

CITY OF ROLLINGWOOD INFRASTRUCTURE IMPROVEMENTS PLAN

FINAL REPORT

PREPARED FOR:

CITY OF ROLLINGWOOD
403 NIXON DRIVE
ROLLINGWOOD, TEXAS 78746



PREPARED BY



JUNE 2020

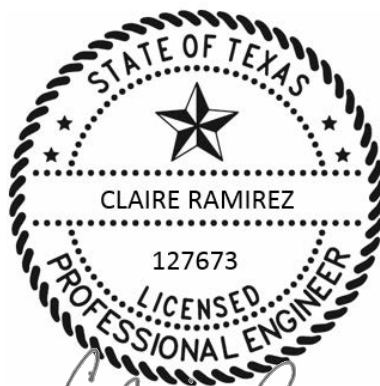
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1 GLOSSARY AND ACRONYMS

AOI – Area of Interest: defined as areas within the City that are prone to property flooding and street flooding.

CAPCOG – Capital Area Council of Governments

CIP – Capital Improvement Plan

City – City of Rollingwood

FEMA – Federal Emergency Management Program

FIS – Flood Insurance Study

GIS – Geographic Information System

HMGP – Hazard Mitigation Grant Program

KFA – K Friese + Associates, Inc.

NFIP – National Flood Insurance Program

NOAA – National Oceanic and Atmospheric Administration

TCAD – Travis County Appraisal District

TCEQ – Texas Commission on Environmental Quality

TNRIS – Texas Natural Resource Information System

2 INTRODUCTION

The City of Rollingwood (City) contracted K Friese & Associates, Inc. (KFA) to perform a city-wide Infrastructure Improvements Plan (IIP) to identify and mitigate local infrastructure concerns, with a focus on stormwater drainage and flooding issues. This plan provides potential mitigations for these issues and a summary of potential funding sources to guide the City's development of a Capital Improvement Program (CIP).

To identify drainage issues in the City, the project team spent the first half of 2019 gathering data by distributing a public survey, holding an open house, and reviewing drainage concerns and solutions that were documented prior to this plan. The team also conducted fieldwork, created a web-based geodatabase of existing infrastructure, and developed an inundation model to assess flooding depths and velocities within the City.

Following the data collection and modeling efforts, the project team identified areas of interest (AOIs) and developed project concepts to address the highest priority issues. This final report includes summary sheets and cost estimates for these project concepts, as well as an analysis of potential external funding sources.

This report documents the methodology and results of the plan in the following sections:

- *Data Collection:* This section describes the combination of public outreach, hydraulic and hydrologic modeling, data synthesis, field investigation, and coordination with City staff that provided the information needed to develop this plan.
- *Findings:* This section details the methodology and results of the process by which the project team used the collected data to identify and rank the top 23 AOIs.
- *Recommendations:* This section contains information regarding the CIP projects and associated cost estimates that are recommended for further analysis and design to mitigate drainage issues at the AOIs.
- *Next Steps:* This section provides a roadmap for further analysis and coordination for the City of Rollingwood to undertake to successfully implement the projects recommended by this plan.



Figure 1: Edgegrove Drive Low Water Crossing (September 11, 2019)

3 DATA COLLECTION

This section of the report describes the data gathered by the project team from a variety of methods and sources that form the foundation for the plan.

3.1 GEOGRAPHIC DATA INVENTORY

Drainage-related data, including as-built documentation of infrastructure, and Geographic Information System (GIS) mapping data, was gathered and reviewed. Sources included the City of Rollingwood, the Federal Emergency Management Agency (FEMA), the Capital Area Council of Governments (CAPCOG), the City of Austin, the Texas Commission on Environmental Quality (TCEQ), the Texas Natural Resource Information System (TNRIS), and the Travis County Appraisal District (TCAD). Most GIS data was collected to provide background mapping data for jurisdictional boundaries, parcel boundaries, street names, creek centerlines, and FEMA flood hazard zones.

3.2 CITY COORDINATION

Site visits were conducted with City staff to incorporate their knowledge into the inventory. The experience and familiarity of City staff provided insight to better understand and document drainage issues including the severity and frequency of recurring issues, as well as maintenance impacts.

The City Engineer, LNV, provided documentation of past drainage complaints received by the City, including photo and video files for approximately a dozen properties. Other notable data obtained from the City included a previous survey prepared in CAD for the purpose of mapping city stormwater infrastructure for the TCEQ Municipal Separate Storm Sewer System (MS4) program.

3.3 FIELD INVESTIGATION

The KFA project team drove each City street in Rollingwood to build a database of geolocated existing infrastructure. The resulting inventory, which also builds upon as-built data provided by LNV, the City Engineer, is shown in a series of maps provided in **Appendix A**. The inventory includes the following infrastructure components (as observable from the right-of-way):

- Drainage infrastructure, including culverts, ditches, and inlets
- Water & wastewater infrastructure, including distribution lines, hydrants, manholes, and valves
- Electric infrastructure, including overhead utility lines and electric poles
- Observations of pavement issues based on a visual inspection during fieldwork

KFA conducted dry and wet weather field visits to investigate potential drainage concerns around the City to determine contributing factors and to assess the severity of each identified issue. Additional drainage concerns were documented and recorded during field visits with City staff and public outreach efforts. Through this process, KFA created an inventory in the form of a GIS database to track drainage issues for the IIP and develop a comprehensive view of the issues facing the City.



Figure 2: South Crest Drive, Looking West (June 6, 2019)

3.4 PUBLIC INVOLVEMENT

The largest collective data source within a community are those who live there and experience it every day. A public survey was sent out to the residents and businesses within the City to utilize this data source. The purpose of the public survey was to gather data regarding drainage concerns in and around the home or business of the participants as well as any city-wide concerns. The questions were designed to retrieve objective data and to solicit comments from the participants. A flyer accompanied the survey explaining the purpose of the Infrastructure Improvements Plan and detailing the response process. Participants had the option to fill out the survey online, via email, or by U.S. mail. The flyer and public survey sent out to the community are provided in **Appendix B**.

3.4.1 Public Meeting

The City and KFA hosted a public meeting for the Infrastructure Improvements Plan on Tuesday, March 26, 2019. The public meeting was held at City Hall from 4 p.m. to 8 p.m. Nineteen attendees recorded their names on the sign-in sheet, and an estimated five to ten others were in attendance.



Figure 3: City Hall Public Meeting (March 26, 2019)

3.4.2 Public Survey

According to the American Community Survey, there are 533 housing units within the City of Rollingwood. A total of 106 public survey responses were received online, by mail, and at the public meeting, which equals approximately 20 percent participation.

Each public survey response was reviewed and incorporated into a GIS database and map. The database provided a method to analyze both the content and the spatial locations of the responses and issues. Maps of survey responses are included in **Appendix C**. The responses provide firsthand accounts of those affected by known issues, such as the intersection of Nixon and Pleasant, the Hatley culvert, and the Edgegrove Drive low water crossing. However, respondents also identified previously undocumented drainage issues, including ponding at the east Timberline bend and overtopping of the culvert on east Rollingwood Drive.

3.4.3 Citizen Input

In addition to the public meeting and survey, the project team received input directly from a number of citizens via email, including photos and videos of historic flooding at various locations throughout the City. These flooding complaints have been organized and incorporated into the GIS database for this plan.

3.5 HYDRAULIC MODELING

The project team developed a preliminary existing conditions hydrologic and hydraulic model for the entire City limits utilizing Infoworks ICM v8.0.4. The model was used to identify areas at risk of flooding and estimate potential flood depths and velocities. A rapid assessment “rain-on-mesh” model was created for the 100-year storm. A “rain-on-mesh” model simulates rainfall directly on a surface and utilizes two-dimensional (2D) hydraulic computations to compute overland and channel flow. Because the model is conceptual, it conservatively assumes no infiltration of rainfall. More detailed modeling would be required to assess the impacts of increases in impervious cover on the City’s drainage system.

The primary inputs into the model were the terrain surface, rainfall hyetographs and existing drainage infrastructure. The surface data used was the 2017 LiDAR downloaded from TNRS and processed in ArcGIS. The 100-year rainfall depth of 10.2-inches used was from the COA DCM (December 2018) and was applied using a 24-hour SCS Type 3 storm distribution. A Manning's n-value of 0.055 (for grass cover) was selected to model overland flow ease, or resistance. This value was chosen to represent an average of the various surfaces throughout City. The model also included approximately a dozen of the largest culverts and pipes, including the Bee Cave Road, Edgegrove Drive, Pleasant Cove, and Rollingwood Drive culverts. Pipes whose total diameter at one location was less than 36 inches were not incorporated into the high-level model.

The projected depths and velocities produced by the model were a helpful tool to identify, confirm, and prioritize flooding issues throughout the development of this plan. A map of model depths can be seen in **Appendix D**.

4 FINDINGS

This section of the report describes how the project team used the data they collected to develop a list of AOIs for CIP project candidacy. An area of interest map is provided in **Appendix F** for reference.

4.1 AREA OF INTEREST IDENTIFICATION

A list of preliminary AOIs was developed using 2D modeling results, public input, field observations, and input from City staff. In total, 23 AOIs were identified. These areas of interest were categorized into their corresponding watersheds, drainage areas, and sub-basins.

- *Watersheds*: The watershed boundary divides the City into the portion that drains to Town Lake (or Lady Bird Lake), and the portion that drains to Eanes Creek.
- *Drainage Areas*: LNV delineated drainage basins for the 2012 City of Rollingwood Drainage Area Map. KFA reviewed these drainage areas delineations for consistency with available contour data and known drainage patterns within the City and used them for this plan.
- *Sub-basins*: Sub-basins were delineated for Drainage Area 5. Drainage Area 5 contains multiple tributaries with three or more areas of interest each. Because of the number of tributaries and potential interdependency of the AOIs, it was necessary to subdivide Drainage Area 5 into Sub-basins. The Drainage Areas and Sub-basins are shown on the map in **Appendix F**.

4.2 AREA OF INTEREST PRIORITIZATION

Due to the scale of improvements and a review of the 100-year storm inundation model, a 200-foot buffer around each area of interest was assumed to be its area of influence. This buffer was analyzed for each area of interest to determine the percentage of parcels in this buffer that experience:

- Depth of flooding at structures greater than or equal to 6 inches (based on the most recently available building footprint GIS data from the City of Austin GIS database, 2013). 6-inch depths were selected based on a review of model results as an effective threshold to distinguish between AOIs for the purpose of prioritization for the IIP.
- Flooding velocities greater than or equal to 6 feet per second (based on the maximum permissible velocity in the 100-year storm, from the City of Rollingwood Drainage Criteria Manual)

These factors were used to assess the need for a project at that area of interest. The percentage of parcels within the buffer that meet the depth criteria and the percentage of parcels within the buffer that meet the velocity criteria were added together to obtain a need-based rating for each area of interest, as shown in **Table 1**.

Five projects received equivalent ratings using this process: projects C, I, A, P, and U. For these projects, public comments received in the spring of 2019 as part of the development of this Infrastructure Improvements Plan were referenced to prioritize the AOIs with the most apparent impact to private property.

Upon further analysis of area of interest C, no project was proposed. For this reason, C was moved to the bottom of the priority list.

4.2.1 Project Dependencies

In addition to the prioritization based on flooding depth and velocities, another factor considered was project interdependency. It is recommended that where projects are interdependent – that is, they are directly upstream or downstream from one another – the downstream projects be completed first. It is possible that improving hydraulic efficiency will result in higher peak flows downstream, and it would be prudent for the City to construct downstream improvements prior to upstream improvements to mitigate potential impacts. Due to this risk of downstream impacts, it is further recommended that the City model potential improvements for interdependent AOIs together. Modeling the system together will ensure the City reaches the desired outcome for the system as a whole.

One example is AOI M. AOI M is considered to be a higher priority than project K, even though project K's initial ranking is higher. This is because AOI M is located downstream of AOI K and in order for improvements at AOI K to begin, the improvements at AOI M would need to be complete. The same principle is true for projects L and H. These recommendations have been incorporated into the rankings provided in **Table 1**.



Figure 4: Nixon Drive Culvert, Looking Southeast/Downstream (June 6, 2019)



Figure 5: Bee Caves Road Culvert, Downstream (September 11, 2019)

Projects involving drainage infrastructure large enough to be included in the citywide inundation model were included in a proposed conditions inundation model to determine preliminary culvert and storm drain sizing. This model was compared to the existing conditions inundation model to assess project impact.

Table 1: Area of Interest Prioritization

Watershed	Drainage Basin	Drainage Subbasin	ID	Description	200-ft Area of Influence		Score	Ranking
					% of Parcels with Velocity > 6 fps	% of Parcels with Depth > 6" at Structures		
Eanes	10	-	B	Bee Caves Road low water crossing	75%	25%	1.00	1
Eanes	10	-	G	Edgegrove low water crossing	63%	13%	0.75	2
Town Lake	5	5-2	M*	Nixon/Pleasant property/roadway flooding	20%	40%	0.60	3
Town Lake	5	5-2	K	303 Pleasant Drive property flooding	0%	71%	0.71	4
Eanes	10	-	D	Timberline-South Crest roadway and property flooding	50%	17%	0.67	5
Town Lake	6	-	W	Hatley Drive and Riley Road flooding	33%	33%	0.66	6
Town Lake	5	5-1	L*	Pleasant Cove flooding	18%	36%	0.55	7
Town Lake	5	5-1	H	City Hall property flooding	29%	29%	0.57	8
Eanes	10	-	J	Rollingwood Drive ponding across from underground pond	0%	43%	0.43	9
Eanes	14	-	T	Rollingwood Drive property flooding	0%	30%	0.30	10
Eanes	10	-	N	Timberline ravine property flooding	0%	25%	0.25	11
Town Lake	5	5-4	Q	Rock Way Cove flooding and ponding	0%	20%	0.20	12
Eanes	14	-	S	Timberline bend water ponding	0%	18%	0.18	13
Town Lake	6	-	R	Hatley flooding and ponding	0%	18%	0.18	14
Town Lake	5	5-1	F	Nixon/Gentry property and road flooding	0%	17%	0.17	15
Town Lake	5	5-2	V	Pleasant Drive property flooding	0%	15%	0.15	16
Town Lake	5	5-4	O	Kristy Drive flooding	0%	10%	0.10	17
Town Lake	5	5-1	E	Randolph property flooding	0%	8%	0.08	18
Town Lake	5	5-2	I	Park Hills flooding and ponding	0%	0%	0.00	19
Eanes	9	-	A	Rollingwood Drive ponding in yards	0%	0%	0.00	20
Town Lake	5	5-3	P	Wallis/Hatley yard flooding	0%	0%	0.00	21
Town Lake	6	-	U	Vance/Riley ponding in road	0%	0%	0.00	22
Eanes	10	-	C**	Rollingwood Drive south side property flooding	0%	0%	0.00	23

*AOI is downstream of an AOI with a higher rating. It is given higher priority than the upstream AOI because downstream AOI's should be addressed first to mitigate adverse impacts.

**No project is recommended at this AOI due to further analysis, so this AOI is listed as the lowest priority level.

5 RECOMMENDATIONS

This section of the plan contains a summary of CIP project concepts that were developed by the project team to address the drainage issues at the AOIs described in the previous section. Specific project summaries and cost estimates can be found in **Appendix H** and **Appendix I**, respectively.

5.1 CIP DEVELOPMENT

The proposed improvements included in each CIP project are based on preliminary level engineering, field visits, and high-level topographic information; these are not detailed engineering analysis or design. The following sections discuss the CIP development process and prioritization.

Guiding principles from the City of Rollingwood Drainage Criteria Manual were used to determine planning-level preliminary sizing for recommended CIP projects: runoff from the 100-year storm event should be generally contained within City right-of-way. While modeling more frequent storm events was not included within the scope of this plan, the CIP project concepts that were developed provide planning-level approximations of pipe sizes and other parameters that could achieve other Drainage Criteria Manual objectives, like mitigation of adverse downstream impacts and runoff from the 25-year storm event contained within drainage infrastructure. Further analysis through modeling and design is required to determine exact design parameters.

5.2 PROJECT COST ESTIMATES

Planning-level cost estimates were developed for the proposed projects. These cost estimates are based on the preliminary project concepts developed to mitigate the issue at each area of interest, and are likely to vary when detailed design is completed for each project.

The cost estimates include:

- *Engineering & Surveying*: Engineering, surveying, and environmental costs were estimated as a uniform percentage of construction costs for each project.
- *Permitting Fees*: Estimated fees required by TCEQ or FEMA have been included in project cost estimates.
- *Construction*: Unit costs and quantities are provided in the project cost estimate sheets. Traffic control and roadway reconstruction are included where necessary.

The estimates do not include costs for:

- *Right-of-Way & Easement Acquisition*: It was determined in the course of the project through close coordination with the City that additional research is required to determine right-of-way and easement acquisition needs. It is recommended that the City perform this research prior to implementation of recommended CIP projects.

Due to these limitations in available information and the associated impacts on the design of proposed projects, it is recommended that construction costs continue to be refined as this information is made available and projects are further developed.

Cost summary sheets for each project can be found in **Appendix I**. A summary of costs is provided in **Table 2**. As shown in the table, costs for projects that comprise a combined system are bundled together. These project combinations are projects E and F; projects M, K, and V; projects Q and P; and projects S and T.

Also note that a cost estimate was not generated for the Bee Cave Road crossing of Eanes Creek at AOI B. The flooding along Bee Cave Road has added complexity with the adjacent tributary, roadway design implications and would require significant TxDOT involvement. It is the opinion of KFA that this AOI would

require its own feasibility study to understand flooding sources, roadway implications and involvement with TxDOT prior to developing a cost estimate.

Table 2: Project Ranking and Cost Summary

ID	Project Name	Cost	Ranking*
B	Bee Caves Road Drainage Improvements	<i>Not Estimated</i>	1
G	Edgegrove Drainage Improvements	\$ 2,631,000	2
M	Nixon/Pleasant Roadway Drainage Improvements	\$ 5,283,000	3
K	Pleasant Drive Drainage Improvements	<i>included in M</i>	4
D	Timberline-South Crest Drainage Improvements	\$ 558,000	5
W	Hatley Drive Drainage Improvements	\$ 654,000	6
L	Pleasant Cove Drainage Improvements	\$ 490,000	7
H	City Hall Property Drainage Improvements	\$ 475,000	8
J	Underground Infiltration Basin Drainage Improvements	\$ 883,000	9
T	East Rollingwood Drive Drainage Improvements	\$ 2,122,000	10
N	Timberline Drive Drainage Improvements	\$ 380,000	11
Q	Rock Way Cove Drainage Improvements	\$ 816,000	12
S	East Timberline Drive Drainage Improvements	<i>included in T</i>	13
R	Hatley Drive Drainage Improvements	\$ 400,000	14
F	Nixon/Gentry Drainage Improvements	\$ 2,024,000	15
V	Pleasant Drive Drainage Improvements	<i>included in M</i>	16
O	Kristy Drive Drainage Improvements	\$ 217,000	17
E	Randolph Place Drainage Improvements	<i>included in F</i>	18
I	Park Hills Drainage Improvements	\$ 238,000	19
A	Rollingwood Drive West Drainage Improvements	\$ 589,000	20
P	Wallis and Hatley Drainage Improvements	<i>included in Q</i>	21
U	Riley Rd and Vance Ln Drainage Improvements	\$ 141,000	22
C	Rollingwood Drive South Drainage Improvements	<i>Not Estimated</i>	23
SUM		\$ 17,901,000	

* Ranking is based on velocities and flooding depths at structures from the inundation model.

5.3 ADDITIONAL INFRASTRUCTURE IMPROVEMENTS

While this Infrastructure Improvements Plan is focused primarily on drainage, additional infrastructure improvements have been incorporated into the plan in several ways:

- Projects identified and recommended for inclusion by City staff
- Projects identified by the project team during development of the IIP
- Recommended next steps listed in this section of the report

5.3.1 Projects Identified by City Staff

City staff reviewed the recommended CIP projects identified by this plan for alignment with other infrastructure needs that were identified at the time of this plan, to see if projects could be completed concurrently for time and cost efficiency. The City provided construction plans and a cost estimate for a waterline improvement project on South Crest Drive that could be completed in conjunction with project D. A cost estimate for this waterline is included on the project summary and cost estimate sheets for project D in **Appendix H** and **Appendix I**.

5.3.2 Projects Identified by IIP

Roadway reconstruction has been incorporated into project concepts and cost estimates where necessitated by the drainage improvements. For example, raising and repaving the road on Pleasant Cove is recommended for project L in conjunction with regrading the adjacent channel to seek to maintain access to homes during flooding events. Similarly, roadway improvements are included with project G along Edgegrove Drive and South Crest Drive to accommodate the bridge that is recommended to replace the existing low water crossing on Edgegrove Drive.

5.3.3 Recommended Next Steps

For a detailed assessment of other infrastructure improvements, it is recommended that the City allocate resources to the creation of the following citywide plans to assess infrastructure needs comprehensively:

- Sidewalk Master Plan
- Utility Master Plan
- Traffic Calming Master Plan (*The City completed a Traffic Calming Study in 2001 that can be used as a reference, but an updated plan should be completed to assess current needs.*)

As discussed in **Section 6.2** of this report, verification of right-of-way and easement data across the City should be performed prior to the design of the drainage projects recommended by this plan. Similarly, this data should be obtained prior to developing the other infrastructure plans listed above. Knowledge of where the City currently holds right-of-way and easements will be crucial information to inform what options are available to the City when it comes to the installation of sidewalks, underground utilities, and other potential projects.

When the drainage projects proposed by this plan go out for design and construction, all current City plans (including the above list) should be reviewed for two reasons:

1. If any additional projects are proposed in the vicinity of the drainage projects, the City should consider whether it makes sense to combine the projects for the sake of time and cost efficiency.
2. Infrastructure projects like sidewalks and traffic speed humps are likely to impact drainage patterns. As detailed design parameters are developed for each drainage project, it is important to consider whether the addition of other infrastructure should be considered in the drainage analysis for the project.

6 NEXT STEPS

While this Plan provides a preliminary assessment of top drainage issues and potential solutions across the City of Rollingwood, additional study, coordination, analysis, and design are required for implementation.

6.1 ONGOING DATA NEEDS

During the course of this project, a significant data needs issue came to KFA's attention that must be addressed prior to design and implementation of CIP projects. There is currently no comprehensive and up-to-date database of right-of-way and easements belonging to the City. The lines between public right-of-way and private property with respect to drainage, utility, roadway and other public infrastructure have been blurred over time through verbal agreements and changes in property ownership.

Without this data, the definition and design parameters for each of the recommended CIP projects will be unclear. For example, if the City has or is able to obtain a drainage easement for a swale that can sufficiently contain runoff from the 25-year storm, it may not be necessary to build underground storm drain infrastructure to convey runoff in this location. On the other hand, if no easement exists and one cannot be obtained, the City may choose to construct storm drain in order to reroute the flow to where drainage conditions can be monitored and maintained by the City.

