to subsection (e)(l)a and b of this section.)

- a. For each plumbing fixture on one trap or a set of fixtures on one trap (including water, drainage piping, and backflow protection)15.00
- b. For each building sewer and each trailer park sewer30.00
- c. Rainwater systems, per drain (inside building)15.00
- d. For each cesspool (where permitted)50.00
- e. For each private sewage disposal system80.00
- f. For each water heater and/or vent15.00
- g. For each gas piping system up to five inlets or outlets15.00
- h. For each additional gas piping inlet or outlet5.00
- i. For each medical gas piping system, up to five inlets or outlet25.00
- j. For each additional medical gas inlet or outlet5.00
- k. For each waste pretreatment interceptor including its trap and vent45.00
- l. For each installation, alteration or repair of water piping and/or water treating equipment15.00
- m. For each repair or alteration of drainage or vent piping, each fixture15.00
- n. For each residential lawn sprinkler system on any one meter, including backflow protection devices and plan review130.00
- o. For each commercial lawn sprinkler system on any one meter, including backflow protection devices and plan review200.00
- p. For each atmospheric-type vacuum breaker not part of a lawn sprinkler system15.00
- q. For each backflow protective device other than atmospheric-type vacuum breakers:
 - 1. Two inch diameter and smaller40.00
 - 2. Over two-inch diameter80.00
- r. For each graywater system60.00
- s. For initial installation and testing for a reclaimed water system45.00
- t. For each annual backflow device testing (excluding initial test)60.00
- u. For each gas pressure test75.00

(3) *Other inspection fees.*

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- a. *Inspections outside normal business hours (minimum charge, two hours):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.
 - b. *Reinspection fees:* \$70.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employee involved.
 - c. *Inspections for which no fee is specifically indicated, per hour (minimum charge, one hour):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages, and fringe benefits of the employees involved.
- (f) *Mechanical permits.*
- (1) *Permit issuance.*
 - a. For the issuance of each permit\$ 70.00
 - b. For issuance of each supplemental permit for which the original permit has not expired, been cancelled or finaled30.00
 - (2) *Unit fee schedule.* (Note: The following do not include permit-issuing fees.)
 - a. *Furnaces (heat).*
 - 1. For the installation or relocation of each forced-air or gravity-type furnace or burner, including ducts and vents attached to each appliance, up to and including 100,000 Btu/h (29.3 kW)30.00
 - 2. For the installation or relocation of each forced-air or gravity furnace or burner, including ducts and vents attached to such appliance, over 100,000 Btu/h (29.3 kW)40.00
 - 3. For the installation or relocation of each floor furnace, including vent30.00
 - 4. For the installation or relocation of each suspended heater, recessed wall heater or floor-mounted unit heater30.00
 - b. *Appliance vents.* For the installation, relocation or replacement of each appliance vent installed and not included in an appliance permit20.00
 - c. *Repairs or additions.* For the repair of, alteration of, or addition to each heating appliance, refrigeration unit, cooling unit, absorption unit, or each heating, cooling, absorption unit, or evaporative cooling system, including installation controls regulated by the mechanical code30.00
 - d. *Boilers, compressors and absorption systems (A/C).*
 - 1. For the installation or relocation of each boiler or compressor to and including three horsepower (10.6 kW), or each absorption system to and including 100,000 Btu/h (29.3 kW)40.00
 - 2. For the installation or relocation of each boiler or compressor over three horsepower (10.6 kW) to and including 15 horsepower (52.7 kW), or for each absorption system over 100,000 Btu/h (29.3 kW) to and including 500,000 Btu/h (146.6 kW)60.00
 - 3. For the installation or relocation of each boiler or compressor over 15 horsepower (52.7 kW) to and including 30 horsepower (105.5 kW), or each absorption system over 500,000 Btu/h (146.6 kW) to and including 1,000,000 Btu/h (293.1 kW)80.00

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4. For the installation or relocation of each boiler or compressor over 30 horsepower (105.5 kW) to and including 50 horsepower (176 kW), or each absorption system over 1,000,000 Btu/h (293.1 kW) to and including 1,750,000 Btu/h (512.9 kW)120.00
 5. For the installation or relocation of each boiler or compressor over 50 horsepower (176 kW), or 1,750,000 Btu/h (512.9 kW)200.00

e. *Air handlers.*

1. For each air-handling unit to and including 10,000 cubic feet per minute permit (cfm) (4,719 L/s), including ducts attached thereto38.00

Note: This fee does not apply to an air-handling unit which is a portion of a factory assembled appliance, cooling unit, evaporative cooler, or absorption unit for which a permit is required elsewhere in the mechanical code.

2. For each air-handling unit over 10,000 cfm (4,719 L/s)60.00

f. *Evaporative cooler.* For each evaporative cooler other than portable type35.00

g. *Ventilation and exhaust.*

1. For each ventilation fan connected to a single duct20.00
2. For each ventilation system which is not a portion of any heating or air conditioning system authorized by a permit30.00
3. For the installation of each hood which is served by mechanical exhaust, including the ducts for such hood40.00

h. *Incinerators.*

1. For the installation or relocation of each domestic—type incinerator45.00
2. For the installation or relocation of each commercial or industrial type incinerator60.00

i. *Miscellaneous fees.*

1. For each appliance or piece of equipment regulated by the mechanical code but not classed in other appliance categories, or for which no other fee is listed in the table30.00
2. Permit fees for fuel gas piping shall be:
 - (i) For each gas piping system of one to four outlets15.00
 - (ii) For each additional outlet exceeding four, each5.00
3. Permit fees for process piping shall be as follows:
 - (i) For hazardous process piping system (HPP) of one to four outlets15.00
 - (ii) For hazardous process piping system of five or more outlets5.00
 - (iii) For each nonhazardous process piping system (HPP) of one to four outlets2.00
 - (iv) For each nonhazardous process piping system of five or more outlets2.00

j. *Other inspection fees.*

1. *Inspections outside normal business hours (minimum charge, two hours):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.

