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Rensch Road Drainage Study

Revised September 2022

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1. Executive Summary

The purpose of this report is to provide the Franklin County Engineer with an assessment of the existing drainage system, identify conditions that contribute to the reported flooding issues, and evaluate potential improvements within the study area to mitigate the flooding issues. AECOM completed a site visit to review and document the existing drainage conditions. Information received from Franklin County, the City of Grove City, Jackson Township and ODOT is listed below:

- Franklin County Engineer
 - Project Area Jurisdiction Map (2020)
 - Franklin County Mapping Panel 32
- City of Grove City
 - Project Summary Memo - EMH&T (2020)
 - Hoover Park Subdivision plans and stormwater reports
 - Hoover Park Subdivision Section 8 Tributary Area Map (2004)
 - Hoover Park Subdivision Section 1 Storm Sewer Plans (1994)
 - Hoover Park Subdivision Section 2 (1995)
 - Storm Sewer Plans & Stormwater Detention Analysis
 - Hoover Park Subdivision Section 8 (2004)
 - Storm Sewer Plans & Stormwater Management Plan including pond design
 - Project Memo - EMH&T (2020) – Watershed Area Information RE: Autumn Grove Subdivision (2006)
- ODOT District 6
 - Site Development Plans – Dollar General (2016)
 - Highway Plans – S.H.50 Sec. H-2&H-3, Sht. 16,17&38 of 39 (1932)
- Jackson Township
 - Grove City Church of God parking lot drainage plans (1998)

The documentation was reviewed and used as a reference along with GIS mapping data to model the existing drainage system. The system model included the storm sewer and detention ponds within the Hoover Park Subdivision in order to model the impact of potential improvements on that system.

The Rensch Road Study area/Patzer Ditch watershed includes areas within the jurisdictions of Franklin County and Grove City and is also bisected by CSX railroad tracks and a State highway (SR-62 / Harrisburg Pike). Throughout the last several decades, there has been ongoing development within the Patzer Ditch watershed area that has changed and has impacted the current drainage system. A chronology of the development and improvements noted and considered in this report are listed below and an exhibit, presented in **Appendix A**, was created to show the watershed area and the existing and proposed drainage infrastructure within the area. The exhibit can be referred to for items discussed throughout the report.

- Patzer Ditch established – circa 1912
- SR-62 Culvert – 24-Inch pipe replaced with 4'x4' Box Culvert with spillway inlets – 1932
- Hoover Park Subdivision – Sec. 1, 1994 – Sec. 8, 2004
- Grove City Church of God – parking lot expansion – 2004 (designed 1998)
- Autumn Grove Subdivision – 2006 - 2015
- Dollar General property development – 2016

- Whitt Property – home constructed in 1997, purchased by Whitt in 2017
- CSX Railroad – new 24-Inch culvert constructed between Whitt and Church properties - 2019

The raised embankment of the railroad creates a physical restriction to the flow of runoff limiting flow to the capacity of the culverts crossing the tracks. The three historical culverts, an 18-Inch at-grade pipe and a 10-inch subsurface tile crossing at the church property and a 15-Inch pipe at the Dollar General property, are not able to convey the peak flows across the railroad and it appears that excess flow has been collecting in the adjacent fields and yards and infiltrating into the soil. It was noted in our site visit that the 15-Inch pipe at the Dollar General property was not found and is suspected of being buried and/or filled. It also appears that as stormwater collects along the west side of the railroad at this location, a portion of it will eventually flow to the north and add to the flooding at the Whitt's property. The Whitt's had experienced repeated flooding of their yard and basement after purchasing their property in 2017. As a result of the property flooding, the owners contacted the railroad and a 24-inch culvert was installed under the tracks to help reduce flooding on the Whitt's property and convey additional flow to the east towards SR-62. The culvert was not designed or approved by any agency other than the railroad. It was also observed that the existing 10-inch tile connecting the yard drains on the Whitt property with existing drainage tile on the Church property was replaced at the same time the new culvert was installed and was reconnected through a new 24-inch corrugated plastic casing pipe located directly beneath the new 24 inch surface culvert.

Following the construction of the new 24-Inch culvert under the railroad in 2019, additional flooding events were reported east of the railroad including erosion at the church parking lot, overtopping of SR-62, back yard flooding along Williams Nook and emergency spillway discharge at the Hoover Park Subdivision pond. Additional flooding has also worsened in the areas immediately east and west of the culvert crossing SR-62. As part of the Storm Water Detention design for Hoover Park Section 8 (2004) it was identified that the 125.09-acre tributary area west of SR-62 was routed to the culvert crossing the roadway. The report identified that an 18-Inch pipe would intercept the existing 18-inch drain tile and the outlet would be connected to the Section 8 detention basin (upper basin) which was constructed with the subdivision improvements. The report also identified a natural storage area west of SR-62 that would hold additional water during higher rainfall events that stormwater would be flood routed across SR-62 and into the upper basin. There does not appear to be a clear routing for flow in excess of the 18-Inch pipe outlet to travel from the east end of the box culvert to the upper pond. This appears to be contributing to the flooding behind the Williams Nook properties.

The improvement measures considered to mitigate the flooding included providing additional flow capacity across the railroad and SR-62 and to provide additional storm water storage capacity west of SR-62 and west of the railroad. Based on our evaluation of the area conditions and drainage systems we have identified three improvements in this report to reduce the flooding. The improvements are recommended to be implemented in a near-term, mid-term and long-term sequence based on their impact value to the flooding issues and based on the complexity of planning and construction.