Due to the relative lack of existing documentation, defining existing easements and right-of-way will be a greater than average effort. For the purposes of this plan, it has been assumed that the City will pursue easements on private property where necessary in order to implement recommended drainage projects.



Figure 6: Rockway Cove Culvert, Looking Southwest/Upstream (September 11, 2019)

6.2 MODELING

The 2D 100-year inundation model prepared for this project is a preliminary model that is appropriate for planning purposes. In order to more fully understand project dependencies and mitigate adverse impacts, each proposed project must be modeled with a greater level of detail. It is assumed that a more thorough assessment of adverse impacts will be completed at the time of design for each project, when detailed design parameters are determined.

6.3 INTERAGENCY COORDINATION

It is also strongly recommended that prior to moving forward with the design of any of these projects, the City of Rollingwood coordinate with the City of Austin Watershed Protection Department to discuss what

permitting, coordination, and mitigation measures may be required based on the potential impacts of the proposed projects on City of Austin waterways downstream of the City of Rollingwood.

6.4 ATLAS 14 CONSIDERATIONS

The National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) published Atlas 14 Volume 11 (Texas) in September of 2018. Atlas 14 is a historical rainfall study that provides updated precipitation frequency estimates based on new statistical methods and a greater range of historical precipitation data extending through 2017. Rainfall precipitation frequency estimates are used for the purposes of flood risk management and infrastructure design, including the sizing of pipes and ponds, and determination of floodplain limits. During the development of this plan, discussions have arisen regarding the incorporation of Atlas 14 rainfall data into the modeling and recommendations.

6.4.1 Approach to Rainfall Data for This Plan

The hydraulic modeling and preliminary pipe sizing for this Infrastructure Improvements Plan is based on current City of Rollingwood policies, including the following sections of the City code and drainage ordinance:

- “Storm drainage facilities shall be designed and constructed in compliance with this Article 3.09, the City of Austin, Texas (COA) Drainage Criteria Manual Section 2-8 in effect on September 9, 2014 (the “COA DCM Regulations”) and the City of Rollingwood Drainage Criteria Manual (Rollingwood DCM) attached to this Article as Appendix 3.09 A, and incorporated herein by reference. No amendments made to the COA-DCM Regulations by the COA shall become effective unless adopted by the Rollingwood City Council” (Drainage Ordinance Sec. 3.09.002).
- “Drainage calculation methods shall be based on the COA DCM (Supplement 9 – 2014) Sections 2-8” (Drainage Ordinance Sec. 3.09.005(c)).
- “The areas of special flood hazard identified by the Federal Emergency Management Agency in the current scientific and engineering report entitled, "The Flood Insurance Study (FIS) for Travis County, Texas and Incorporated Areas," dated January 6, 2016, with accompanying flood insurance rate maps or flood boundary-floodway maps (FIRM or FBFM), index panel 48453C0445H, dated January 6, 2016, and any revisions thereto are hereby adopted by reference and declared to be a part of this article” (City Code Sec. 103-116).

Atlas 14 rainfall data is not incorporated into this plan because of the complex policy questions that must first be answered that will determine *how* Atlas 14 rainfall data is incorporated into the City of Rollingwood's code, ordinance and criteria manuals. These questions are numerous and far-reaching, including the following:

- **Which storm frequencies will the City choose to regulate?** The Atlas 14 study includes rainfall data for the one-, two-, five-, ten-, 25-, 50-, 100-, 200-, 500-, and 1000-year storm events. The degree to which the City decides to regulate stormwater runoff based on the new rainfall data will determine which of these storm events are incorporated into design criteria for new drainage infrastructure.
- **What level of service will the City seek to provide for stormwater management?** For example, channels are currently designed to contain runoff from the 25-year storm event within the channel and runoff from the 100-year storm event within the public right-of-way (City code Sec. 103-231). Instead of maintaining the analogous level of service with their drainage infrastructure for the updated rainfall data, some cities are choosing to modify design parameters. An example of this approach could be the City of Rollingwood changing its drainage criteria to require the 10-

year storm event to be contained within the channel and the 25-year event within the right-of-way.

- **How will the City of Rollingwood respond to modifications to FEMA floodplain limits?** The floodplain boundaries within the City of Rollingwood are directly tied to the floodplain boundaries within the City of Austin. Therefore, revisions that the City of Austin decides to submit to FEMA to modify the FEMA Flood Insurance Rate Map (FIRM) panels in the Austin area directly impact the City of Rollingwood. It is known that the City of Austin will re-study the watersheds within the City utilizing the Atlas 14 rainfall data, and therefore the FEMA FIRM panels (which delineate floodplains) for the City of Rollingwood will change. The City should consider whether it wants to participate in the re-study with the City of Austin and what benefits that may serve.
- **How will flood insurance requirements change for properties where the floodplain has changed?** The City of Rollingwood currently refers to FEMA’s Flood Insurance Study (FIS) for Travis County from 2016 for the determination of areas of special flood hazard (City code Sec. 103-116). As a member of the National Flood Insurance Program (NFIP), the City must adopt updates to the FIS and FIRM panel in order to avoid suspension from the NFIP. Note that the City may adopt an ordinance that automatically adopts the most recently available flood elevation data provided by FEMA. The revision of the floodplain limits and elevations within the City of Rollingwood will change the number of properties that require flood insurance.
- **How will changes to floodplains affect development regulations?** This is up to the City of Rollingwood. At a minimum, the City must have a floodplain management ordinance that meets or exceeds the minimum NFIP requirements. It is suggested that City staff review the floodplain regulation changes proposed by the City of Austin to start a discussion on regulations that could benefit the City of Rollingwood. (<http://austintexas.gov/floodplainrules>)
- **When will the City of Rollingwood take action regarding Atlas 14?** With respect to floodplain regulations, it is recommended that the City of Rollingwood begin taking action now. As stated above, the City of Austin will revise the FEMA floodplain boundaries and this will directly impact the City of Rollingwood whether the City is prepared or not. If the City begins to educate residents on the potential changes due to Atlas 14 and begins to regulate development and stormwater management to higher standards now, the City will be better prepared for the coming changes. Like the City of Austin and Travis County, it may benefit the City to use the 500-year floodplain as a proxy for the new Atlas 14 100-year floodplain until final results of the new rainfall data have been incorporated into the FEMA FIRMs. This approach in combination with public education will help ease the impact of the revised FEMA maps when they are adopted. With respect to City stormwater management, such as City stormwater infrastructure, or requirements for development permit applications outside of the floodplain, the City should begin discussing how it would like to regulate stormwater (see the first two bullets above).

Ultimately, the Atlas 14 rainfall data illustrates that Central Texas is more likely to experience larger rain events than previously thought. The City regulates stormwater through the Drainage Criteria Manual and Code of Ordinances in order to protect the public from flood risk and reduce expense after flood events. Updates to rainfall data deserve particularly careful consideration in Rollingwood, given the City’s proximity to Lady Bird Lake, lack of residential impervious cover limitations, and shared boundaries with the City of Austin and the City of West Lake Hills. Because of the complexities and implications of Atlas 14 incorporation, 100-year rainfall data from the City of Austin Type III SCS 24-hour storm duration was used for this plan’s preliminary hydraulic modeling in accordance with the City of Rollingwood’s current drainage ordinance.

While the City determines its desired direction regarding Atlas 14, it should continue to assess appropriate rainfall data to use on a project-by-project basis. In order to account for likely increases in project costs due to future incorporation of Atlas 14 data, a contingency of 10% has been incorporated into the preliminary project cost estimates included in this plan. This figure is based on cost increases experienced by other agencies as a result of incorporating Atlas 14 data into hydraulic analysis for previous projects.

6.4.2 Recommended Approach for Future Consideration of Policy Implications

It remains for the City to determine its response to Atlas 14 data. The following steps are recommended for the City to investigate Atlas 14 further and begin to make important policy decisions:

- Conduct a peer review of similarly sized municipalities in Central Texas to learn what approach to design criteria and development regulations other communities are adopting in response to the Atlas 14 data.
- Develop a set of Atlas 14 adoption scenarios outlining potential paths the City could take to incorporate the data into City policies.
- Conduct public meetings. Educate the public on the potential impacts and receive input on an appropriate path forward for the City.
- Perform an economic study to analyze the costs and benefits of different Atlas 14 adoption scenarios to the residents and businesses of Rollingwood.
- Develop and adopt new policies in accordance with the City's goals and priorities.

Finally, it is recommended that the City update the improvements proposed by this plan once decisions have been made regarding implementation of Atlas 14 rainfall data, as it may have a significant impact on drainage facility sizing, target level of service, and other design parameters within the City's Drainage Criteria Manual.

6.5 PLANNING & DESIGN

The project concepts provided in **Appendix H** provide a possible way to improve drainage at each of area of interest identified by this plan. These project summaries provide order-of-magnitude cost estimates and give a head-start to future planning and design efforts, but are not fully vetted and modeled improvements. Similarly, the cost estimates are intended for planning and programming purposes only and should not be used for construction.

Further coordination with the City and drainage analysis is required to develop specific design parameters and detailed design for each project. A major unknown element for project development is where the City currently has right-of-way and drainage easements. Additional research to determine where easements exist and where they can be acquired will help inform the final design for each project recommended by this plan.

6.6 REGIONAL DETENTION CONSIDERATIONS

Another topic for further study is whether regional detention can play a larger role in improving the drainage conditions within Rollingwood. Runoff generally flows faster through storm drain systems than it does overland, so installing storm sewer systems can increase downstream flow rates. Detention is one way to counteract this effect.

For this plan, the preliminary pipe sizing was based on the City of Rollingwood Drainage Criteria Manual and preliminary review of downstream impacts. When runoff that currently flows overland is captured and conveyed in a storm drain system, the runoff travels faster which can potentially increase peak flows

at the outfall. While detailed impact analysis was not performed, an effort was made to review the preliminary pipe sizing with respect to potential downstream impacts. In order to not cause any downstream impacts, the pipes in some systems may perform at a level of service lower than the current Criteria Manual guidance. An alternative solution to allow larger pipes and a higher level of service while preventing downstream impacts is to provide detention at key locations.

One location for potential detention discussed with City staff is the creek bed just upstream of the Pleasant Cove culvert. By observation of the inundation mapping, this area is already storing runoff upstream of the culvert. It is possible that culvert crossing (AOI L) could be optimized to maximize the natural storage area upstream of the crossing. In addition, there may be opportunity to grade out the channel banks to increase the size of the storage area or combine the area with AOI H. Note that grading within this area will require careful consideration for slope stability and environmental review to ensure USACE permitting is not required.

6.7 ADDITIONAL CONSIDERATIONS

As previously noted, the primary challenge within the City in terms of improving the drainage infrastructure is the lack of right-of-way and easements. However, there are also other challenges the City faces with regulating new development. Moving forward, the City should consider the following to maximize benefit to the residents, utilize funding efficiently, and effectively regulate new development:

1. Ensure new development is considering offsite contributing drainage area as well as site impacts. Establish a policy for drainage easement dedication for new development when offsite runoff will be conveyed through the property. In order improve the drainage within the City, the City must have the ability to maintain drainage infrastructure.
2. For the City to plan for and design City stormwater infrastructure to accommodate an ultimate, fully-developed future condition, it would be prudent to establish a maximum allowable impervious cover percentage for residential land use. If impervious cover is not regulated, additional drainage infrastructure, higher development fees, and/or acquisition of more drainage easements will be necessary to allow the City to continue to mitigate flooding issues.
3. Additional policy-related measures for floodplain management can be found in *A Guide for Higher Standards in Floodplain Management*, prepared by the Association of State Floodplain Managers in 2013 and made available at <https://www.floods.org/ace-files/documentlibrary/committees/3-13-Higher-Standards-in-Floodplain-Management2.pdf>. This guide contains language that can help communities such as Rollingwood establish new policies or strengthen existing ones to protect their communities from flood risk. Examples include requirements for finished floor elevations, foundation design, setbacks for land adjacent to streams, and use restrictions.
4. Establish drainage criteria that requires the comparative review of the flow rate, velocity, depth, and flow type of runoff leaving development and redevelopment projects between pre- and post-project conditions. While the City does currently require new development to detain runoff, it is equally as important to ascertain that runoff leaving a site as sheet flow pre-project does not then leave as concentrated flow post-project. It is also vital that development maintains existing drainage patterns so runoff does not leave the site in a different location post-project.

6.8 SUMMARY OF OUTSIDE FUNDING MECHANISMS

As part of the KFA Project Team, The Goodman Corporation researched external funding sources that could be leveraged by the City to assist with implementation of the recommended CIP projects. Examples include Texas Water Development Board grants, TxDOT Transportation Alternatives funding, and FEMA Flood Mitigation Assistance (FMA). These and other funding sources are described in **Appendix J** as they relate to the specific CIP projects recommended by this plan.

The majority of the recommended projects are, at a minimum, eligible for one or more discretionary funding sources. However, the competitiveness of the projects varies and is difficult to estimate without the completion of further evaluation via a benefit-cost analysis.

Based on the analysis completed thus far, the best projects for discretionary funding support appear to be the Bee Caves Road Drainage Improvement project and the projects related to City Hall Drainage.



Figure 7: Pleasant Cove Culvert, Looking Northeast/Downstream (September 11, 2019)

Recommended next steps for the City to pursue external funding are as follows:

- Conduct detailed outreach with individual property owners to obtain and assemble census tract-level information related to individual flood-related losses, National Flood Insurance Program (NFIP) insurance status, and claim amounts. This information will help to validate whether or not FMA grants will be applicable to individual projects.
- Perform a benefit-cost analysis for all of the projects. Due to the nature of these projects, it is recommended that FEMA methodology be used. This data could also be used to adjust the project ranking information provided as well as determine which projects are or are not eligible for Hazard Mitigation Grant Program (HMGP) funds through FEMA.
- Develop and process for ongoing coordination with Travis County, the City of Austin Watershed Protection Department, and the Lower Colorado River Authority and any other applicable entities to identify opportunities for partnership projects.

6.9 SUMMARY OF INTERNAL FUNDING MECHANISMS

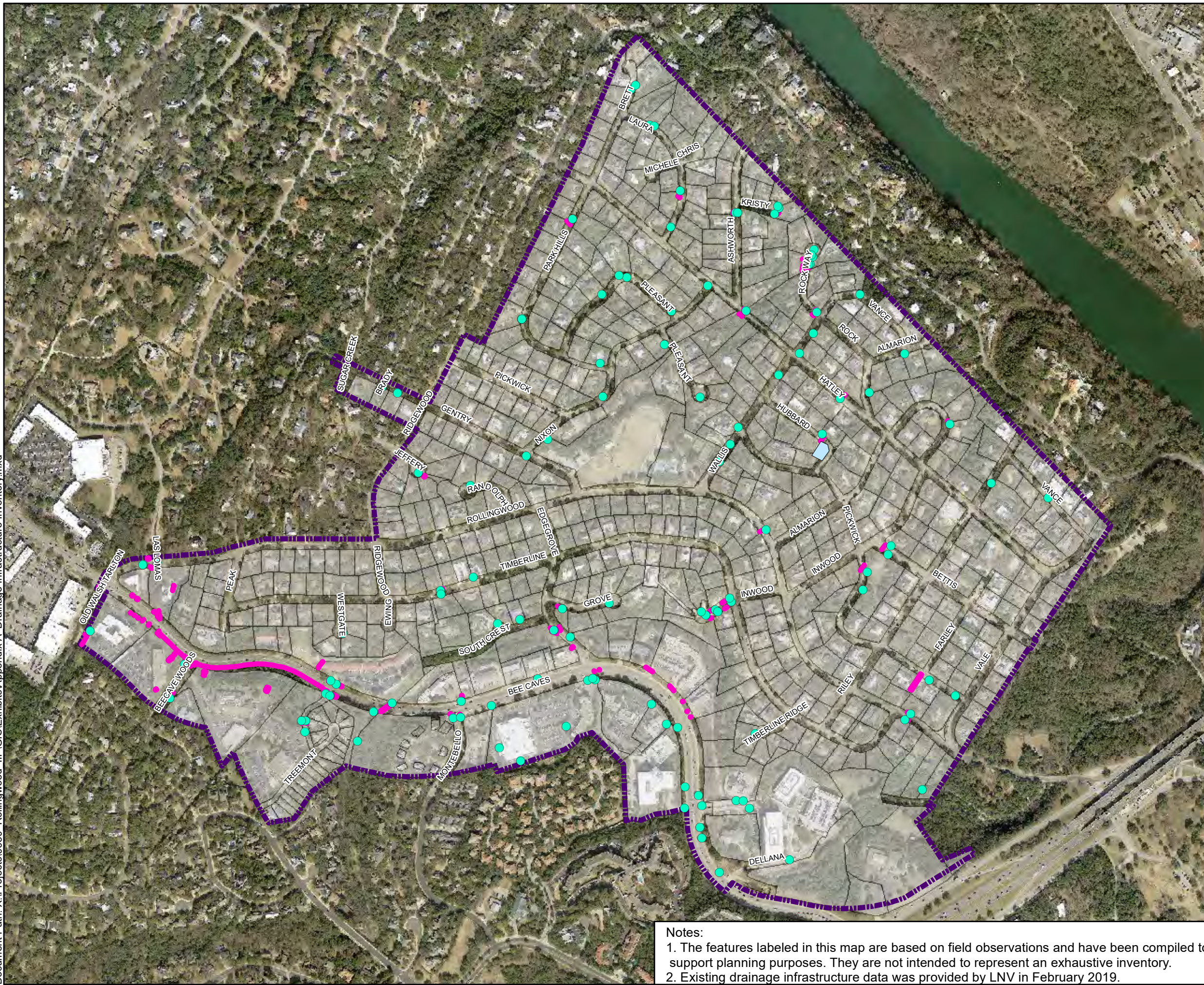
In addition to the external funding mechanisms mentioned above, there are internal funding mechanisms that the City could leverage to support the installation and maintenance of drainage infrastructure. Two such funding mechanisms are outlined below:

1. **Drainage Utility Fee:** Several municipalities in the area, including Austin, Fredericksburg, and Killeen, have implemented a drainage utility fee for this purpose. The amount and structure of drainage utility fees can vary; in some cities the amount of the fee is based on property size, zoning classification, or amount of impervious cover, while others use a flat monthly rate.
2. **Rollingwood Stormwater Discharge Permit (RSDP):** Another option for the City to consider is to modify the current RSDP structure to require redevelopment efforts to contribute to a fund for citywide drainage improvements.






Appendices

Appendix A: Infrastructure Inventory Maps

- Drainage Infrastructure Inventory
- Electric Infrastructure Within Right-of-Way
- Water & Wastewater Infrastructure Within Right-of-Way
- Results of Visual Pavement Observations



Legend

-  Rollingwood City Limits
-  Parcels
-  Existing Detention Pond
-  Existing Inlets
-  Existing Drainage Infrastructure (2010)

City of Rollingwood Infrastructure Improvements Plan Drainage Infrastructure Inventory



0 600 1,200
Feet

Date: 10/25/2019

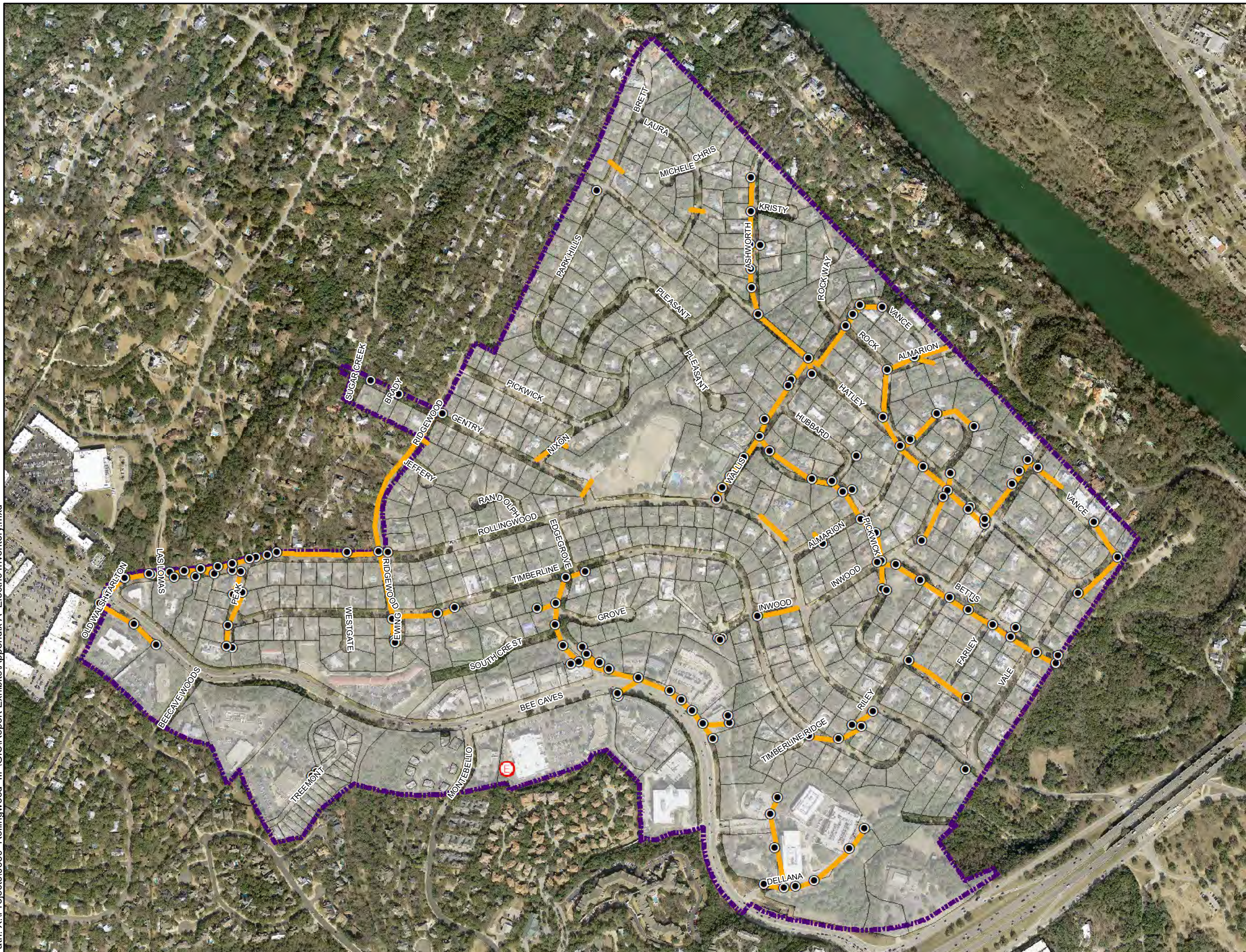


PUBLIC PROJECT ENGINEERING






FIRM NO. 6535

Notes:

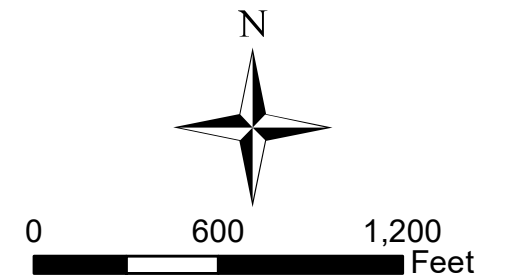
1. The features labeled in this map are based on field observations and have been compiled to support planning purposes. They are not intended to represent an exhaustive inventory.
2. Existing drainage infrastructure data was provided by LNV in February 2019.