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2. *Reinspection fees:* \$70.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employee involved.
 3. *Inspections for which no fee is specifically indicated, per hour (minimum charge, one hour):* \$75.00 per hour or the hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages, and fringe benefits of the employees involved.

(g) *Reinspection fee.* \$70.00

(h) *Certificate of occupancy.* \$100.00

(i) *Application for temporary power.* \$40.00

(j) *Appeal to board of appeals.* Each notice of appeal to the board of appeals shall be accompanied by a cashier's check or money order, payable to the city in the amount of \$200.00.

(Code 2001, app. A, §§ 4.900, 5.900; Code 2010, §§ A3.001, A3.002, A3.004—A3.011; Ord. No. 1460, § I, 5-23-2011; Ord. No. 1556, § IV, 5-19-2014; Ord. No. 1640, § I, 3-27-2017; Ord. No. 2019-009, § VIII, 8-26-2019; Ord. No. 2021-044, § IX, 9-13-2021)

Sec. 12-111. Chapter 111, Signs.

(a) *Temporary sign fee.* \$130.00

(b) *Permanent sign fee.* ~~\$300.00~~~~\$200.00~~ plus three percent of the cost of the sign.

(c) *Billboard advertising permit.* ~~\$300.00~~~~\$200.00~~ valid for a period of one year.

(d) *Billboard digital conversion.* \$1,737.00

(e) *Billboard digital - Annual fee.* ~~\$300.00~~~~\$232.00~~

(Code 2010, §§ A4.001—A4.003; Ord. No. 1460, § I, 5-23-2011; Ord. No. 1640, § I, 3-27-2017; Ord. No. 2019-009, § X, 8-26-2019)

Sec. 12-113. Chapter 113, Subdivisions.

(a) *Fees for processing and filing plats.* Fees for processing and filing plats shall be established as follows:

(1) *Preliminary plat:* ~~\$3400.00~~ plus ~~\$120.00~~ per lot.

(2) *Final plat:* ~~\$400.00~~~~\$300.00~~ plus \$20.00 per lot.

(3) *Replat:* \$300.00 plus ~~\$10.00~~~~\$5.00~~ per residential lot or commercial unit.

a. Recording fees

• 24' × 36" plat ~~\$67.00~~~~\$120.00~~

• 18" × 24" plat ~~52.00~~~~\$100.00~~

• Each additional page (i.e., tax certificate, extra plat page) ~~\$~~10.00

• See current Tarrant County recording fee for other fees that may apply

b. Miscellaneous fees

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- Easement or alley vacation ~~67.00~~ \$1,000.00, plus costs incurred by the city for the postage, mailing, copying, and other related expenses.

(4) Conveyance/corrected/amended plat: ~~\$200.00~~ \$275.00

(5) Zoning Verification Letter ~~22.00~~ \$25.00

(6) Zoning Map copy ~~17.00~~ \$25.00

(7) Plat copy ~~10.00~~ \$15.00

- (b) Construction inspection and permit processing fee.

(1) The developer agrees to pay the city an inspection and ~~permit processing~~ fee in the amount of \$24,000.00 for the first 6 months and \$4,000.00 per month thereafter until the development receives a final letter of acceptance. four percent of the construction costs of the The inspection fee will cover the inspections of streets, curb, and gutter, water, sewer and the drainage facilities, and other public infrastructure -required to serve the subdivision.

(2) Commercial plan review will be 65 percent of permit fee.

(3) Subdivision development (public utility, street, curb and gutter, drainage) plan review will be 65 percent of permit fee.

(4) Detailed drainage reviews or Floodplain reviews shall be based on actual cost of third party review plus 10% for administration.

(5) Pre-construction meeting \$300.00.

(Code 2001, app. A, §§ 8.100, 8.200; Code 2010, §§ A9.001, A9.002; Ord. No. 1640 , § I, 3-27-2017; Ord. No. 2019-009 , § XI, 8-26-2019; Ord. No. 2020-043 , § V, 10-12-2020; Ord. No. 2021-044 , § X, 9-13-2021)

Sec. 12-115. Chapter 115, Zoning.

- (a) *Rezoning fee.* \$600.00 plus costs incurred by the city for the postage, mailing, copying and other related expenses for all other zoning districts; \$600.00 plus costs incurred by the city for the postage, mailing, copying and other related expenses for planned development.
- (b) *Special use permit fee.* \$600.00 plus costs incurred by the city for the postage, mailing, copying, and other related expenses.
- (c) Site plan review fee. \$528.00
- (d) *Zoning board of adjustments hearing fee for variance to existing city codes and ordinances.* \$300.00 plus costs incurred by the city for postage, mailing, copying and other related expenses.
- (e) *Land plan/site plan fee.* \$500.00 for plan/site less than ten acres and \$700.00 for plan/site more than 10 acres.
- (f) *Portable storage container permit fee.* ~~\$25.00~~ \$30.00 for any portable storage container used in a residential zoned district for a period of 30 days or more. No fee shall be assessed for a portable storage building used in a residential zoned district for less than 30 days.

(Code 2001, app. A, §§ 11.100, 11.300; Code 2010, §§ A11.001—A11.003, A11.005; Ord. No. 1476, 10-24-2011; Ord. No. 1640 , § I, 3-27-2017; Ord. No. 2019-009 , § XII, 8-26-2019)