Legend

-  Rollingwood City Limits
-  Parcels
-  Overhead Electric in Right-of-Way
-  Electric Manhole
-  Electric Pole

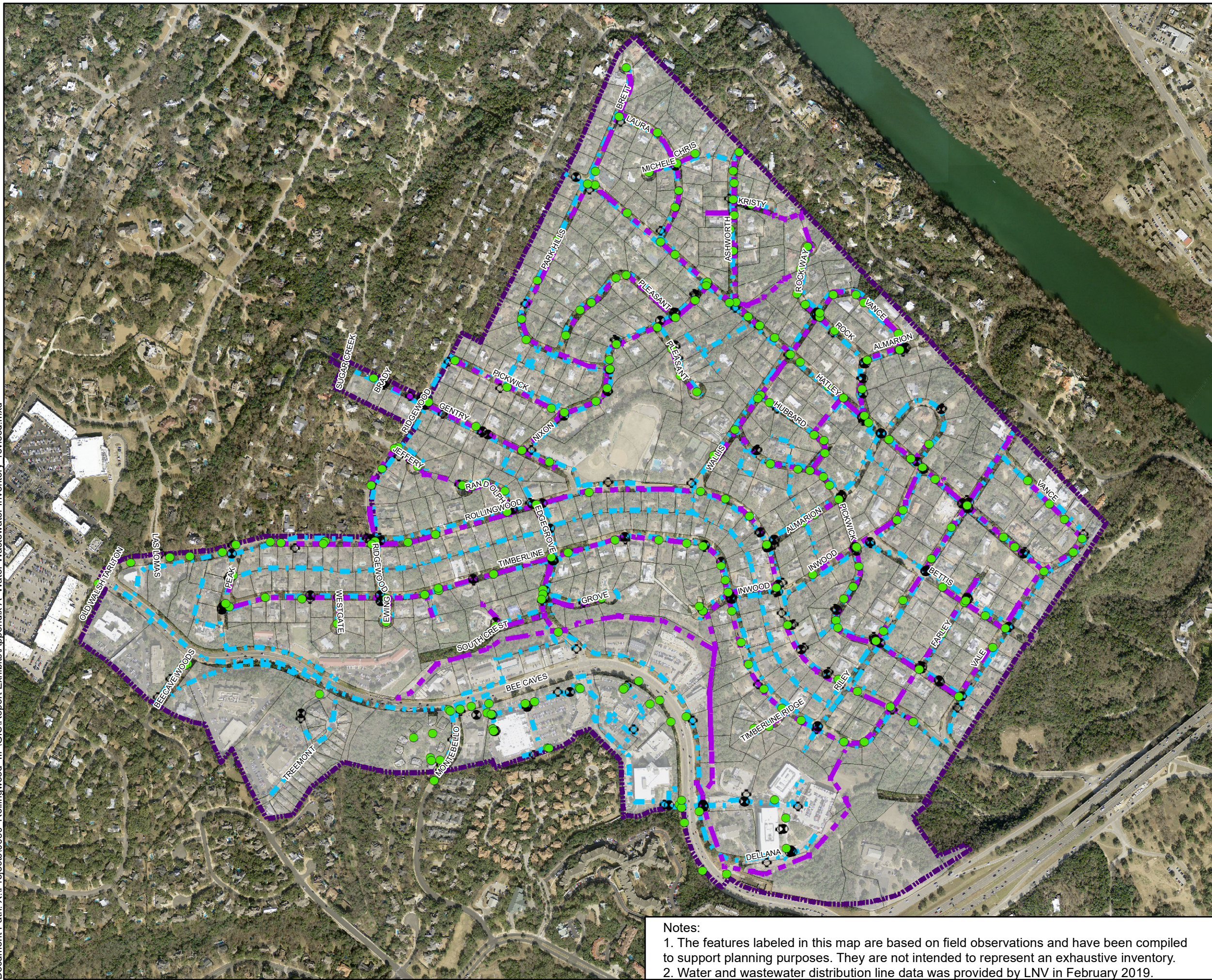
**City of Rollingwood
Infrastructure
Improvements Plan**
Electric Infrastructure
Within Right-of-Way










Date: 11/26/2019



Notes:
1. The features labeled in this map are based on field observations and have been compiled to support planning purposes. They are not intended to represent an exhaustive inventory.

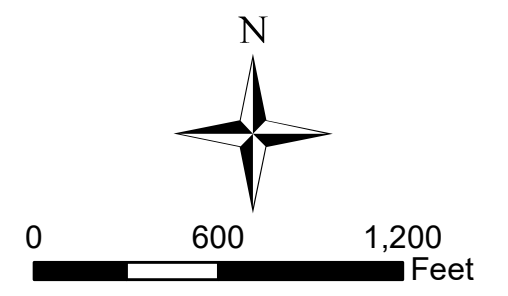


Legend

-  Rollingwood City Limits
-  Parcels
-  Utility Manhole
-  Fire Hydrant
-  Valve
-  Wastewater Collection Line
-  Water Distribution Line

City of Rollingwood Infrastructure Improvements Plan

Water & Wastewater Infrastructure
Within Right-of-Way

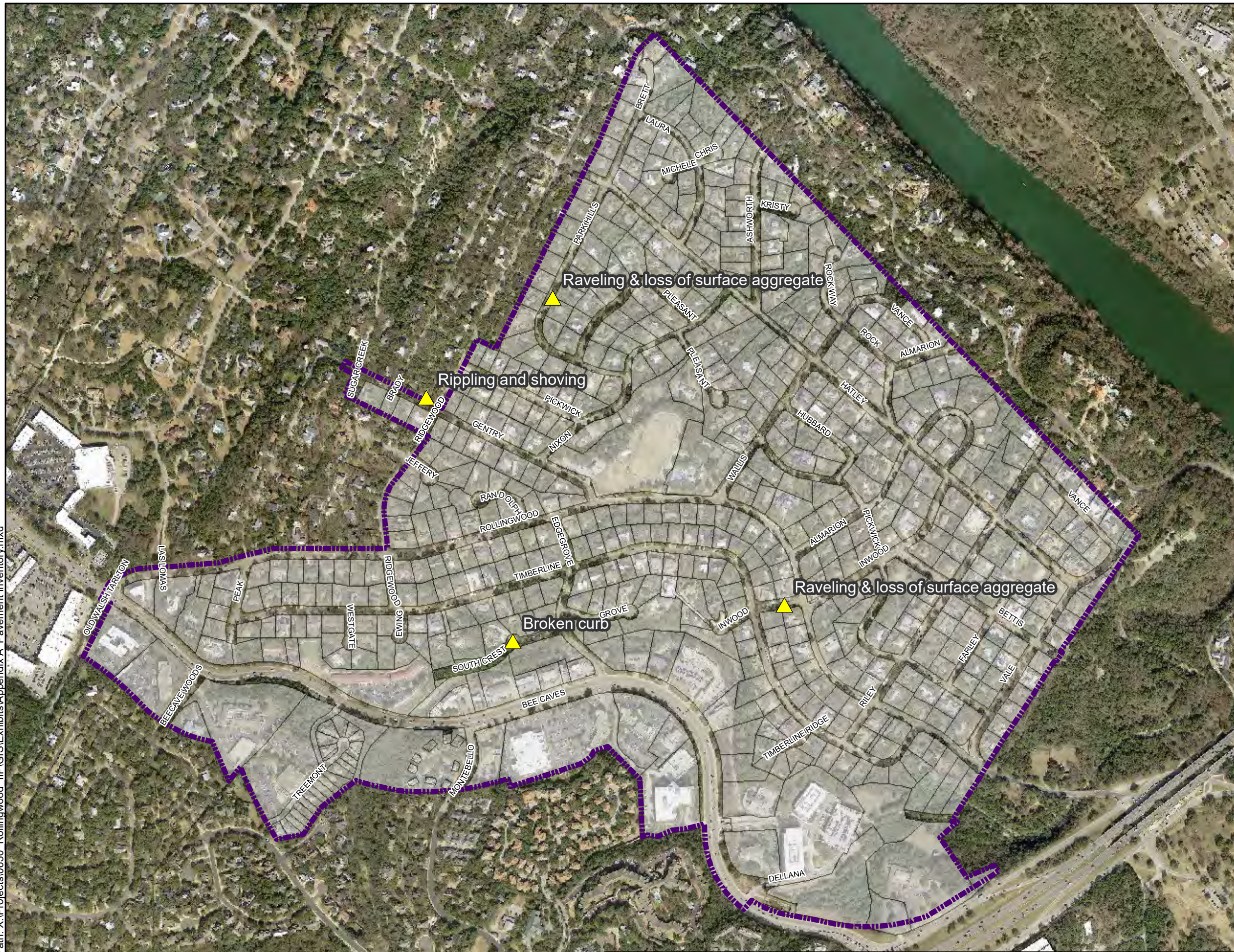


Date: 6/10/2020






FIRM NO. 6535

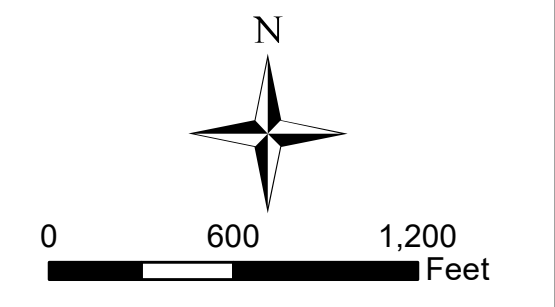
Notes:
 1. The features labeled in this map are based on field observations and have been compiled to support planning purposes. They are not intended to represent an exhaustive inventory.
 2. Water and wastewater distribution line data was provided by LNV in February 2019.



Legend

-  Rollingwood City Limits
-  Parcels
-  Pavement Issues from Visual Inspection

**City of Rollingwood
Infrastructure
Improvements Plan**
Results of Visual
Pavement Observations



Date: 10/25/2019



Notes:
1. The features labeled in this map are based on field observations conducted in February 2019 and have been compiled to support planning purposes. They are not intended to represent an exhaustive inventory.

Appendix B: Public Outreach Materials

- Public Flyer
- Public Survey



PUBLIC SURVEY

Date: _____

First Name: _____ Last Name: _____

Address: _____

House# *Street Name*

CITY OF ROLLINGWOOD Infrastructure Improvements Plan

We have heard your concerns about flooding and drainage in our City, and to address these concerns we are developing an Infrastructure Improvements Plan.

The City of Rollingwood Infrastructure Improvements Plan will identify areas of interest related to drainage and pavement conditions, prioritize those areas, and create project concepts to address the issues that are present.

If you are aware of a drainage problem near your property, please take a few minutes to complete and return the brief survey (on the back of this letter) or go to <https://arcg.is/15rXqD> online to complete and submit the survey electronically. We will use the information you provide as one source of data, along with other information that we collect to help identify and prioritize public infrastructure concerns within the City. If you have relevant photos of flooding, please upload them to the website mentioned above.

Please share your concerns by returning the survey:

By Mail

Attn: Amber Lewis
403 Nixon Drive
Rollingwood, TX 78746

By Email

clafollette@kfriese.com

Online

<https://arcg.is/15rXqD>

If you would like assistance completing your survey or would like more information about the Infrastructure Improvements Plan, join City staff and engineers from K Friese + Associates for a public meeting:

Where: **403 Nixon Drive (City Hall)**

When: **Tuesday, March 26th, 2019 from 4-8 PM**



LOCAL Flooding Issues

1. How long have you lived at this address?
 _____ Months _____ Years
2. Do you have any drainage concerns on your property?
 (Check all that apply)
 - Ponding in front yard Ponding in backyard
 - Water in garage Water in house
 - Septic (on-site wastewater) related problems
 - Other _____
3. How often do these issues occur?
 - Once every couple of years
 - Once or twice a year
 - 3-6 times a year
 - Every time it rains
 - Other _____
4. Approximately how deep is the water?
 - 1-2 inches 3-4 inches
 - 5-6 inches >6 inches
5. How long does the water remain after the rain has stopped?
 - A few minutes 30 minutes 1 hour
 - Several hours 1 day or longer
6. Where is the water coming from?

CITY-WIDE Flooding Issues

1. Are there any roadway or public flooding issues in your area?
 If so, please describe the issue and state the location.

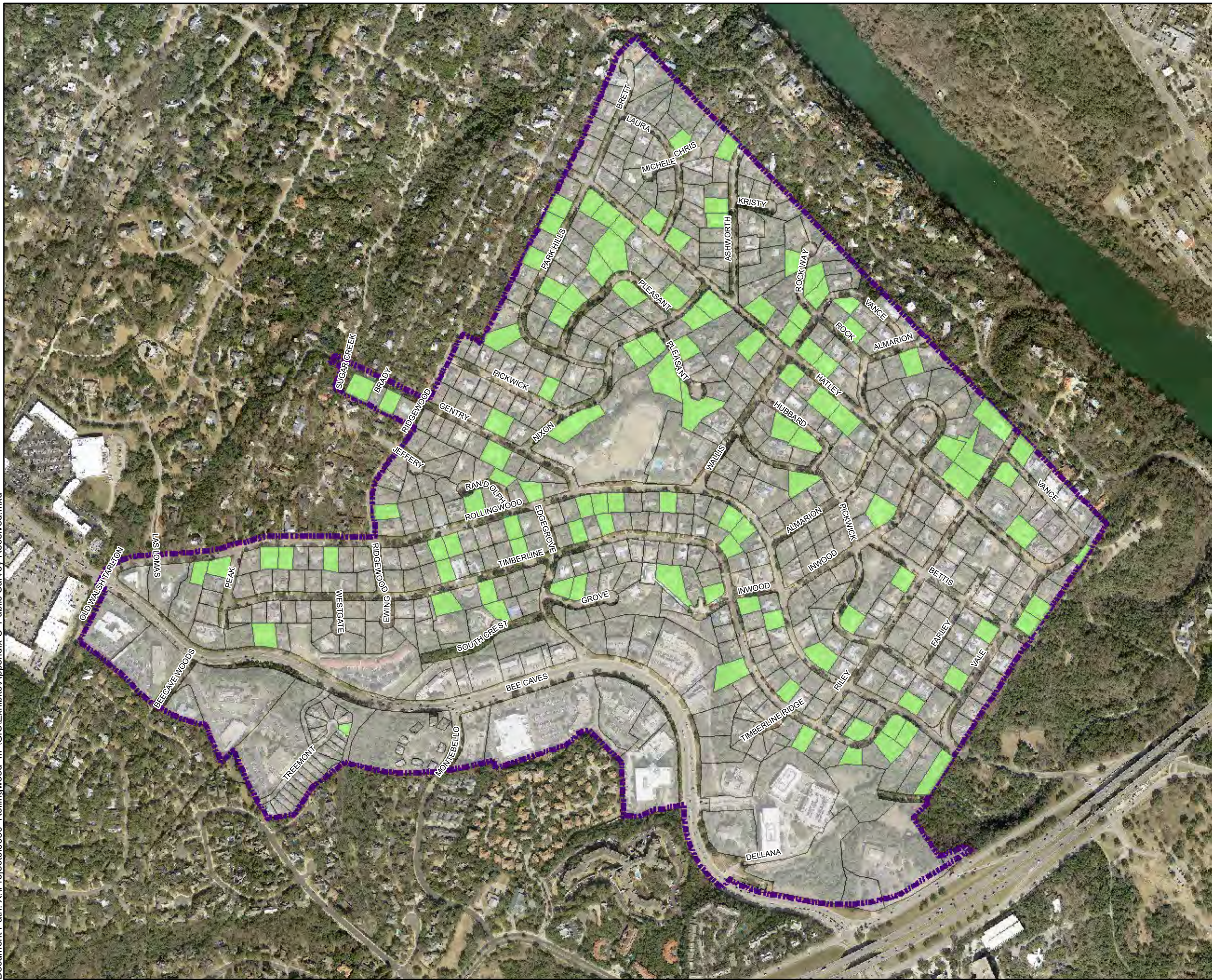
2. When did the issue(s) begin?

3. How often does the issue(s) occur?
 - Once every couple of years
 - Once or twice a year
 - 3-6 times a year
 - Every time it rains
 - Other _____
4. Comments






Appendix C: Public Survey Response Maps

- Public Surveys Received
- Type of Flooding Reported by Survey
- Frequency of Flooding Reported by Survey
- Ponding Duration Reported by Survey
- Flooding Issues Reported Within Right-of-Way by Survey



Legend

-  Rollingwood City Limits
-  Parcels
-  Public Survey Received

City of Rollingwood Infrastructure Improvements Plan

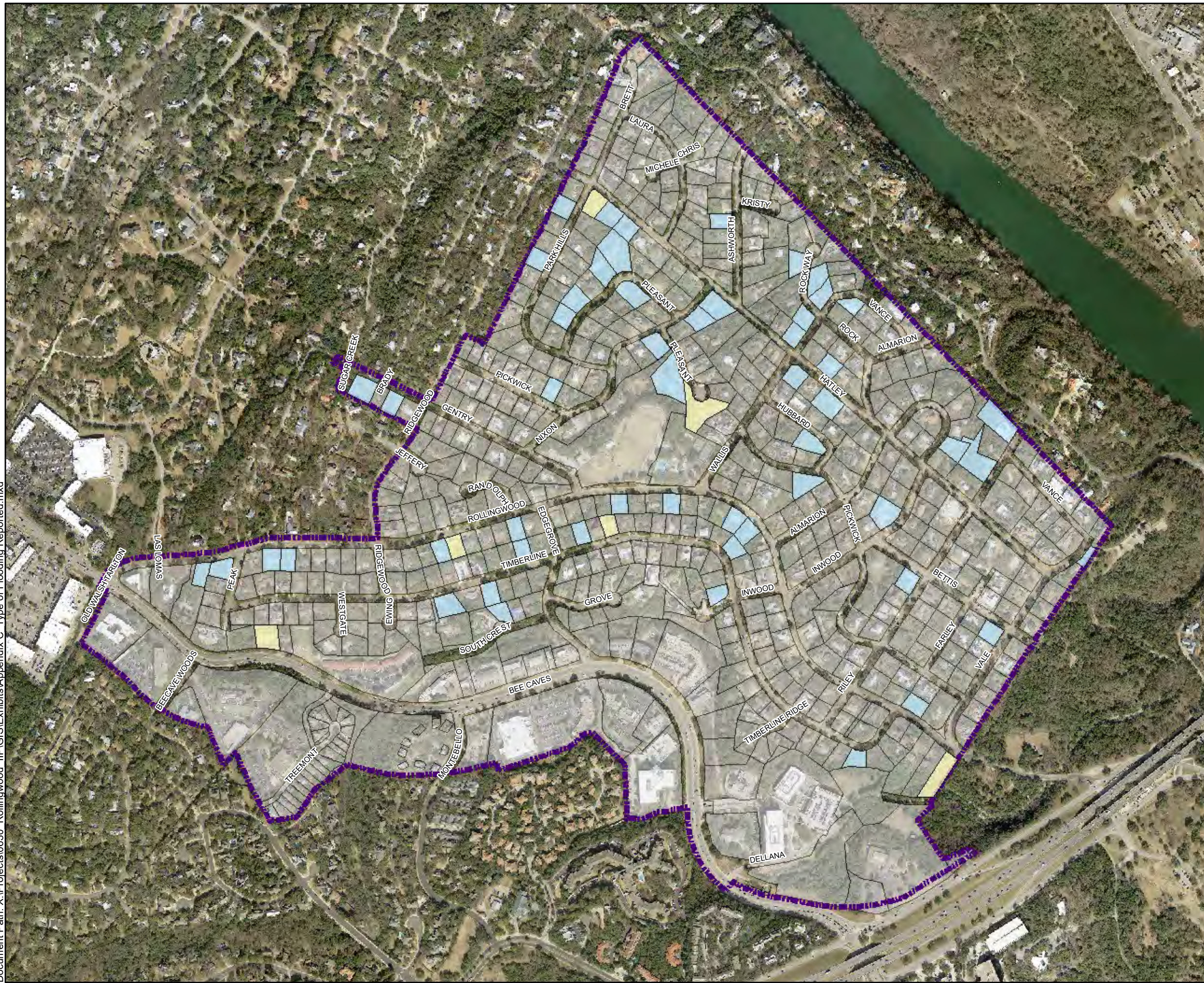
Public Surveys Received







0 600 1,200
Feet

Date: 10/25/2019

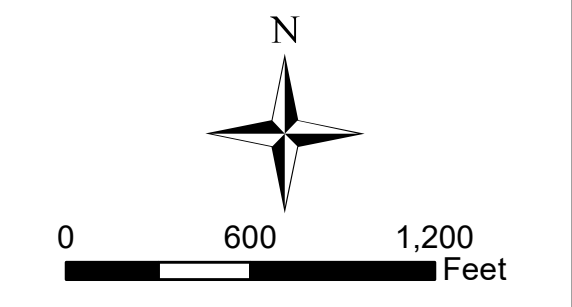




Legend

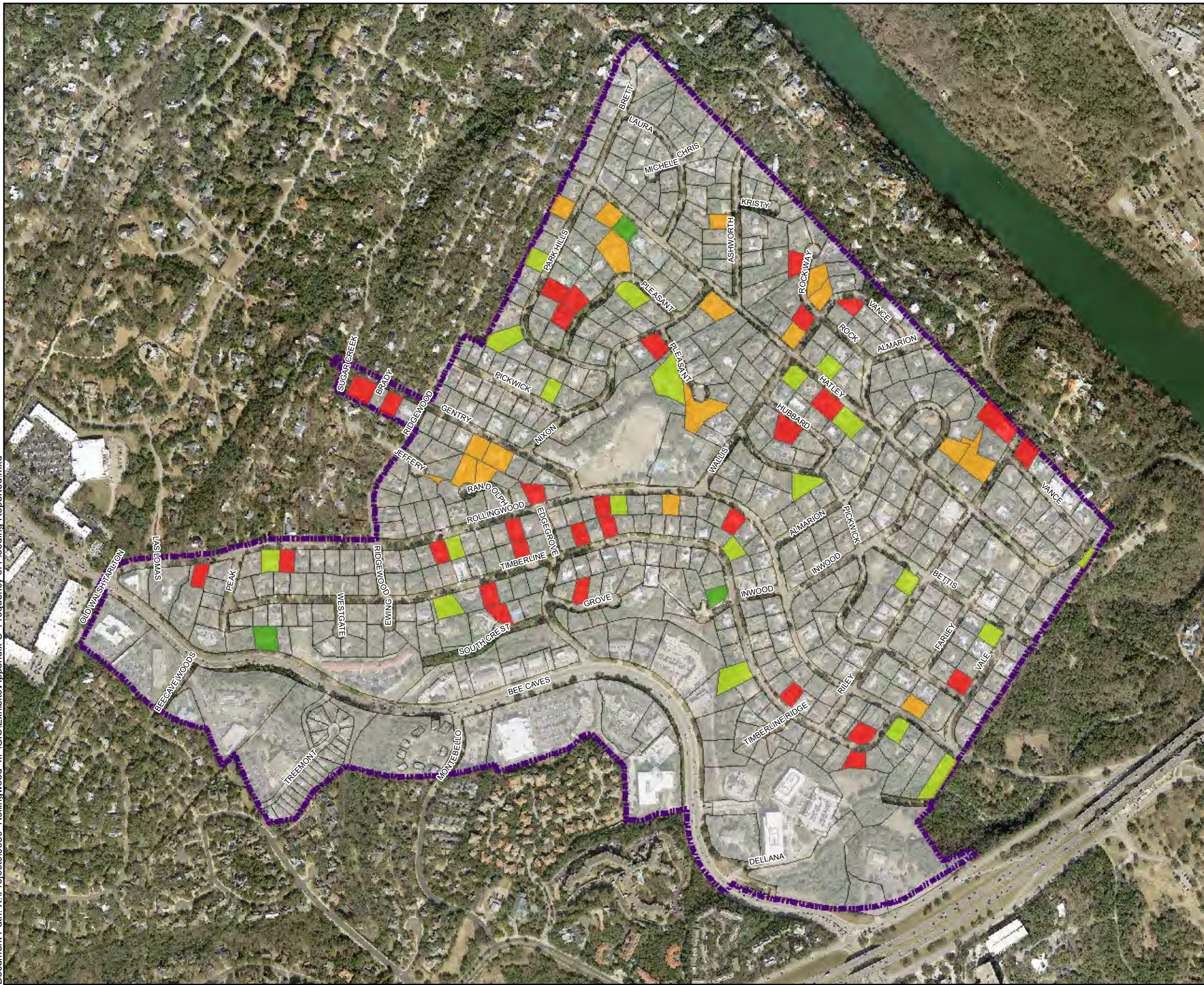
-  Rollingwood City Limits
-  Parcels
-  Yard/Driveway Flooding Reported
-  Home/Garage Flooding Reported

**City of Rollingwood
Infrastructure
Improvements Plan**
Type of Flooding
Reported by Survey





Date: 10/25/2019









Legend

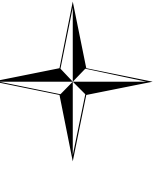
-  Rollingwood City Limits
-  Parcels

Frequency of Reported Issue

-  Once every couple of years
-  Once or twice a year
-  3-6 times a year
-  Every time it rains

**City of Rollingwood
Infrastructure
Improvements Plan**
Frequency of Flooding
Reported by Survey

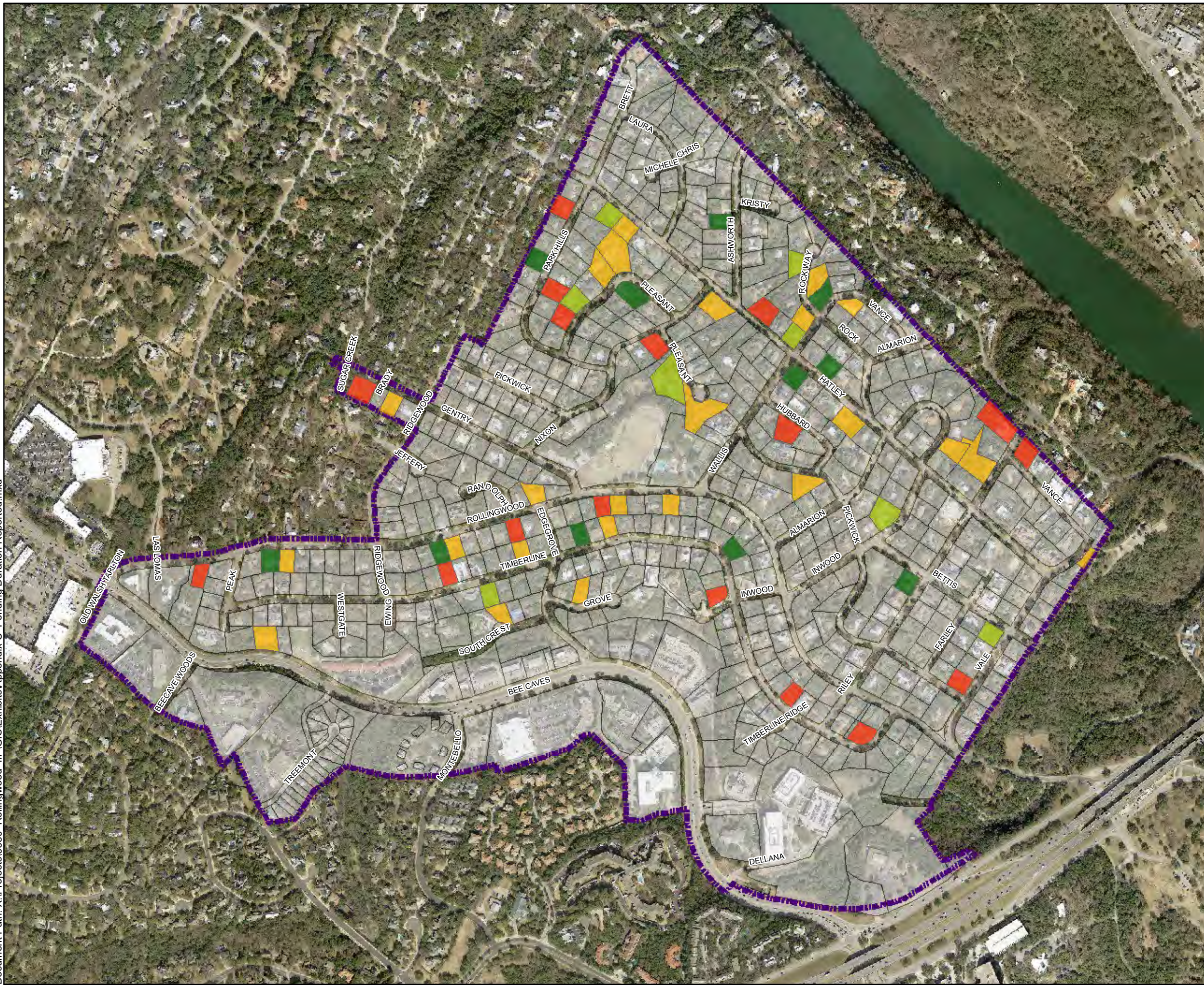
N









0 600 1,200
Feet

Date: 10/25/2019



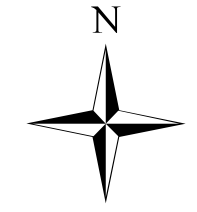


Legend

-  Rollingwood City Limits
-  Parcels
- Ponding Duration Reported**
-  30 minutes
-  1 hour
-  Several hours
-  1 day or longer

City of Rollingwood Infrastructure Improvements Plan

Ponding Duration
Reported by Survey

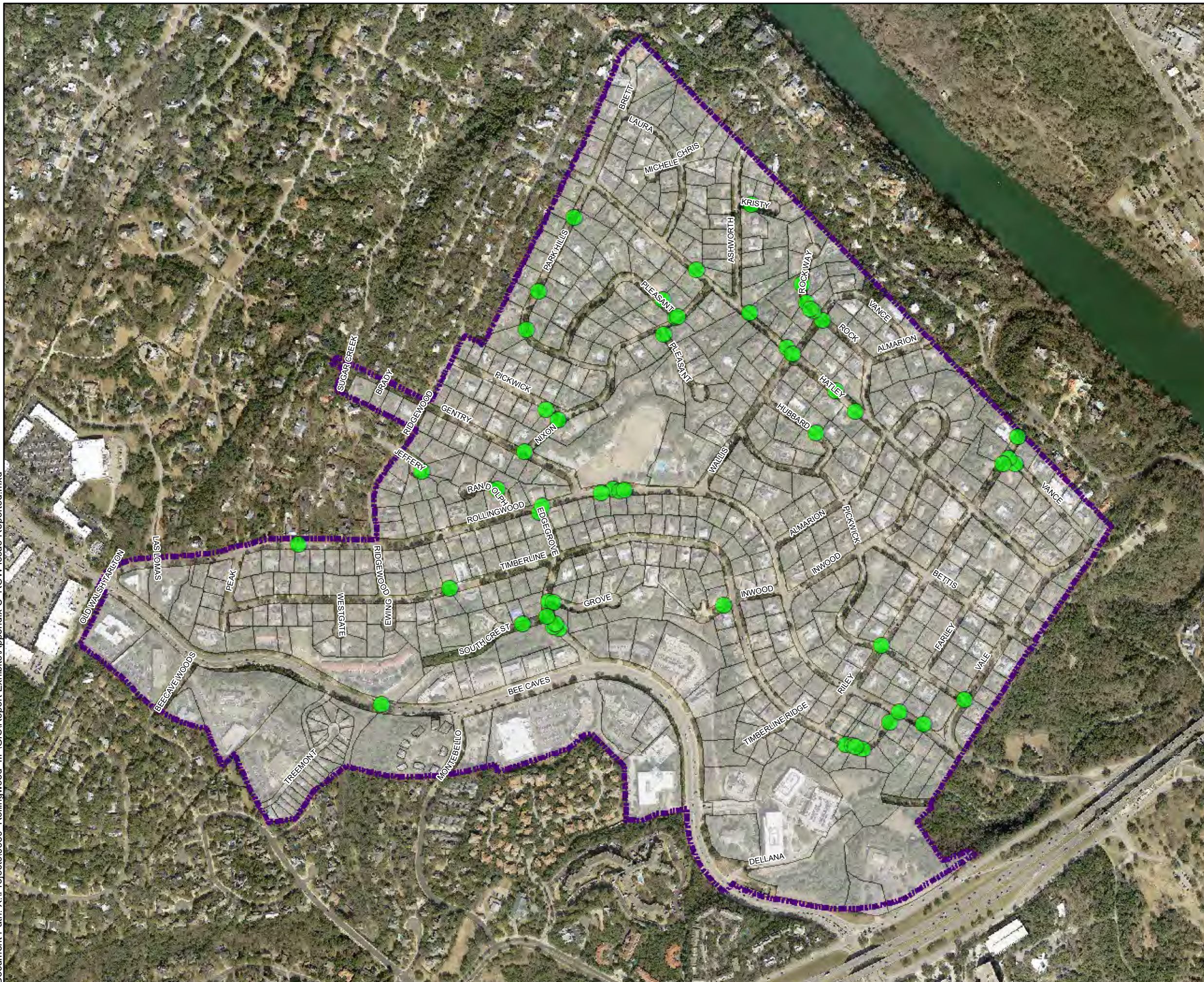


0 600 1,200 Feet




Date: 10/25/2019



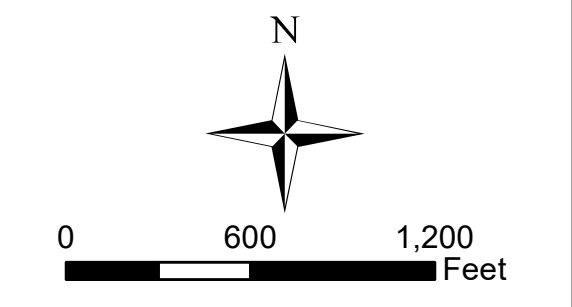
Document Path: X:\Projects\0630_Rollingwood_IP\GIS\Report Exhibits\Appendix C_ROW Issue Reported.mxd



Legend

-  Rollingwood City Limits
-  Parcels
-  Flooding Issues Reported in Right-of-Way

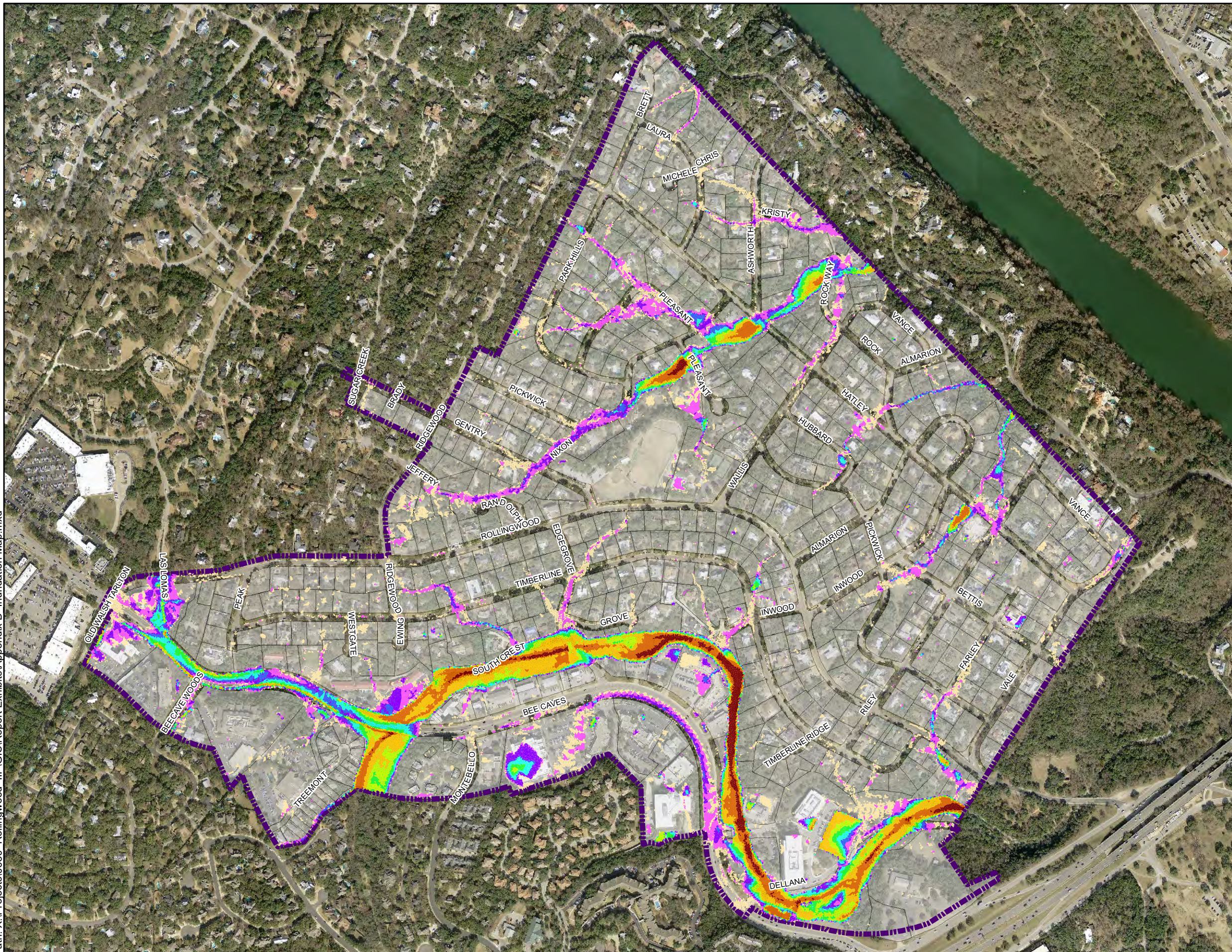
**City of Rollingwood
Infrastructure
Improvements Plan**
Flooding Issues Reported
Within Right-of-Way by Survey



Date: 10/25/2019



Appendix D: Existing 100-year Storm Inundation Map



Legend

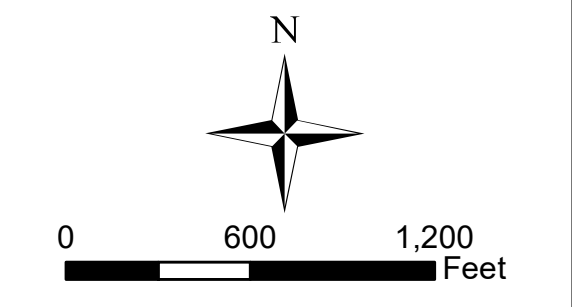
- Rollingwood City Limits
- Parcels

Model Depths

100-yr Storm Inundation

- 3-6 in
- 6-12 in
- 12-18 in
- 18-24 in
- 2-3 ft
- 3-4 ft
- 4-5 ft
- 5-7 ft
- 7-10 ft
- 10-20 ft

**City of Rollingwood
Infrastructure
Improvements Plan
100-year Storm Event
Inundation Map**



Date: 11/26/2019



Notes:
1. This preliminary 2D rain-on-mesh inundation model within Rollingwood city limits was created using 2017 LiDAR data and SCS 100-year storm event rainfall data.

Appendix E: FEMA Flood Insurance Rate Map (January 6, 2016)

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or Floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Obstacle Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 Flood Protection Measures of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Texas State Plane Central Zone (FIPS zone 4203). The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:
 NGS Information Services
 NOAA, NNGS-12
 National Geodetic Survey
 5500 Shattuck Avenue
 Silver Spring, Maryland 20910-3282
 (301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIRM was provided in digital format by the City of Austin and CAPCOG. The projection used in the preparation of the FIRMs was Texas State Plane Central Zone (FIPSZONE 4203) and the horizontal datum was NAD83, GRS1980 spheroid.

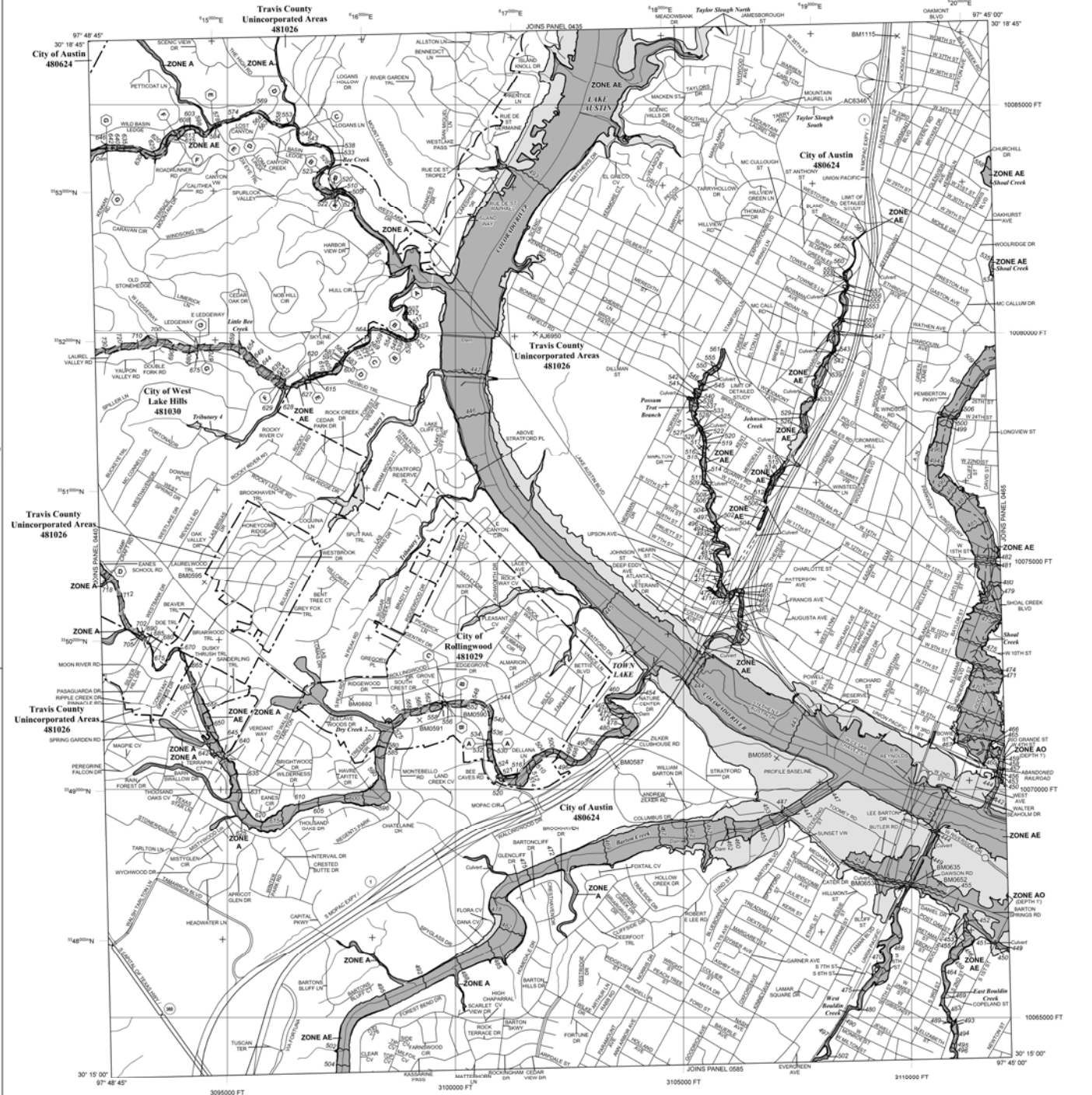
This map reflects more detailed and up-to-date stream channel configurations than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the Map Service Center (MSC) website at <http://www.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov>.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHA) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Areas in the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AO, AH, AV, and V. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A
No Base Flood Elevations determined.
Base Flood Elevations determined.

ZONE AH
Base Flood Elevations determined.
Flood depths of 1 to 3 feet (quality areas of ponding); Base Flood Elevations determined.

ZONE AO
Flood depths of 1 to 3 feet (quality areas of ponding); average depth determined; for areas of slow flow flooding, velocities also determined; Base Flood Elevations determined.

ZONE AE
Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently identified. Zone AE indicates that the former flood control system is being retained to provide protection from the 1% annual chance or greater flood. Areas to be protected from the 1% annual chance flood by a flood control protection system under construction; no Base Flood Elevations determined. Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE AV
Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE V
Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X
Areas of 0.2% annual chance flood, areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from the 1% annual chance flood.

OTHER AREAS

ZONE D
Areas determined to be outside the 0.2% annual chance floodplains. Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are specially limited within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Flood Hazard Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary defining Special Flood Hazard Area Zones and boundary defining Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- Base Flood Elevation value, elevation in feet
- Base Flood Elevation value where uniform within cross section, elevation in feet

Reference to the North American Vertical Datum of 1988

(A) (B)
Cross section line
Traverse line
Culvert

(B) (B)
Bridge

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

- 3100000 FT
- 5000 Foot Grid: Texas State Plane Central Zone (FIPS Zone 4203), Lambert Conformal Conic projection
- 1000 meter Universal Transverse Mercator grid values, zone 14
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Station
- MAP REPOSITORIES (Refer to Map Repository list on Map Index)
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP: June 16, 1993
- EFFECTIVE DATES OF REVISIONS TO THIS PANEL: June 8, 1997; January 19, 2000; April 16, 2002; September 28, 2008; January 6, 2016 - to update corporate limits, to change Special Flood Hazard Areas, to reflect updated hydrographic information, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-633-6622.

MAP SCALE 1" = 1000'
 0 500 1000 2000 FEET
 0 500 1000 METERS

NFIP

PANEL 0445J

FIRM
FLOOD INSURANCE RATE MAP
TRAVIS COUNTY,
TEXAS,
AND INCORPORATED AREAS

PANEL 445 OF 730
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:	COMMUNITY	NUMBER	PANEL	SUFFIX
	AUSTIN, CITY OF	481020	0445 J	
	HOLLANDWOOD, CITY OF	481028	0445 J	
	HIGHLAND, CITY OF	481029	0445 J	
	WEST LAKE HILLS, CITY OF	481030	0445 J	

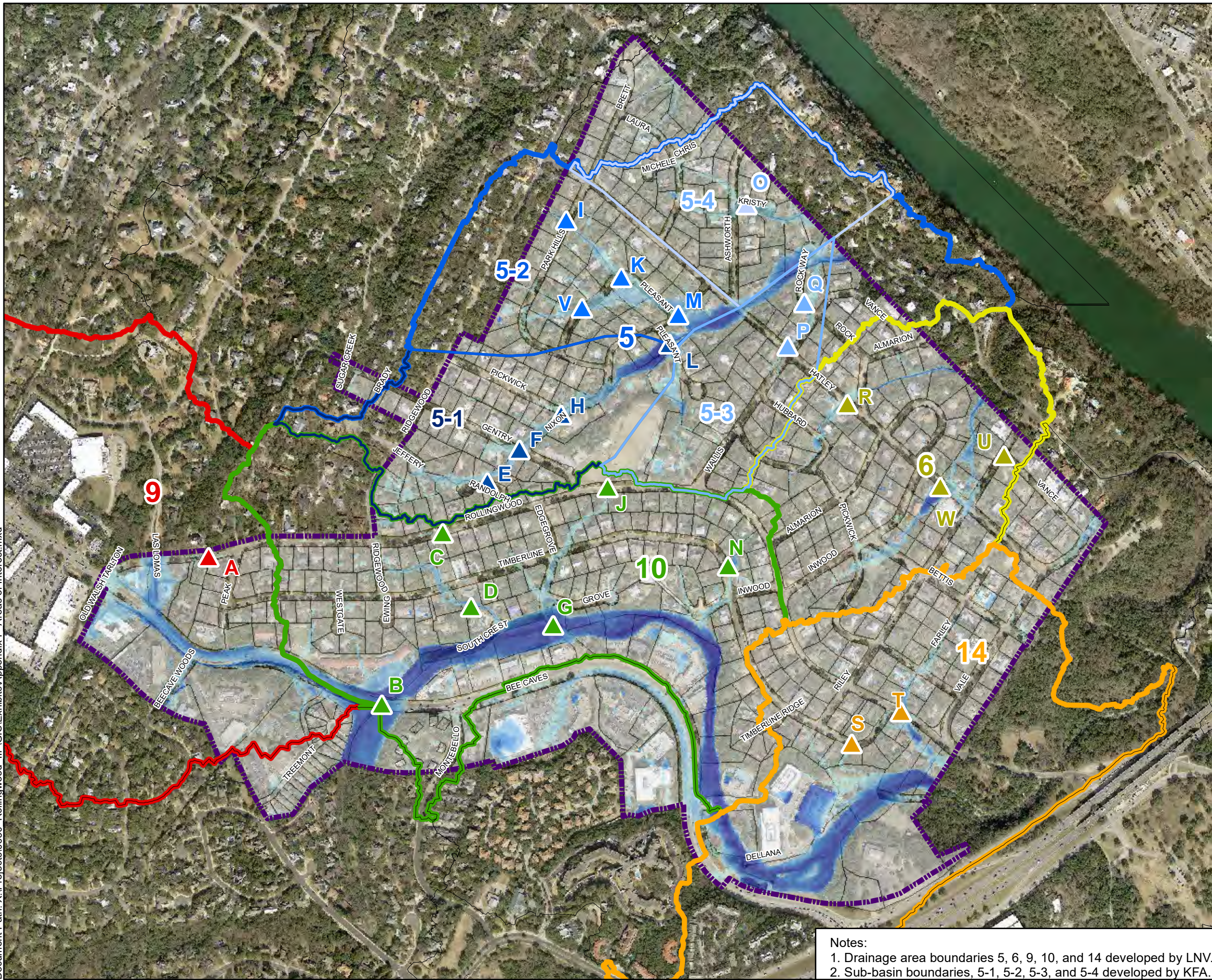
Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
 48453C0445J

MAP REVISED
 JANUARY 6, 2016

Federal Emergency Management Agency











Appendix F: Identified Areas of Interest Map



Legend

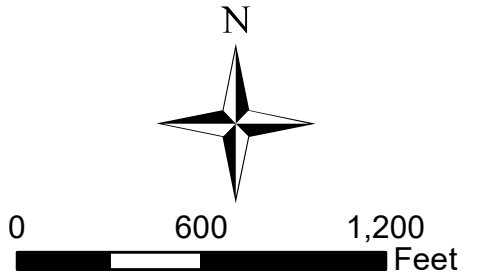
-  Rollingwood City Limits
-  Parcels
-  Area of Interest
-  Drainage Areas

100-yr Inundation

-  3-6 in
-  6-12 in
-  12-18 in
-  18-24 in
-  2-3 ft
-  3-4 ft
-  4-5 ft
-  5-7 ft
-  7-10 ft
-  10-20 ft

City of Rollingwood Infrastructure Improvements Plan

Identified Areas of Interest Map

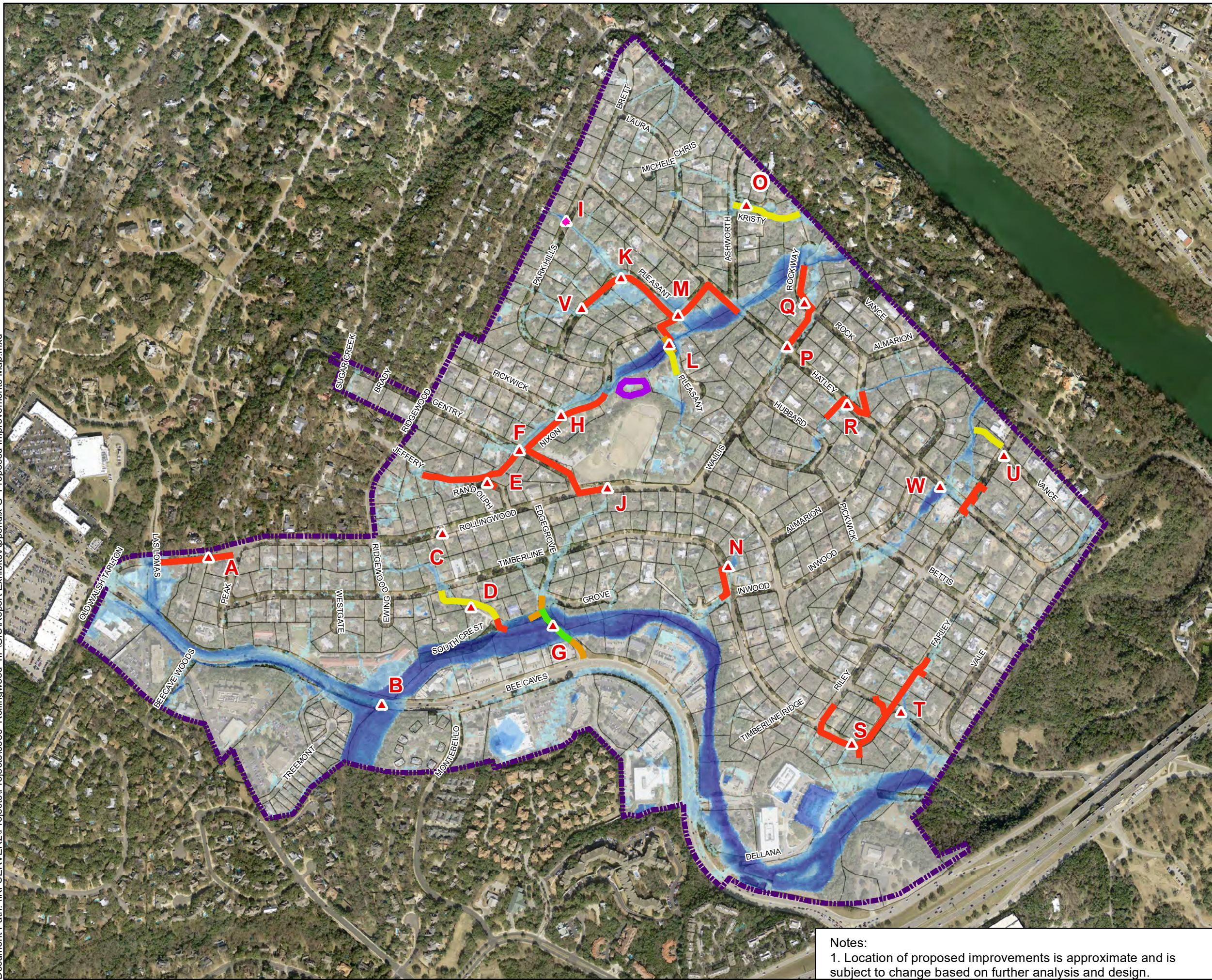


Date: 10/25/2019



Notes:
 1. Drainage area boundaries 5, 6, 9, 10, and 14 developed by LNV.
 2. Sub-basin boundaries, 5-1, 5-2, 5-3, and 5-4 developed by KFA.

Appendix G: Proposed Projects Map

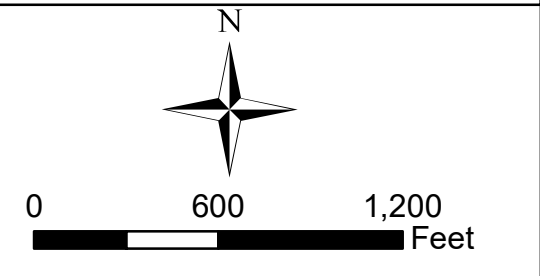


- Legend**
- Rollingwood City Limits
 - Parcels
 - Area of Interest
 - Proposed Channel Improvements
 - Proposed Roadway Improvements
 - Proposed Storm Sewer
 - Proposed Detention Pond
 - Proposed Culvert Improvements
 - Proposed Bridge

100-yr Inundation

	3-6 in		3-4 ft
	6-12 in		4-5 ft
	12-18 in		5-7 ft
	18-24 in		7-10 ft
	2-3 ft		10-20 ft

**City of Rollingwood
Infrastructure
Improvements Plan
Proposed Improvements
Map**



Date: 10/30/2019



Notes:
1. Location of proposed improvements is approximate and is subject to change based on further analysis and design.

Appendix H: Project Summary Sheets

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Table 1: Project Ranking and Cost Summary

Project ID	Project Name	Cost	Rank*
B	Bee Caves Road Drainage Improvements	UNK	1
G	Edgegrove Drainage Improvements	\$ 2,631,000	2
M	Nixon/Pleasant Roadway Drainage Improvements	\$ 5,283,000	3
K	Pleasant Drive Drainage Improvements	included in M	4
D	Timberline-South Crest Drainage Improvements	\$ 558,000	5
W	Hatley Drive Drainage Improvements	\$ 654,000	6
L	Pleasant Cove Drainage Improvements	\$ 490,000	7
H	City Hall Property Drainage Improvements	\$ 475,000	8
J	Underground Infiltration Basin Drainage Improvements	\$ 883,000	9
T	East Rollingwood Drive Drainage Improvements	\$ 2,122,000	10
N	Timberline Drive Drainage Improvements	\$ 380,000	11
Q	Rock Way Cove Drainage Improvements	\$ 816,000	12
S	East Timberline Drive Drainage Improvements	included in T	13
R	Hatley Drive Drainage Improvements	\$ 400,000	14
F	Nixon/Gentry Drainage Improvements	\$ 2,024,000	15
V	Pleasant Drive Drainage Improvements	included in M	16
O	Kristy Drive Drainage Improvements	\$ 217,000	17
E	Randolph Place Drainage Improvements	included in F	18
I	Park Hills Drainage Improvements	\$ 238,000	19
A	Rollingwood Drive West Drainage Improvements	\$ 589,000	20
P	Wallis and Hatley Drainage Improvements	included in Q	21
U	Riley Rd and Vance Ln Drainage Improvements	\$ 141,000	22
C	Rollingwood Drive South Drainage Improvements	UNK	23
SUM		\$ 17,901,000	

* Rank is based on velocities and flooding depths at structures from the inundation model.

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: A
Project Name: Rollingwood Drive West Drainage Improvements
Drainage Basin: 9

Problem Description

Property flooding between Las Lomas Dr and S. Peak Rd on Rollingwood Dr.

Proposed Improvements

Install 24" RCP underground storm sewer system of approximately 500 feet in length with approximately 5 inlets, 5 driveway reconstructions, and curb construction along entire length. Connect to Eanes Creek tributary crossing at Las Lomas Drive.

CIP Ranking

20 out of 23

Project Costs

Engineering & Survey: \$ 86,000
 Construction: \$ 472,000
 Other: \$ 31,000
 ROW/Easements: UNK
Total: \$ 589,000

Conceptual Cost Range: \$500k - \$750k
 Estimated Construction Duration: 6 Months

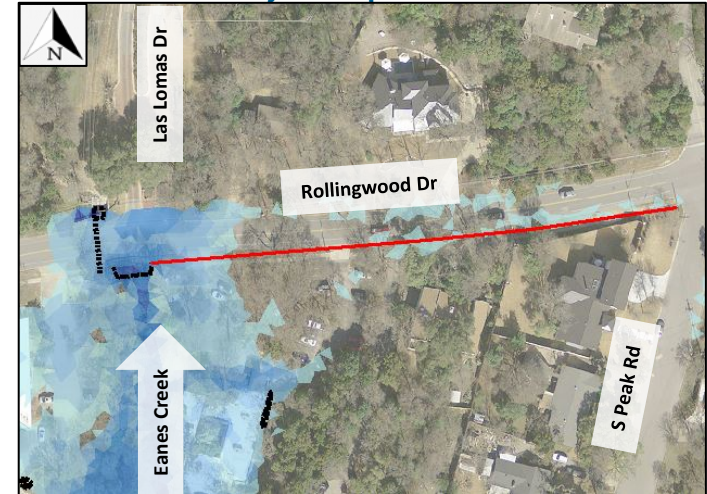
Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream system will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed culverts will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red. Existing culverts in black. Existing 100-yr inundation shown.



Rollingwood Drive looking northwest.

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: B
Project Name: Bee Caves Road Drainage Improvements
Drainage Basin: 10

Problem Description

Roadway flooding at Bee Caves Road. Existing 2-42" CMPs.

Proposed Improvements

Further discussion is needed to determine the desired outcome of a project along Bee Caves Road. Potential project complications include but are not limited to: TxDOT coordination, raising the roadway profile, multiple sources of flooding (Eanes Creek and the Tributary that runs along Bee Caves), the length of flooding along Bee Caves and potential utility conflicts. Due to the number of unknowns, a cost estimate was not generated but it is expected to be within the tens of millions of dollars. The cost incurred by the City would be subject to negotiations with TxDOT and is unknown.

CIP Ranking

1 out of 23

Project Costs

Engineering & Survey:	\$	-
Construction:	\$	-
Other:	\$	-
ROW/Easements:		UNK
Total:		UNK
Conceptual Cost Range:		N/A
Estimated Construction Duration:		N/A

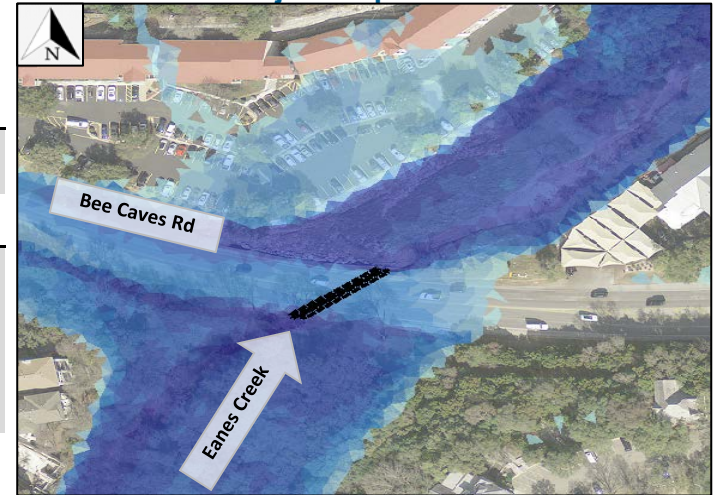
Possible Impacts

N/A

Assumptions

N/A

Project Map & Photo



Bee Caves Road, existing culverts in black.
Existing 100-yr inundation shown.



Bee Caves Road, downstream. 9/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: C
Project Name: Rollingwood Drive South Drainage Improvements
Drainage Basin: 10

Problem Description

Property flooding along Rollingwood Drive.

Proposed Improvements

This AOI was studied using modeling and field observations, and existing infrastructure appears sufficient for this location. A CIP project is not recommended at this AOI at this time.

CIP Ranking

23 out of 23

Project Costs

Engineering & Survey:	\$	-
Construction:	\$	-
Other:	\$	-
ROW/Easements:		UNK
Total:		UNK
Conceptual Cost Range:		N/A
Estimated Construction Duration:		N/A

Project Map & Photo



Rollingwood Drive.
Existing 100-yr inundation shown.



Rollingwood Drive, looking east. 09/11/2019

Possible Impacts

N/A

Assumptions

N/A

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: D
Project Name: Timberline-South Crest Drainage Improvements
Drainage Basin: 10

Problem Description

Property flooding between Timberline Drive and South Crest Drive. Roadway flooding on Timberline Drive.

Proposed Improvements

Regrade and improve the channel between 4907 and 4905 South Crest Drive to 4908 Timberline Drive, approximately 475 feet. At the end of the channel, build a drop inlet leading to approximately 140 feet of 48" underground storm sewer.

CIP Ranking

5 out of 23

Project Costs

Engineering & Survey:	\$ 80,000
Construction:	\$ 438,000
Other:	\$ 40,000
ROW/Easements:	UNK
Total:	\$ 558,000
Conceptual Cost Range:	\$500k - \$750k
Estimated Construction Duration:	6 Months

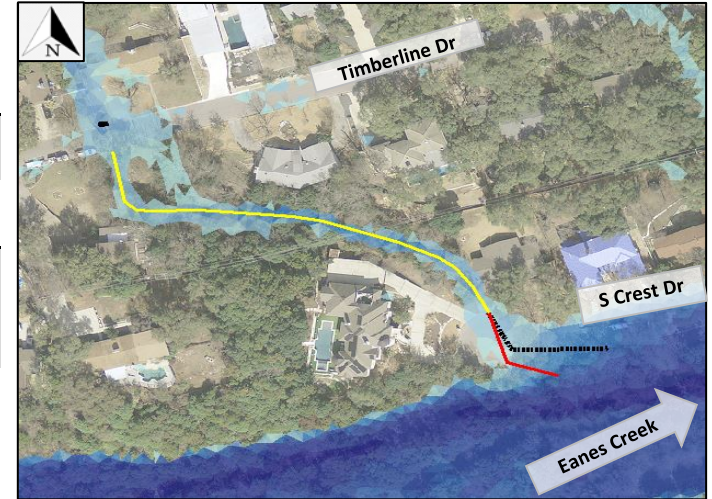
Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- Cost included estimate completed by Peabody General Contractors and provided to KFA by the City for waterline improvements along South Crest Drive.
- It is assumed the proposed culverts will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Channel improvements in yellow, proposed storm sewer in red. Existing channel in black. Existing 100-yr inundation shown.



South Crest Drive during rain event, looking north. 06/06/2019

CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY



Project ID: E
Project Name: Randolph Place Drainage Improvements
Drainage Basin: 5

Problem Description

Roadway flooding and property flooding along Randolph Place.

Proposed Improvements

Install approximately 272 feet of 24" RCP, 846 feet of 36" RCP, 125 feet of 5' x 3' RCB, and 626 feet of 6' x 3' RCB. Begin at Gentry Drive and discharge to channel near City Hall. It will include an estimated 20 curb inlets, 1 area inlet, and approximately 12 driveway reconstructions. This includes the improvements at AOI F. In accordance with downstream impacts the improvements along AOI M should be completed first.

CIP Ranking

18 out of 23

Project Costs

See Cost on AOI F

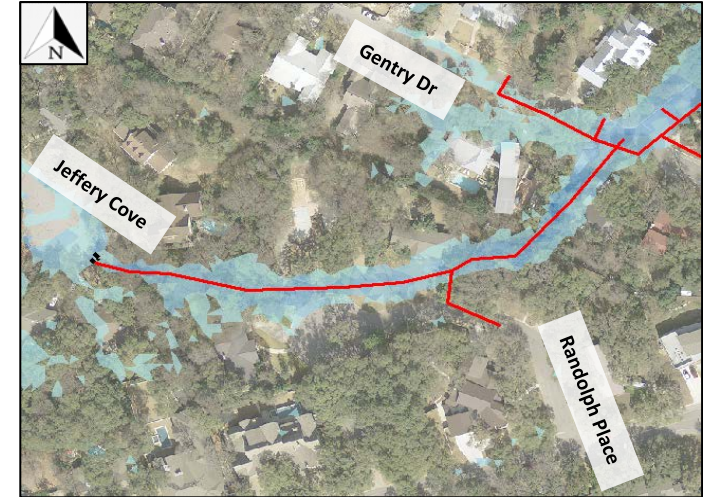
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red.
Existing 100-yr inundation shown.



3 Randolph Place looking west.

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: F
Project Name: Nixon/Gentry Drainage Improvements
Drainage Basin: 5

Problem Description

Roadway flooding and property flooding along Gentry Drive and Nixon Drive.

Proposed Improvements

Install approximately 272 feet of 24" RCP, 846 feet of 36" RCP, 125 feet of 5' x 3' RCB, and 626 feet of 6' x 3' RCB. Begin at Gentry Drive and discharge to channel near City Hall. It will include an estimated 20 curb inlets, 1 area inlet, and approximately 12 driveway reconstructions. This includes the improvements at AOI E. To mitigate downstream impacts, the improvements along AOI M should be completed first.

CIP Ranking

15 out of 23

Project Costs**

**AOI E included

Engineering & Survey:	\$ 300,000
Construction:	\$ 1,648,000
Other:	\$ 76,000
ROW/Easements:	UNK
Total:	\$ 2,024,000

Conceptual Cost Range: > \$2M
 Estimated Construction Duration: 15 Months

Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red.
Existing 100-yr inundation shown.



Nixon and Gentry intersection looking north. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: G
Project Name: Edgegrove Drive Drainage Improvements
Drainage Basin: 10

Problem Description

Roadway flooding at Edgegrove Drive. Existing 2 - 32" RCP and 1 - 24" RCP.

Proposed Improvements

Bridge crossing approximately 300 feet in length and an estimated 46 feet in width (2 lanes, 2 shoulders/bike lanes, and sidewalk). Improve and regrade the channel 50 feet downstream and upstream of the crossing. Raise and rebuild the road about 350 feet in total length. The roadway improvements are along Edgegrove Drive and South Crest Drive. It is recommended this AOI should be coordinated with the proposed retail study along Eanes Creek.

CIP Ranking

2 out of 23

Project Costs

Engineering & Survey: \$ 394,000
Construction: \$ 2,167,000
Other: \$ 70,000
ROW/Easements: UNK
Total: \$ 2,631,000

Conceptual Cost Range: > \$2M
Estimated Construction Duration: 12 Months

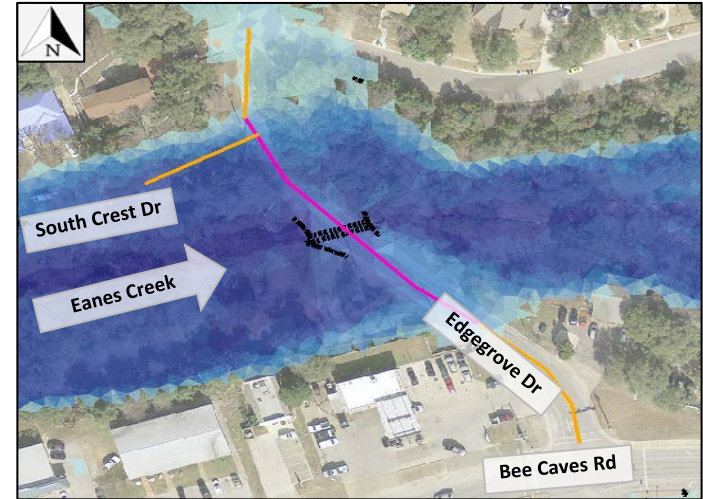
Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. The bridge should be designed to ensure no upstream impacts. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- Flooding on Edgegrove Dr is controlled by Eanes Creek.
- It is assumed the proposed bridge will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and detailed hydraulic will need additional consideration and analysis.

Project Map & Photo



Proposed bridge in pink. Road improvements in orange. Existing culvert in black. Existing 100-yr inundation shown.



Edgegrove Drive, looking northeast. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: H
Project Name: City Hall Drainage Improvements
Drainage Basin: 5

Problem Description

Property flooding at City Hall and roadway flooding along Nixon Drive.

Proposed Improvements

Regrade Rollingwood City Hall property. Design and create a detention pond of approximately 0.20 acres at the existing community playground. This would include connecting to the improvements at AOI E and F. The detention pond may provide benefit for smaller storm events, however preliminary modeling shows that the area is too small to provide detention in the 100-year event. Further analysis is necessary to determine the potential benefits from a detention pond at this location.

CIP Ranking

8 out of 23

Project Costs

Engineering & Survey:	\$ 64,000
Construction:	\$ 350,000
Other:	\$ 61,000
ROW/Easements:	UNK
Total:	\$ 475,000
Conceptual Cost Range:	\$250k - \$500k
Estimated Construction Duration:	12 Months

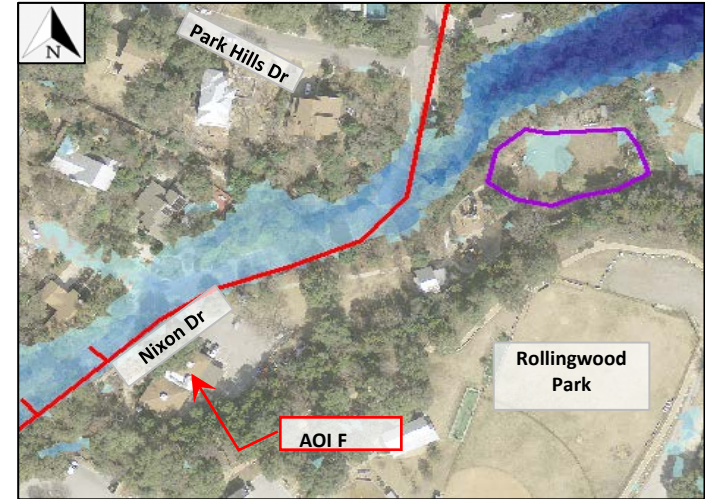
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer (AOI F) and pond area in purple. Existing 100-yr inundation shown.



Proposed area for detention. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: I
Project Name: Park Hills Drainage Improvements
Drainage Basin: 5

Problem Description

Property and roadway flooding along Park Hills Drive. Existing 24" RCP cross culvert.

Proposed Improvements

Double the size of the existing culvert, approximately 35 feet 24" RCP, to 2-24" RCPs with two new headwalls. Remove the existing culvert. Regrade the channel about 20 feet downstream and upstream. Another alternative improvement is to purchase an inundation easement and not upsize the existing culvert. Note downstream headwall could not be field located.

CIP Ranking

19 out of 23

Project Costs

Engineering & Survey:	\$	32,000
Construction:	\$	175,000
Other:	\$	31,000
ROW/Easements:		UNK
Total:	\$	238,000
Conceptual Cost Range:		\$200k - \$250k
Estimated Construction Duration:		6 Months

Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed culverts will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed culvert in green. Channel improvements in yellow. Existing 100-yr inundation shown.



Park Hills Drive, upstream. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: J
Project Name: Underground Infiltration Basin Drainage Improvements
Drainage Basin: 10

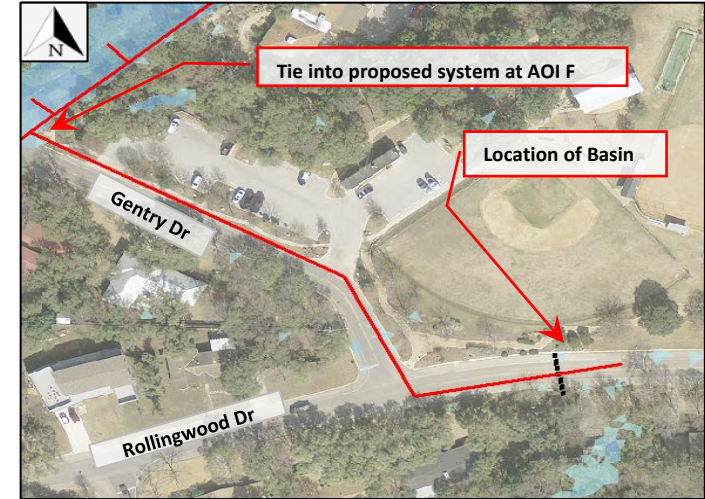
Problem Description

Rollingwood Drive ponding across from the underground infiltration basin pond. The existing inlet and pipe are clogged with debris, and sediment, creating maintenance and ponding challenges.

Proposed Improvements

Abandon the underground vault and tie the existing lateral pipe, assuming a 24" RCP, into the proposed drainage system on Gentry Drive. Approximately 675 feet of proposed 24" RCP will be needed for the connection, approximately 10 inlets, and an estimated 2 driveway reconstructions.

Project Map & Photo



Rollingwood Drive, proposed storm sewer in red. Existing 100-yr inundation shown.



Pond inlet during rain event. 06/06/2019

CIP Ranking

9 out of 23

Project Costs

Engineering & Survey:	\$ 127,000
Construction:	\$ 695,000
Other:	\$ 61,000
ROW/Easements:	UNK
Total:	\$ 883,000
Conceptual Cost Range:	\$750k - \$1M
Estimated Construction Duration:	12 Months

Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and pond area will need additional consideration.
- The recommendation to abandon the underground basin was generated in coordination with City staff & City engineer.

CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY



Project ID: K
Project Name: Pleasant Drive Drainage Improvments
Drainage Basin: 5

Problem Description

Roadway and property flooding along Pleasant Drive.

Proposed Improvements

Install approximately 248 feet of 36" RCP, 358 feet of 5' x 3' RCB, 303 feet of 6' x 3' RCB and 1382 feet of 8' x 4' RCB. Begin at Pleasant Drive and proposed detention pond (AOI H) and outfall at Town Lake tributary downstream of Hatley Drive. It will include an estimated 27 curb inlets, 1 area inlet, 675 feet of 12" tall curb, and approximately 16 driveway reconstructions. This includes the improvements at AOI V and AOI M.

CIP Ranking

4 out of 23

Project Costs

See Cost on AOI M

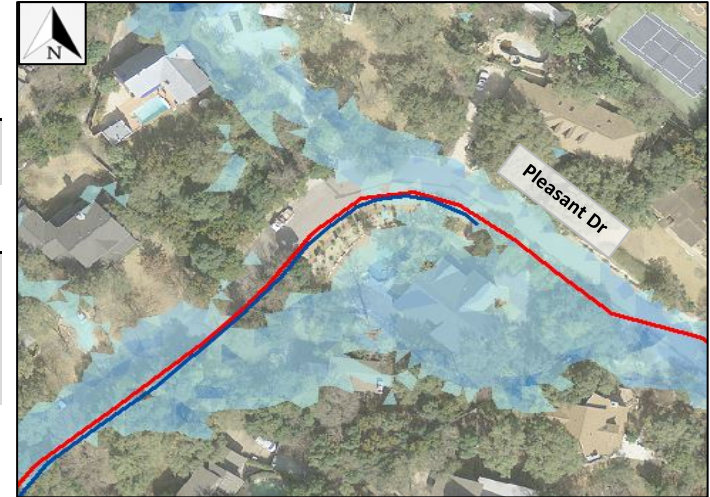
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red. Proposed 12" curb in blue. Existing 100-yr inundation shown.



Pleasant Drive, looking northeast/upstream.06/06/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: L
Project Name: Pleasant Cove Drainage Improvements
Drainage Basin: 5

Problem Description

Roadway flooding. Existing 60" RCP cross culvert at Pleasant Cove.

Proposed Improvements

Install new roadside channel upstream, approximately 400 feet in length. The channel grading will be to an approximate channel of 20 feet wide, 2 feet deep with a 4 ft bottom width, and 4:1 side slopes. Approximately 1 driveway reconstruction with a crossing culvert of 24" RCP of an estimated 24 feet. Raise the roadway profile, an estimated 175 feet.

CIP Ranking

7 out of 23

Project Costs

Engineering & Survey:	\$ 67,000
Construction:	\$ 368,000
Other:	\$ 55,000
ROW/Easements:	UNK
Total:	\$ 490,000
Conceptual Cost Range:	\$250k - \$500k
Estimated Construction Duration:	9 Months

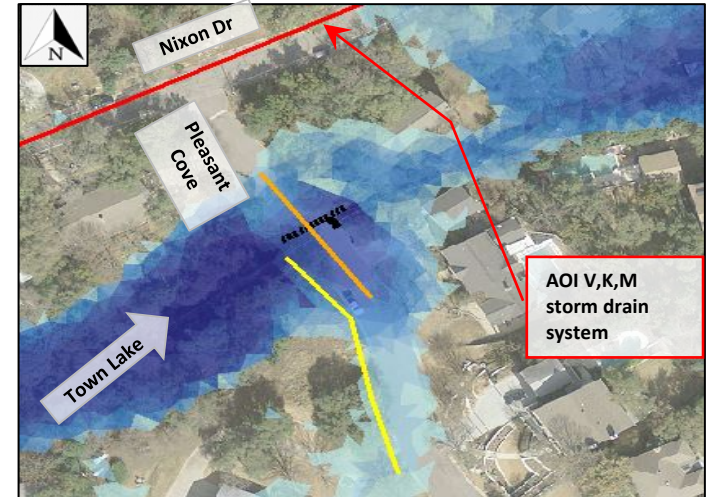
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed culverts will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed road improvements in orange, channel improvements in yellow. Existing culverts in black. Existing 100-yr inundation shown.



Pleasant Cove culvert crossing, upstream. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: M
Project Name: Nixon/Pleasant Drainage Improvements
Drainage Basin: 5

Problem Description

Roadway flooding on Nixon Drive. Property flooding between Pleasant Drive and Hatley Drive.

Proposed Improvements

Install approximately 248 feet of 36" RCP, 358 feet of 5' x 3' RCB, 303 feet of 6' x 3' RCB and 1382 feet of 8' x 4' RCB. Begin at Pleasant Drive and proposed detention pond (AOI H) and outfall at Town Lake tributary downstream of Hatley Drive. It will include an estimated 27 curb inlets, 1 area inlet, 675 feet of 12" tall curb, and approximately 16 driveway reconstructions. This includes the improvements to AOI V and AOI K.

CIP Ranking

3 out of 23

Project Costs**

**AOI V and AOI K included

Engineering & Survey:	\$ 804,000
Construction:	\$ 4,419,000
Other:	\$ 60,000
ROW/Easements:	UNK
Total:	\$ 5,283,000

Conceptual Cost Range: > \$2M
 Estimated Construction Duration: 12 Months

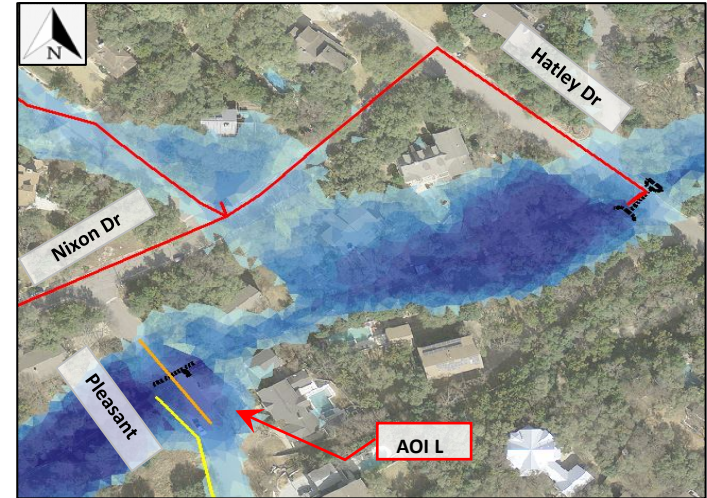
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red. Proposed 12" curb in blue. Existing culvert in black. Existing 100-yr inundation shown.



Nixon Drive during rain event, looking west. 06/06/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: N
Project Name: Timberline Drive Drainage Improvements
Drainage Basin: 10

Problem Description

Roadway and property flooding along Timberline Drive and Inwood Drive.

Proposed Improvements

Install approximately 250 feet of 36" RCP underground storm sewer. Begin at a drop inlet in the ravine on 4803 Timberline Drive property and connect to existing storm sewer network on Inwood Drive. It will include clearing and regrading the ravine for approximately 10 feet, addition of approximately 2 inlets, and approximately 3 driveway reconstructions. The existing network outfalls into Eanes Creek south of Inwood Drive.

CIP Ranking

11 out of 23

Project Costs

Engineering & Survey: \$ 54,000
Construction: \$ 295,000
Other: \$ 31,000
ROW/Easements: UNK
Total: \$ **380,000**

Conceptual Cost Range: \$250k - \$500k
Estimated Construction Duration: 6 Months

Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream system will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red to existing inlets in black. Existing 100-yr inundation shown.



Ravine at 4803 Timberline Drive. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: O
Project Name: Kristy Drive Drainage Improvments
Drainage Basin: 5

Problem Description

Roadway and property flooding along Kristy Drive.

Proposed Improvements

Approximately 475 feet of channel improvements along Kristy Drive.

CIP Ranking

17 out of 23

Project Costs

Engineering & Survey:	\$	29,000
Construction:	\$	157,000
Other:	\$	31,000
ROW/Easements:		UNK
Total:	\$	217,000
Conceptual Cost Range:		\$200k - \$250k
Estimated Construction Duration:		6 Months

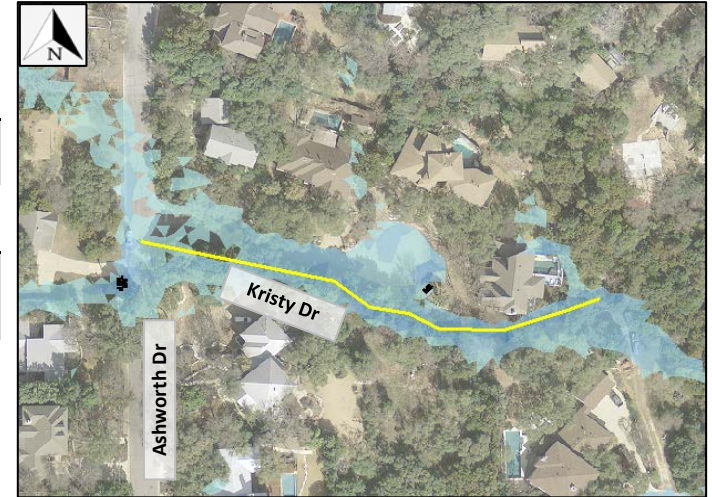
Possible Impacts

It is possible that the velocities and peak flow in the Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream impacts to adjacent properties will need to be reviewed in addition to the tributary impacts. Channel grading will impact multiple roadside trees.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the channel will have sufficient capacity for the design storm event.

Project Map & Photo



Channel improvements in yellow.
Existing 100-yr inundation shown.



Kristy Drive, looking northwest.

CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY



Project ID: P
Project Name: Wallis and Hatley Drainage Improvements
Drainage Basin: 5

Problem Description

Property flooding along Wallis Drive and roadway flooding at intersection of Wallis Drive and Hatley Drive.

Proposed Improvements

Install approximately 630 feet of 36" RCP underground storm sewer. Begin at the intersection of Hatley Drive and Wallis Drive and connect to the Town Lake tributary crossing on Rock Way Cove . It will include approximately 10 inlets and approximately 8 driveway reconstructions. This system includes the improvements at AOI Q.

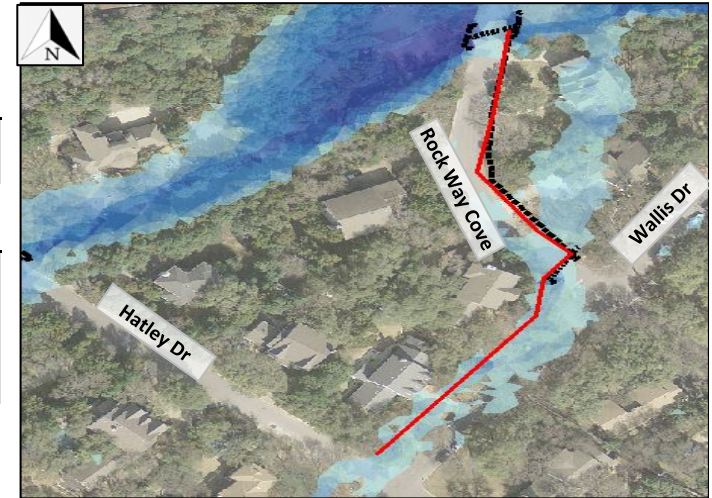
CIP Ranking

21 out of 23

Project Costs

See Cost on AOI Q

Project Map & Photo



Proposed storm sewer in red, existing in black.
Existing culverts in black. Existing 100-yr inundation shown.



200 Wallis Drive, during rain event. 06/06/2019

Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream system will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed culverts will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: Q
Project Name: Rock Way Cove Drainage Improvements
Drainage Basin: 5

Problem Description

Property flooding along Rock Way Cove and roadway flooding at intersection of Rock Way Cove and Wallis Drive.

Proposed Improvements

Install approximately 630 feet of 36" RCP underground storm sewer. Begin at the intersection of Hatley Drive and Wallis Drive and connect to the Town Lake tributary crossing on Rock Way Cove . It will include approximately 10 inlets and approximately 2 driveway reconstructions. This system includes the improvements at AOI P.

CIP Ranking

12 out of 23

Project Costs

**AOI P included

Engineering & Survey:	\$ 115,000
Construction:	\$ 631,000
Other:	\$ 70,000
ROW/Easements:	UNK
Total:	\$ 816,000

Conceptual Cost Range: \$750k - \$1M
 Estimated Construction Duration: 12 Months

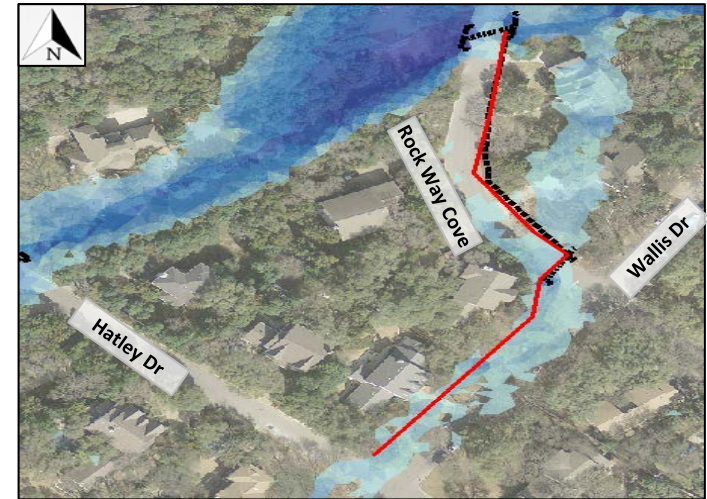
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream system will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed culverts will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red, existing in black.
 Existing culverts in black. Existing 100-yr inundation shown.



Outfall at Town Lake tributary. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: R
Project Name: Hatley Drive Drainage Improvements
Drainage Basin: 6

Problem Description

Roadway flooding at Hatley Drive and Almarion Way. Property flooding along Hubbard Circle and Hatley Drive.

Proposed Improvements

Install underground storm sewer of approximately 415 feet of 36" RCP. Start at Hatley Drive property and outfall at the beginning of the Town Lake tributary channel on Almarion Way. It will include clearing and regrading downstream channel about 150 feet in length, 4 curb inlets, 1 area inlet, and 1 driveway reconstruction.

CIP Ranking

14 out of 23

Project Costs

Engineering & Survey:	\$ 57,000
Construction:	\$ 312,000
Other:	\$ 31,000
ROW/Easements:	UNK
Total:	\$ 400,000
Conceptual Cost Range:	\$250k - \$500k
Estimated Construction Duration:	6 Months

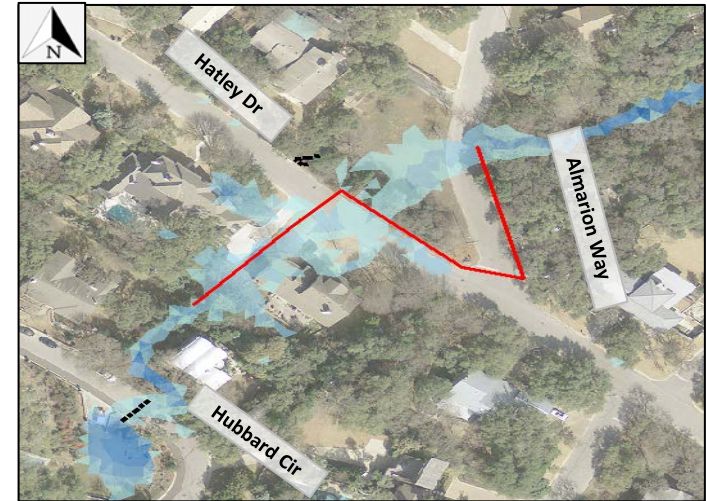
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red.
Existing 100-yr inundation shown.



Almarion Way, looking northwest. 09/11/2019

CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY



Project ID: S
Project Name: East Timberline Drive Drainage Improvements
Drainage Basin: 14

Problem Description

Roadway flooding on Rollingwood Drive and Timberline Drive. Property flooding along Rollingwood Drive and Riley Drive.

Proposed Improvements

Install approximately 700 feet of 36" RCP underground storm sewer, 520 feet of 5' x 3' RCB, and 350 feet of 7' x 4' RCB. Begin at Farley Trial and outfall at Eanes Creek tributary downstream of Timberline Drive. It will include an estimated 22 inlets and approximately 15 driveway reconstructions. This includes the improvements at AOI T.

CIP Ranking

14 out of 23

Project Costs

See Cost on AOI T

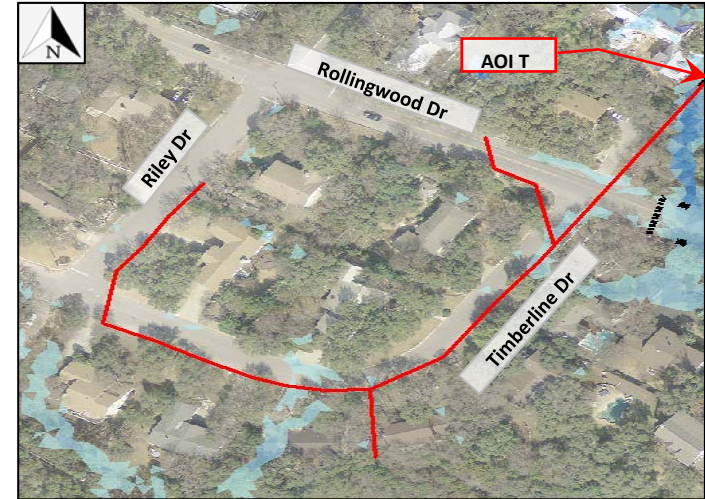
Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream channel will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red.
Existing 100-yr inundation shown.



Timberline Drive looking northeast. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: T
Project Name: East Rollingwood Drive Drainage Improvements
Drainage Basin: 14

Problem Description

Roadway flooding on Rollingwood Drive and Pickwick Lane. Property flooding along Farley Trail and Rollingwood Drive.

Proposed Improvements

Install approximately 700 feet of 36" RCP underground storm sewer, 520 feet of 5' x 3' RCB, and 350 feet of 7' x 4' RCB. Begin at Farley Trail and outfall at Eanes Creek tributary downstream of Timberline Drive. It will include an estimated 22 inlets and approximately 15 driveway reconstructions. This includes the improvements at AOI S.

CIP Ranking

14 out of 23

Project Costs**

**AOI S included

Engineering & Survey:	\$ 313,000
Construction:	\$ 1,718,000
Other:	\$ 91,000
ROW/Easements:	UNK
Total:	\$ 2,122,000

Conceptual Cost Range: > \$2M
 Estimated Construction Duration: 18 Months

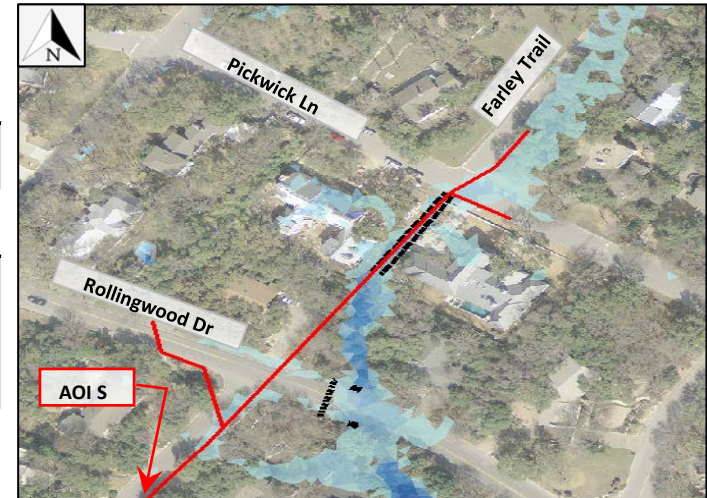
Possible Impacts

It is possible that the velocities and peak flow in Eanes Creek will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream system will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red, existing in black.
 Existing culverts in black. Existing 100-yr inundation shown.



Half buried culvert at Rollingwood Drive. 09/11/2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: U
Project Name: Riley Rd and Vance Ln Drainage Improvements
Drainage Basin: 6

Problem Description

Property flooding at intersection of Riley Rd and Vance Ln.

Proposed Improvements

An approximate 3 foot curb cut at intersection of Vance Ln and Riley Rd and approximately 230 feet of channel improvements.

CIP Ranking

22 out of 23

Project Costs

Engineering & Survey:	\$	17,000
Construction:	\$	94,000
Other:	\$	30,000
ROW/Easements:		UNK
Total:	\$	141,000
 Conceptual Cost Range:		 \$100k - \$150k
Estimated Construction Duration:		4 Months

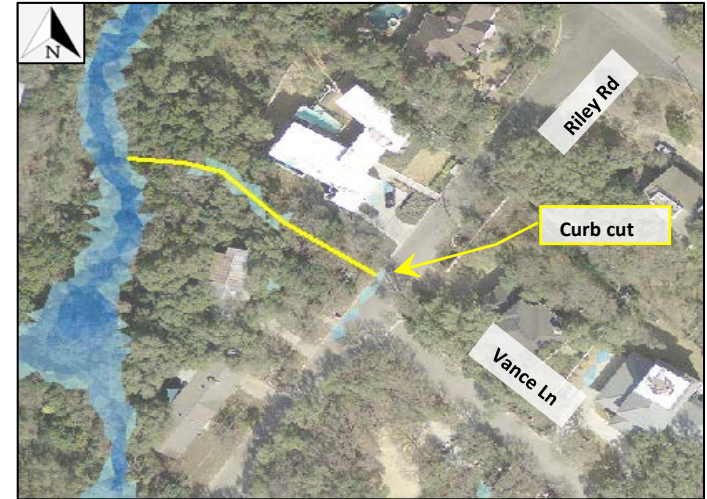
Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary. The downstream system will need to be surveyed and analyzed for potential impacts.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the channel will have sufficient capacity for the design storm event.

Project Map & Photo



Channel improvements shown in yellow.
Existing 100-yr inundation shown.



Riley Road off of Vance Lane, looking north.

CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY



Project ID: V
Project Name: Pleasant Drive Drainage Improvements
Drainage Basin: 5

Problem Description

Roadway flooding and property flooding on Pleasant Drive.

Proposed Improvements

Install approximately 248 feet of 36" RCP, 358 feet of 5' x 3' RCB, 303 feet of 6' x 3' RCB and 1382 feet of 8' x 4' RCB. Begin at Pleasant Drive and proposed detention pond (AOI H) and outfall at Town Lake tributary downstream of Hatley Drive. It will include an estimated 27 curb inlets, 1 area inlet, 675 feet of 12" tall curb, and approximately 16 driveway reconstructions. This includes the improvements at AOI K and AOI M.

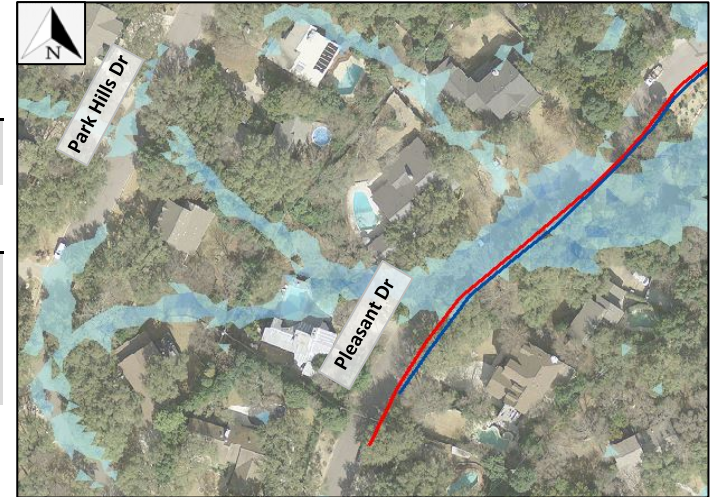
CIP Ranking

16 out of 23

Project Costs

See Cost on AOI M

Project Map & Photo



Proposed storm sewer in red. Proposed 12" curb in blue. Existing 100-yr inundation shown.



Pleasant Drive, looking northeast. 09/11/2019.

Possible Impacts

It is possible that the velocities and peak flow in Town Lake tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
COST SUMMARY**



Project ID: W
Project Name: Hatley Drive Drainage Improvements
Drainage Basin: 6

Problem Description

Roadway flooding across Hatley Drive and at intersection with Riley Road. Property flooding and along Hatley Dr.

Proposed Improvements

Install approximately 390 feet of 36" RCP underground storm sewer. Begin at intersection of Hatley Drive and Riley Road and outfall at channel on Riley Road to Town Lake. It will include approximately 8 inlets, and approximately 2 driveway reconstructions. Keep existing 36" RCP crossing at Hatley Drive.

CIP Ranking

6 out of 23

Project Costs

Engineering & Survey:	\$ 90,000
Construction:	\$ 494,000
Other:	\$ 70,000
ROW/Easements:	UNK
Total:	\$ 654,000
Conceptual Cost Range:	\$500k - \$750k
Estimated Construction Duration:	12 Months

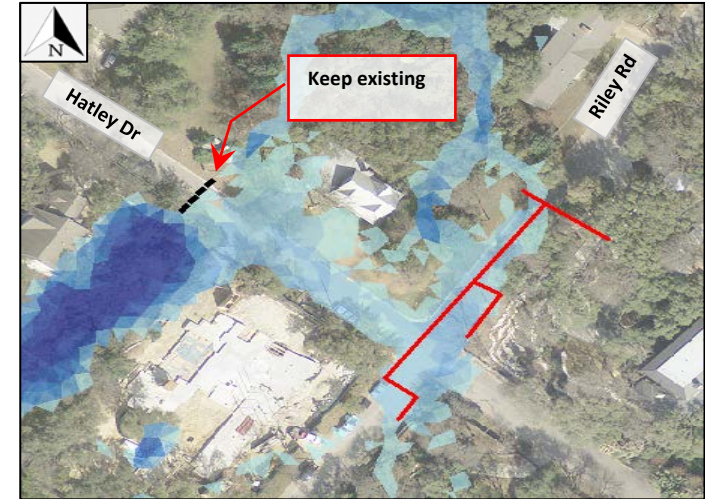
Possible Impacts

It is possible that the velocities and peak flow in Town Lake Tributary will increase downstream of the project due to these improvements. Further analysis to document impacts is necessary.

Assumptions

- It is assumed drainage easements and ROW can and will be obtained as necessary.
- It is assumed the proposed storm drain will have sufficient capacity for the design storm event.
- During detailed project design, the design storm and tailwater will need additional consideration.

Project Map & Photo



Proposed storm sewer in red. Existing culvert in black. Existing 100-yr inundation shown.



Crossing of Town Lake tributary at Hatley Drive. 09/09/2019

Appendix I: Opinions of Probable Cost

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: A

Total Cost Estimate: \$ 589,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 42,900	\$ 42,900
SURVEY (5%)	1	LS	\$ 21,450	\$ 21,450
ENVIRONMENTAL (5%)	1	LS	\$ 21,450	\$ 21,450
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 86,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(24 IN)	500	LF	\$ 208	\$ 104,000
RECONSTRUCTION OF DRIVEWAYS	5	EA	\$ 4,000	\$ 20,000
CUT AND RESTORE PAVEMENT	500	LF	\$ 160	\$ 80,000
BARRICADES, SIGNS AND TRAFFIC HANDLING	6	MO	\$ 10,000	\$ 60,000
PERMANENT EROSION CONTROL AND REVEGETATION	500	LF	\$ 10	\$ 5,000
CURB INLET	5	EA	\$ 5,500	\$ 27,500
SAFETY END TREATMENT (24 IN)	1	EA	\$ 1,250	\$ 1,250
SUBTOTAL				\$ 297,750
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 2,978
MOBILIZATION (8%)				\$ 23,820
CONTINGENCY (35%)				\$ 104,213
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 429,000
ATLAS 14 CONTINGENCY (10%)				\$ 42,900
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 472,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	6	MO	\$ 5,000	\$ 30,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 31,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

THIS DOCUMENT IS AN OPINION OF PROBABLE COST AND NOT TO BE USED FOR BID PURPOSES.

**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: B

Total Cost Estimate: \$ -

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ -	\$ -
SURVEY (5%)	1	LS	\$ -	\$ -
ENVIRONMENTAL (5%)	1	LS	\$ -	\$ -
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ -

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
<div style="border: 2px solid red; padding: 10px; width: fit-content; margin: 0 auto;"> NO PROJECT IS PROPOSED AT THIS AREA OF INTEREST AT THIS TIME, SO NO COST ESTIMATE IS PROPOSED. </div>				
SUBTOTAL				\$ -
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ -
MOBILIZATION (8%)				\$ -
CONTINGENCY (35%)				\$ -
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ -
ATLAS 14 CONTINGENCY (10%)				\$ -
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ -

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES		MO		\$ -
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)		LS		\$ -
TOTAL OTHER COSTS:				\$ -

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

THIS DOCUMENT IS AN OPINION OF PROBABLE COST AND NOT TO BE USED FOR BID PURPOSES.

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: D

Total Cost Estimate: \$ 558,000

ENGINEERING AND SURVEYING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 39,800	\$ 39,800
SURVEY (5%)	1	LS	\$ 19,900	\$ 19,900
ENVIRONMENTAL (5%)	1	LS	\$ 19,900	\$ 19,900
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 80,000

CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(48 IN)	140	LF	\$ 208	\$ 29,120
HEADWALL	1	EA	\$ 17,500	\$ 17,500
DROP INLET	1	EA	\$ 6,000	\$ 6,000
CHANNEL IMPROVEMENTS	475	LF	\$ 70	\$ 33,250
RECONSTRUCTION OF DRIVEWAYS	1	EA	\$ 4,000	\$ 4,000
CUT AND RESTORE PAVEMENT	140	LF	\$ 160	\$ 22,400
BARRICADES, SIGNS AND TRAFFIC HANDLING	6	MO	\$ 10,000	\$ 60,000
PERMANENT EROSION CONTROL AND REVEGETATION	475	LF	\$ 10	\$ 4,750
PROPOSED CUL-DE-SAC WATERMAIN IMPROVEMENTS LNV PROJECT 2	1	LS	\$ 98,929	\$ 98,929
SUBTOTAL				\$ 275,949
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 2,759
MOBILIZATION (8%)				\$ 22,076
CONTINGENCY (35%)				\$ 96,582
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 398,000
ATLAS 14 CONTINGENCY (10%)				\$ 39,800
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 438,000

OTHER

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	6	MO	\$ 5,000	\$ 30,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ 9,200
TOTAL OTHER COSTS:				\$ 40,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

² PROJECT DATED JULY 07, 2018 WAS INFLATED TO NOVEMBER 2019

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: F, E

Total Cost Estimate: \$ 2,024,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 149,800	\$ 149,800
SURVEY (5%)	1	LS	\$ 74,900	\$ 74,900
ENVIRONMENTAL (5%)	1	LS	\$ 74,900	\$ 74,900
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 300,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	846	LF	\$ 143	\$ 120,978
RC PIPE (CL III)(24 IN)	272	LF	\$ 95	\$ 25,840
CONC BOX CULV (6 FT x 3 FT)	626	LF	\$ 465	\$ 291,090
CONC BOX CULV (5 FT x 3 FT)	125	LF	\$ 642	\$ 80,250
HEADWALL	1	EA	\$ 17,500	\$ 17,500
CURB INLET	20	EA	\$ 5,500	\$ 110,000
CURB INLET	1	EA	\$ 6,000	\$ 6,000
CUT AND RESTORE PAVEMENT	1118	LF	\$ 160	\$ 178,880
BARRICADES, SIGNS AND TRAFFIC HANDLING	15	MO	\$ 10,000	\$ 150,000
PERMANENT EROSION CONTROL AND REVEGETATION	1118	LF	\$ 10	\$ 11,180
DRIVEWAY RECONSTRUCTION	12	EA	\$ 4,000	\$ 48,000
SUBTOTAL				\$ 1,039,718
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 10,397
MOBILIZATION (8%)				\$ 83,177
CONTINGENCY (35%)				\$ 363,901
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 1,498,000
ATLAS 14 CONTINGENCY (10%)				\$ 149,800
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 1,648,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	15	MO	\$ 5,000	\$ 75,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 76,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

THIS DOCUMENT IS AN OPINION OF PROBABLE COST AND NOT TO BE USED FOR BID PURPOSES.

**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: G

Total Cost Estimate: \$ 2,631,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 197,000	\$ 197,000
SURVEY (5%)	1	LS	\$ 98,500	\$ 98,500
ENVIRONMENTAL (5%)	1	LS	\$ 98,500	\$ 98,500
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 394,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
BRIDGE	13800	SF	\$ 75	\$ 1,035,000
RAISE ROAD/ROAD IMPROVEMENTS	350	LF	\$ 570	\$ 199,500
BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO	\$ 10,000	\$ 120,000
PERMANENT EROSION CONTROL AND REVEGETATION	650	LF	\$ 10	\$ 6,500
CHANNEL IMPROVEMENTS	100	LF	\$ 70	\$ 7,000
SUBTOTAL				\$ 1,368,000
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 13,680
MOBILIZATION (8%)				\$ 109,440
CONTINGENCY (35%)				\$ 478,800
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 1,970,000
ATLAS 14 CONTINGENCY (10%)				\$ 197,000
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 2,167,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	12	MO	\$ 5,000	\$ 60,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ 9,200
TOTAL OTHER COSTS:				\$ 70,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST
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**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: H

Total Cost Estimate: \$ 475,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 31,800	\$ 31,800
SURVEY (5%)	1	LS	\$ 15,900	\$ 15,900
ENVIRONMENTAL (5%)	1	LS	\$ 15,900	\$ 15,900
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 64,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO	\$ 10,000	\$ 120,000
PERMANENT EROSION CONTROL AND REVEGETATION	55	LF	\$ 10	\$ 550
DETENTION POND	1	EA	\$ 100,000	\$ 100,000
SUBTOTAL				\$ 220,550
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 2,206
MOBILIZATION (8%)				\$ 17,644
CONTINGENCY (35%)				\$ 77,193
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 318,000
ATLAS 14 CONTINGENCY (10%)				\$ 31,800
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 350,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	12	MO	\$ 5,000	\$ 60,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 61,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

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**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: I

Total Cost Estimate: \$ 238,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 15,900	\$ 15,900
SURVEY (5%)	1	LS	\$ 7,950	\$ 7,950
ENVIRONMENTAL (5%)	1	LS	\$ 7,950	\$ 7,950
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 32,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(24 IN)	70	LF	\$ 95	\$ 6,650
HEADWALL	2	EA	\$ 17,500	\$ 35,000
CHANNEL IMPROVEMENTS	40	LF	\$ 70	\$ 2,800
BARRICADES, SIGNS AND TRAFFIC HANDLING	6	MO	\$ 10,000	\$ 60,000
PERMANENT EROSION CONTROL AND REVEGETATION	475	LF	\$ 10	\$ 4,750
REMOVE HEADWALL	2	EA	\$ 401	\$ 802
SUBTOTAL				\$ 110,002
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 1,100
MOBILIZATION (8%)				\$ 8,800
CONTINGENCY (35%)				\$ 38,501
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 159,000
ATLAS 14 CONTINGENCY (10%)				\$ 15,900
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 175,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	6	MO	\$ 5,000	\$ 30,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 31,000

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**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: J

Total Cost Estimate: \$ 883,000

ENGINEERING AND SURVEYING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 63,100	\$ 63,100
SURVEY (5%)	1	LS	\$ 31,550	\$ 31,550
ENVIRONMENTAL (5%)	1	LS	\$ 31,550	\$ 31,550
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 127,000

CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(24 IN)	675	LF	\$ 208	\$ 140,400
RECONSTRUCTION OF DRIVEWAYS	2	EA	\$ 4,000	\$ 8,000
CUT AND RESTORE PAVEMENT	675	LF	\$ 160	\$ 108,000
BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO	\$ 10,000	\$ 120,000
PERMANENT EROSION CONTROL AND REVEGETATION	675	LF	\$ 10	\$ 6,750
CURB INLET	10	EA	\$ 5,500	\$ 55,000
SUBTOTAL				\$ 438,150
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 4,382
MOBILIZATION (8%)				\$ 35,052
CONTINGENCY (35%)				\$ 153,353
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 631,000
ATLAS 14 CONTINGENCY (10%)				\$ 63,100
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 695,000

OTHER

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	12	MO	\$ 5,000	\$ 60,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 61,000

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**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: L

Total Cost Estimate: \$ 490,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 33,400	\$ 33,400
SURVEY (5%)	1	LS	\$ 16,700	\$ 16,700
ENVIRONMENTAL (5%)	1	LS	\$ 16,700	\$ 16,700
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 67,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(24 IN)	24	LF	\$ 95	\$ 2,280
SET (TY II) (24 IN) (RCP)	2	EA	\$ 1,300	\$ 2,600
CHANNEL IMPROVEMENTS	175	LF	\$ 70	\$ 12,250
RECONSTRUCTION OF DRIVEWAYS	1	EA	\$ 4,000	\$ 4,000
BARRICADES, SIGNS AND TRAFFIC HANDLING	9	MO	\$ 10,000	\$ 90,000
RAISE ROAD/ROAD IMPROVEMENTS	315	LF	\$ 380	\$ 119,700
PERMANENT EROSION CONTROL AND REVEGETATION	55	LF	\$ 10	\$ 550
SUBTOTAL				\$ 231,380
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 2,314
MOBILIZATION (8%)				\$ 18,510
CONTINGENCY (35%)				\$ 80,983
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 334,000
ATLAS 14 CONTINGENCY (10%)				\$ 33,400
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 368,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	9	MO	\$ 5,000	\$ 45,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ 9,200
TOTAL OTHER COSTS:				\$ 55,000

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**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: M, K, V

Total Cost Estimate: \$ 5,283,000

ENGINEERING AND SURVEYING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 401,700	\$ 401,700
SURVEY (5%)	1	LS	\$ 200,850	\$ 200,850
ENVIRONMENTAL (5%)	1	LS	\$ 200,850	\$ 200,850
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 804,000

CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	248	LF	\$ 143	\$ 35,464
CONC BOX CULV (6 FT x 3 FT)	303	LF	\$ 465	\$ 140,895
CONC BOX CULV (8 FT x 4 FT)	1382	LF	\$ 573	\$ 791,886
CONC BOX CULV (5 FT x 3 FT)	358	LF	\$ 642	\$ 229,836
HEADWALL	1	EA	\$ 17,500	\$ 17,500
CURB INLET	27	EA	\$ 5,500	\$ 148,500
AREA INLET	1	EA	\$ 6,000	\$ 6,000
12" TALL CURB (TY II)	675	LF	\$ 30	\$ 20,250
CUT AND RESTORE PAVEMENT	2043	LF	\$ 160	\$ 326,880
BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO	\$ 10,000	\$ 120,000
PERMANENT EROSION CONTROL AND REVEGETATION	2043	LF	\$ 10	\$ 20,430
DRIVEWAY RECONSTRUCTION	16	EA	\$ 4,000	\$ 64,000
SUBTOTAL				\$ 1,921,641
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 19,216
MOBILIZATION (8%)				\$ 153,731
CONTINGENCY (35%)				\$ 1,922,000
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 4,017,000
ATLAS 14 CONTINGENCY (10%)				\$ 401,700
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 4,419,000

OTHER

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	12	MO	\$ 5,000	\$ 60,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ -
TOTAL OTHER COSTS:				\$ 60,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: N

Total Cost Estimate: \$ 380,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 26,800	\$ 26,800
SURVEY (5%)	1	LS	\$ 13,400	\$ 13,400
ENVIRONMENTAL (5%)	1	LS	\$ 13,400	\$ 13,400
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 54,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	250	LF	\$ 143	\$ 35,750
HEADWALL	1	EA	\$ 17,500	\$ 17,500
DROP INLET	1	EA	\$ 6,000	\$ 6,000
CHANNEL IMPROVEMENTS	10	LF	\$ 70	\$ 700
RECONSTRUCTION OF DRIVEWAYS	3	EA	\$ 4,000	\$ 12,000
CUT AND RESTORE PAVEMENT	250	LF	\$ 160	\$ 40,000
BARRICADES, SIGNS AND TRAFFIC HANDLING	6	MO	\$ 10,000	\$ 60,000
PERMANENT EROSION CONTROL AND REVEGETATION	250	LF	\$ 10	\$ 2,500
CURB INLET	2	EA	\$ 5,500	\$ 11,000
SUBTOTAL				\$ 185,450
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 1,855
MOBILIZATION (8%)				\$ 14,836
CONTINGENCY (35%)				\$ 64,908
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 268,000
ATLAS 14 CONTINGENCY (10%)				\$ 26,800
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 295,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	6	MO	\$ 5,000	\$ 30,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 31,000

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**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: O **Total Cost Estimate: \$ 217,000**

ENGINEERING AND SURVEYING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 14,200	\$ 14,200
SURVEY (5%)	1	LS	\$ 7,100	\$ 7,100
ENVIRONMENTAL (5%)	1	LS	\$ 7,100	\$ 7,100
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 29,000

CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CHANNEL IMPROVEMENTS	475	LF	\$ 70	\$ 33,250
BARRICADES, SIGNS AND TRAFFIC HANDLING	6	MO	\$ 10,000	\$ 60,000
PERMANENT EROSION CONTROL AND REVEGETATION	475	LF	\$ 10	\$ 4,750
SUBTOTAL				\$ 98,000
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 980
MOBILIZATION (8%)				\$ 7,840
CONTINGENCY (35%)				\$ 34,300
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 142,000
ATLAS 14 CONTINGENCY (10%)				\$ 14,200
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 157,000

OTHER

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	6	MO	\$ 5,000	\$ 30,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 31,000

**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: Q, P

Total Cost Estimate: \$ 816,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 57,300	\$ 57,300
SURVEY (5%)	1	LS	\$ 28,650	\$ 28,650
ENVIRONMENTAL (5%)	1	LS	\$ 28,650	\$ 28,650
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 115,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	630	LF	\$ 143	\$ 90,090
HEADWALL	1	EA	\$ 17,500	\$ 17,500
CURB INLET	10	EA	\$ 5,500	\$ 55,000
RECONSTRUCTION OF DRIVEWAYS	2	EA	\$ 4,000	\$ 8,000
CUT AND RESTORE PAVEMENT	630	LF	\$ 160	\$ 100,800
BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO	\$ 10,000	\$ 120,000
PERMANENT EROSION CONTROL AND REVEGETATION	630	LF	\$ 10	\$ 6,300
SUBTOTAL				\$ 397,690
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 3,977
MOBILIZATION (8%)				\$ 31,815
CONTINGENCY (35%)				\$ 139,192
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 573,000
ATLAS 14 CONTINGENCY (10%)				\$ 57,300
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 631,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	12	MO	\$ 5,000	\$ 60,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ 9,200
TOTAL OTHER COSTS:				\$ 70,000

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**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: R

Total Cost Estimate: \$ 400,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 28,300	\$ 28,300
SURVEY (5%)	1	LS	\$ 14,150	\$ 14,150
ENVIRONMENTAL (5%)	1	LS	\$ 14,150	\$ 14,150
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 57,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	415	LF	\$ 143	\$ 59,345
HEADWALL	1	EA	\$ 17,500	\$ 17,500
CURB INLET	4	EA	\$ 5,500	\$ 22,000
CURB INLET	1	EA	\$ 6,000	\$ 6,000
CUT AND RESTORE PAVEMENT	80	LF	\$ 160	\$ 12,800
BARRICADES, SIGNS AND TRAFFIC HANDLING	6	MO	\$ 10,000	\$ 60,000
PERMANENT EROSION CONTROL AND REVEGETATION	415	LF	\$ 10	\$ 4,150
CHANNEL IMPROVEMENTS	150	LF	\$ 70	\$ 10,500
DRIVEWAY RECONSTRUCTION	1	EA	\$ 4,000	\$ 4,000
SUBTOTAL				\$ 196,295
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 1,963
MOBILIZATION (8%)				\$ 15,704
CONTINGENCY (35%)				\$ 68,703
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 283,000
ATLAS 14 CONTINGENCY (10%)				\$ 28,300
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 312,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	6	MO	\$ 5,000	\$ 30,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 31,000

**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: T, S

Total Cost Estimate: \$ 2,122,000

ENGINEERING AND SURVEYING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 156,100	\$ 156,100
SURVEY (5%)	1	LS	\$ 78,050	\$ 78,050
ENVIRONMENTAL (5%)	1	LS	\$ 78,050	\$ 78,050
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 313,000

CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	700	LF	\$ 130	\$ 91,000
CONC BOX CULV (7 FT x 4 FT)	350	LF	\$ 294	\$ 102,900
CONC BOX CULV (5 FT x 3 FT)	520	LF	\$ 470	\$ 244,400
HEADWALL	1	EA	\$ 17,500	\$ 17,500
CURB INLET	22	EA	\$ 5,500	\$ 121,000
CUT AND RESTORE PAVEMENT	1570	LF	\$ 160	\$ 251,200
BARRICADES, SIGNS AND TRAFFIC HANDLING	18	MO	\$ 10,000	\$ 180,000
PERMANENT EROSION CONTROL AND REVEGETATION	1570	LF	\$ 10	\$ 15,700
DRIVEWAY RECONSTRUCTION	15	EA	\$ 4,000	\$ 60,000
SUBTOTAL				\$ 1,083,700
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 10,837
MOBILIZATION (8%)				\$ 86,696
CONTINGENCY (35%)				\$ 379,295
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 1,561,000
ATLAS 14 CONTINGENCY (10%)				\$ 156,100
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 1,718,000

OTHER

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	18	MO	\$ 5,000	\$ 90,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 500	\$ 500
TOTAL OTHER COSTS:				\$ 91,000

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**CITY OF ROLLINGWOOD
INFRASTRUCTURE IMPROVEMENTS PLAN
ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
OPINION OF PROBABLE COST**



Project ID: U

Total Cost Estimate: \$ 141,000

ENGINEERING AND SURVEYING				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 8,500	\$ 8,500
SURVEY (5%)	1	LS	\$ 4,250	\$ 4,250
ENVIRONMENTAL (5%)	1	LS	\$ 4,250	\$ 4,250
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 17,000

CONSTRUCTION COSTS				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CHANNEL IMPROVEMENTS	230	LF	\$ 70	\$ 16,100
BARRICADES, SIGNS AND TRAFFIC HANDLING	4	MO	\$ 10,000	\$ 40,000
PERMANENT EROSION CONTROL AND REVEGETATION	230	LF	\$ 10	\$ 2,300
SUBTOTAL				\$ 58,400
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 584
MOBILIZATION (8%)				\$ 4,672
CONTINGENCY (35%)				\$ 20,440
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 85,000
ATLAS 14 CONTINGENCY (10%)				\$ 8,500
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 94,000

OTHER				
DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	4	MO	\$ 5,000	\$ 20,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ 9,200
TOTAL OTHER COSTS:				\$ 30,000

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**CITY OF ROLLINGWOOD
 INFRASTRUCTURE IMPROVEMENTS PLAN
 ROLLINGWOOD DRIVE WEST DRAINAGE IMPROVEMENTS
 OPINION OF PROBABLE COST**



Project ID: W

Total Cost Estimate: \$ 654,000

ENGINEERING AND SURVEYING

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
ENGINEERING (10%)	1	LS	\$ 44,900	\$ 44,900
SURVEY (5%)	1	LS	\$ 22,450	\$ 22,450
ENVIRONMENTAL (5%)	1	LS	\$ 22,450	\$ 22,450
TOTAL ENGINEERING AND SURVEYING COSTS:				\$ 90,000

CONSTRUCTION COSTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
RC PIPE (CL III)(36 IN)	390	LF	\$ 143	\$ 55,770
HEADWALL	1	EA	\$ 17,500	\$ 17,500
RECONSTRUCTION OF DRIVEWAYS	2	EA	\$ 4,000	\$ 8,000
CUT AND RESTORE PAVEMENT	390	LF	\$ 160	\$ 62,400
BARRICADES, SIGNS AND TRAFFIC HANDLING	12	MO	\$ 10,000	\$ 120,000
PERMANENT EROSION CONTROL AND REVEGETATION	390	LF	\$ 10	\$ 3,900
CURB INLET	8	EA	\$ 5,500	\$ 44,000
SUBTOTAL				\$ 311,570
TEMPORARY EROSION AND SEDIMENT CONTROLS (1%)				\$ 3,116
MOBILIZATION (8%)				\$ 24,926
CONTINGENCY (35%)				\$ 109,050
SUBTOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 449,000
ATLAS 14 CONTINGENCY (10%)				\$ 44,900
TOTAL ESTIMATED CONSTRUCTION COSTS:				\$ 494,000

OTHER

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
CONSTRUCTION PHASE SERVICES	12	MO	\$ 5,000	\$ 60,000
ROW/EASEMENT ACQUISITION ¹		LS	UNK	UNK
PERMITTING (FEMA OR TCEQ)	1	LS	\$ 9,200	\$ 9,200
TOTAL OTHER COSTS:				\$ 70,000

¹ NOT INCLUDED IN OPINION OF PROBABLE TOTAL PROJECT COST

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Appendix J: External Funding Sources Memorandum



THE **GOODMAN**
CORPORATION

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AUSTIN: 911 W. Anderson Lane
Suite 200
Austin, TX 78757

PHONE: (713) 951-7951

MEMO

THEGOODMANCORP.COM

Date: October 31, 2019
To: K. Friese + Associates (KFA)
From: The Goodman Corporation (TGC)
Subject: City of Rollingwood Infrastructure Improvements Plan: Potential Capital Improvement Program (CIP) Project Funding Sources

Background

TGC is assisting KFA in the review of recommended City of Rollingwood (City) Capital Improvement Program (CIP) projects. TGC's review is specific to recommendations related to discretionary funding opportunities and other project specific recommendations related to funding and implementation. This memo summarizes these recommendations. The order of projects listed within this memo is based on the ranked CIP order as established by KFA.



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MEMO

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Funding Types

This memorandum refers to various funding opportunities. For ease of reference, commonly referenced funding opportunities are summarized and described below. Other funding opportunities are identified as they apply to individual projects.

Economic Development Administration Disaster Recovery (EDA-DR)	Refers to EDA funding made available after a Presidential Disaster Declaration and administered directly through the EDA. The EDA typically requires for there to be a rational nexus between the proposed project, the disaster suffered, and job growth, attraction, and/or retention.
Flood Mitigation Assistance (FMA)	Refers to Federal Emergency Management Agency (FEMA) funds which are made available annually and allocated through the Texas Water Development Board. This particular program requires a connection between the project and its potential to benefit National Flood Insurance Program (NFIP) policy holders who have suffered significant or repetitive losses.
Hazard Mitigation Grant Program (HMGP)	Refers to FEMA funds made available after a Presidential Disaster Declaration and channeled through the Texas General Land Office (GLO). HMGP funding can be used for a variety of project types to include acquisition and a variety stormwater management type to include drainage improvements and floodwater diversion and storage. Nearly every project in this analysis is technically eligible for HMGP funds. However, it is very difficult to determine the potential for funding without the completion of a Benefit Cost Analysis (BCA) per FEMA criteria.

<p>Surface Transportation Block Grant (STBG)</p>	<p>Refers to federal discretionary dollars made available through the Capital Area Metropolitan Planning Organization (CAMPO). STBG funds can be spent on most mobility-related capital projects so long as the facility is federally functionally classified as a collector or above. The only two roadways within the City which meet this criteria are Rollingwood Drive and FM 2244/Bee Caves Road.</p>
<p>Texas Water Development Board (TWDB)</p>	<p>Refers to funding potentially made available via Proposition 8, Flood Infrastructure Fund Amendment. The proposition will create a fund for projects related to flood drainage, mitigation and control. The majority of funding will be in the form of low interest loans and grants to provide the match for federal funds. So, these funds could theoretically be applied to the EDA-DR, FMA, and HMGP resources previously referenced.</p>
<p>Transportation Alternatives Set-Aside Program (TAP)</p>	<p>Refers to federal discretionary dollars for sidewalks, bike facilities, and other multi-modal investments. Funds are made available through CAMPO as well as through Texas Department of Transportation (TxDOT) itself for small urban and rural areas of the state.</p>
<p>TxDOT On-System</p>	<p>Refers to TxDOT funding reserved for on-system facilities (meaning, TxDOT owned and operated facilities) or otherwise used at the discretion of a District office or at the Texas Transportation Commission. This could mean funds derived from Propositions 1 & 7 or from TxDOT Category 2 funding.</p>

Project ID:	B
Project Name:	Bee Cave Road Drainage Improvements
<p>Comments and Recommendations: The issues and resultant recommendations relative to this project should be further evaluated through engineering studies and meetings with TxDOT, as the issue is completely specific to the flooding of their facility. TxDOT is currently performing an overlay project on the road so it is logical to schedule a meeting with the TxDOT Austin District Office to understand how the overlay project could impact any future programming decisions for future roadway specific projects, especially in light of TxDOT’s reconstruction and widening of the section of FM 2244 west of Walsh Tarlton. Depending on the recommended solution, there could be a variety of TxDOT resources available.</p> <p>Further project scope development is needed prior to the recommendation of any specific funding opportunities. A project involving a significant roadway reconstruction and/or bridge replacement would result in a recommendation for the pursuit of roadway/highway centric funding. Close coordination with TxDOT is recommended as the frequency and severity of roadway flooding could be interpreted as an impediment to safe travel, especially for emergency services. A potential funding partnership with TxDOT could be explored towards a solution. A project on this facility would be eligible for TxDOT On-System funds and could potentially be ranked high as FM 2244 is designated as a portion of the National Highway System (NHS) and as a Principal Arterial.</p> <p>Project eligible for HMGP funding but will likely yield a low BCA based on travel time delay alone. However, if the elevation of the bridge will have other positive downstream impacts, then a higher BCA is possible. TxDOT may or may not be supportive of using FEMA funding as part of a broader project involving their facility.</p> <p>Project could be a very strong candidate for EDA-DR funding based upon strength of economic development argument (movement of goods, freight, etc.) along Bee Caves Road during rain events. However, the same caveat related to mixing funding sources applies.</p>	

Project ID:	G
Project Name:	Edgegrove Drive Drainage Improvements
<p>Comments and Recommendations: The recommended project is not eligible for most types of federal funding as Edgegrove Drive is considered to be a local road and it does not appear that this flooding impacts any adjacent property. However, there are elements of the project which could theoretically be funded through TAP resources, such as the proposed bicycle facilities and pedestrian improvements. The road also provides a key connection between an adjacent Major Collector (Rollingwood Drive) and Principal Arterial (FM 2244/Bee Caves Road), which may make it more attractive for funding partnerships.</p> <p>Project eligible for HMGP funding but will likely yield a low BCA based on travel time delay alone. However, if the elevation of the bridge will have other positive downstream impacts, then a higher BCA is possible.</p> <p>Potential for EDA-DR funds based on project benefits.</p>	

Project ID:	M, K, V, L
Project Name:	Nixon / Pleasant Drainage Improvements
<p>Comments and Recommendations: The recommended project appears to have some potential to reduce localized flooding for residential structures along Nixon and Pleasant Drives. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures and the individual property owners themselves have NFIP severe or repetitive losses, then FMA funding made available through the Texas Water Development Board (TWDB) and FEMA may be an option.</p> <p>Project eligible for HMGP funding but will require a closer analysis of structural damage reduction and vehicular delay through modeling to determine BCA. However, due to the relatively high cost of the combined project, it may be difficult to quantify a BCA over 1.0.</p>	

Project ID:	D
Project Name:	Timberline-South Crest Drainage Improvements
Comments and Recommendations: Area inundation does not appear sufficient to justify competitive discretionary funding resources.	

Project ID:	W
Project Name:	Hatley Drive Drainage Improvements
Comments and Recommendations: The project appears to have some potential to reduce localized flooding for residential structures along Hatley Drive. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option. Potential for HMGP application based on calculated structural damage.	

Project ID:	H
Project Name:	City Hall Drainage Improvements
Comments and Recommendations: Project appears to be dependent upon AOI E and F improvements. However, the project and its benefits may lead to opportunities within the HMGP and EDA-DR Programs due to the benefits created at City Hall and the Rollingwood Police Department. FMA funding may also be applicable for this project dependent upon flood damage historically experienced at public facilities.	

Project ID:	J
Project Name:	Underground Sand Filtration Pond Drainage Improvements
Comments and Recommendations: Project appears to be dependent upon AOI E and F improvements. Regardless, the minor ponding experienced at the pond inlet is not significant enough to warrant competitive discretionary funding resources.	

Project ID:	T, S
Project Name:	East Rollingwood Drive and East Timberline Drive Drainage Improvements
Comments and Recommendations: The recommended project appears to have the potential to reduce localized flooding for residential structures. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option.	

Project ID:	N
Project Name:	Timberline Drive Drainage Improvements
Comments and Recommendations: Incorporating these improvements into a larger CIP project which involved sidewalk/roadway reconstruction could facilitate a grant request for sidewalks, curb, gutter, new stormwater systems, and ADA compliant ramps through CAMPO’s TAP/STBG programs. HMGP and FMA funding may also be an option dependent upon historical flooding claims and damage but it appears to be unlikely based on the existing ponding maps.	

Project ID:	Q, P
Project Name:	Rock Way Cove Drainage Improvements + Wallis and Hatley Drainage Improvements
Comments and Recommendations: : The project appears to have some potential to reduce localized flooding for residential structures along Hatley Drive. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option. Potential for HMGP application based on calculated structural damage. Additionally, the addition of sidewalks to the project scope, as well as expansion of the scope to connect activity centers such as Rollingwood Park and/or Pool could potentially create grant opportunities for a project that included sidewalks, curb, gutter, new stormwater systems, and ADA compliant ramps.	

Project ID:	R
Project Name:	Hatley Drive Drainage Improvements
Comments and Recommendations: The project appears to have some potential to reduce localized flooding for residential structures along Hatley Drive. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option. Potential for HMGP application based on calculated structural damage.	

Project ID:	O
Project Name:	Kristy Drive Drainage Improvements
Comments and Recommendations: The project appears to have some potential to reduce localized flooding for residential structures along Kristy Drive. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option. Potential for HMGP application based on calculated structural damage.	

Project ID:	E, F
Project Name:	Nixon/Gentry, Randolph Place Drainage Improvements
Comments and Recommendations: The recommended project appears to have the potential to reduce localized flooding for residential structures along Town Lake tributary. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option. HMGP, and EDA-DR resources may be applicable due to a reduction along Nixon adjacent to Rollingwood City Hall. However, the direct nexus between this project and AOI project H is unclear.	

Project ID:	I
Project Name:	Park Hills Drainage Improvements
Comments and Recommendations: The recommended project appears to have the potential to reduce localized flooding for residential structures along Town Lake tributary. Additional analysis and modeling may need to be completed to confirm this, but if so, and the structures have NFIP severe or repetitive losses, then FMA funding made available through the TWDB and FEMA may be an option. Potential for HMGP funding based on historic structural losses.	

Project ID:	A
Project Name:	Rollingwood Drive West Drainage Improvements
Comments and Recommendations: Area inundation does not appear sufficient to justify competitive discretionary funding resources for drainage component alone. Scope expansion to include access management, roadway, and/or sidewalk and bicycle improvements could potentially allow for the creation of discretionary funding opportunities through CAMPO's STBG program which would also support the overall area drainage objectives. The facility does meet the federal functional classification requirements for STBG funding application through CAMPO.	

Project ID:	U
Project Name:	Riley Road and Vance Lane Drainage Improvements
Comments and Recommendations: Per engineering report, inundation does not appear sufficient to justify competitive discretionary funding resources.	

Project ID:	C
Project Name:	Rollingwood Drive South Drainage Improvements
Comments and Recommendations: Per engineering report, inundation does not appear sufficient to justify development of a project.	

Next Steps

Prior to determining how these projects could best be funded, it is recommended that the following is completed, or at least considered:

- The calculated BCA of each of these projects. Due to the nature of these projects, it is recommended that FEMA methodology be used. This data could also be used to adjust the project ranking information provided as well as determine which projects are or are not HMGP eligible.
- Outreach with the community to determine the real world “true up” of the flooding demonstrated in the ponding maps. As many of these projects are based on individual locations of “spot” flooding, it will be helpful to understand the experienced severity and the associated frequency. Rather than a public meeting or survey tool, discussion with individual property owners could likely provide the additional information. These discussions could also include information relative to individual flood-related losses, NFIP insurance status, and claim amounts. This information will help to validate whether or not FMA grants will be applicable to individual projects. It is important to note that census tract level information.
- Coordination should occur with Travis County, the City of Austin Watershed Protection Department, and the Lower Colorado River Authority and/or any other applicable entities to understand if there are any opportunities for partnership projects or project specific restrictions related to downstream impacts.
- *Possible Next Step:* The City could develop funding applications which includes all or some of the projects identified. The local match participation amount could be adjusted (20%, 25%, 50%, etc.) to elevate the competitiveness of the project. It is important to remember that HMGP funds are only made available after a disaster declaration.

Conclusion

The majority of the recommended projects are, at a minimum, eligible for one or more discretionary funding sources. However, the competitiveness of the projects vary and are difficult to estimate without the completion of further evaluation via a benefit-cost analysis. Based on the information provided to date by KFA, the best projects for discretionary funding support appear to be the Bee Caves Road Drainage Improvement project and the projects related to City Hall Drainage.

It is our recommendation that the City use the framework provided here to monitor and identify funding opportunities. Grant funds can be pursued when identified and if awarded, will allow for the City to reallocate funding to other projects at that time.