The near-term improvement consists of constructing a new 24-Inch storm pipe connecting the east end of the SR-62 culvert with the upper pond. The total cost for the new storm sewer is estimated to be **\$138,000** and is expected to be constructed within existing right of way and City / HOA owned property. The second recommended improvement, mid-term, is located at the Dollar General property and includes re-establishing a culvert crossing the railroad with a new 18-Inch pipe culvert and constructing an additional storm water detention basin with a capacity of approximately 8.5 acre-feet on the unused portion of the property. Although this site is zoned commercial rather than residential or agricultural it is currently unused and partially impacted by

the natural storage area. The cost of the proposed culvert and detention basin is estimated to be **\$1,200,000**. The third recommended improvement, long-term, is located at the Bauman property and includes constructing an additional storm water detention basin at the rear of the property adjacent to the church parking lot with a capacity of approximately 4 acre-feet. This site is zoned residential and it is recommended that this improvement only be implemented if needed after the first two measures are constructed and evaluated for their effectiveness on mitigating the flooding issues. The cost of this proposed detention basin is estimated to be **\$529,000**. Additional storage locations are discussed in Section 4 of this report and relate to potential property development and roadway improvements which, if realized, would impact the cost and location preference for the proposed detention basin.

2. Background and Field Investigation Findings

Multiple property owners south of Rensch Road and west of Harrisburg Pike (SR-62), as well as property owners within the Hoover Park development along Williams Nook have experienced flooding in their yards. There have also been occurrences of water over topping SR-62 during larger storm events. AECOM performed a desktop analysis of the drainage in this area as well as a field investigation to locate and document existing storm structures and evidence of flooding and erosion.

Significant land use changes have occurred over the last twenty years including the development of the Hoover Park Subdivision, the development of the Dollar General property, and the installation of a new 24-inch culvert under the railroad. AECOM evaluated these changes to determine the impact of each on the drainage of the area. A detailed discussion of the effects of the 24-inch culvert under the railroad and decisions made in the drainage design for the Hoover Park subdivision is presented in **Section 3**.

AECOM performed a field investigation of the area to locate and document existing storm infrastructure, and evidence of flooding within the area. The focus of this field investigation was to determine the condition of the culverts under the railroad, the condition of the box culvert under SR-62, and the condition of existing ditch lines. AECOM identified the 24-inch and 18-inch culverts located under the railroad outletting to a ditch running along the western side of the church parking lot. **Figure 2-1** and **Figure 2-2** show the current condition of these culverts. Both culverts were determined to be functional.



Figure 2-1: 24-Inch Culvert Under Railroad



Figure 2-2: 18-Inch Culvert Under Railroad

The 15-inch culvert shown on the Dollar General site plans was not located. It should be noted that this culvert was already assumed to be not functioning properly. The 2016 development plans for the property show the new outlet for the on-site detention pond connecting with the relocated 15-Inch pipe routed along the north side of the property and connecting with the storm pipes in the road right of way. The existing pipe at the back of the property including the railroad crossing were not noted as found or improved as part of the development. Visible signs of localized ponding were observed in the field west of the railroad where the pipe crossing was expected to be. It is suspected that the pipe may have become buried over time and is now only receiving flow through ponding and infiltration. It is also noted that the ground elevation at the 15-Inch pipe location is several feet higher than the 18-Inch and 24-Inch pipes at the Whitt's property. Although the ditch line between the crossings is not clear and maintained, our model supports that water is flowing north to the Whitt property and adding to their flooding issues.

It was also determined that the existing ditch lines facilitating flow to the box culvert under SR-62 are in poor condition. **Figure 2-3** below shows the ditch leading to the west side of the box culvert. The ditch line is partially overgrown with vegetation and the area surrounding the inlet to the culvert is wooded. The west inlet of the culvert is grated with rebar and is susceptible to clogging by debris from the ditch line and surrounding woods. Clearing of the ditch line and removal of the vegetation near the inlet is recommended in addition to regular maintenance and monitoring to keep the inlet free from debris.

The east side of the culvert crossing SR-62 is not grated; however, the window opening is depressed below the surrounding ground surface and there is not a clear route for the flow to get to the upper pond. When the flow through the culvert overtops the depression, it apparently sheet flows into the back-yard areas along the shared use path.



Figure 2-3: Ditch Approaching SR-62 Culvert

3. Preliminary Evaluation and Hydraulic Model Development

A preliminary investigation was performed by reviewing the pre- and post-developed condition evaluations conducted by EMH&T, the storm water management plan and detention design for the Hoover Park Subdivision, and anecdotal evidence of flooding extents in the area. Additionally, several 2-D hydraulic models were created using PCSWMM to evaluate the:

- Existing conditions of the area
- Conditions prior to changes in the hydrology and hydraulics of the area including the new 24-inch culvert under the railroad and redirection of a portion of the upper watershed area as part of the Autumn Grove development, and
- Proposed conditions model evaluating the potential alternatives to mitigate flooding and the overtopping of SR-62.

The Hoover Park Stormwater Management Plan and drainage design documents state that the design of the stormwater infrastructure and detention basins in the Hoover Park development identified controlled flow from the west of SR-62 through an existing 18-inch culvert that conveyed flow from an area of 125.09 acres. Additionally, it also identified that there was approximately 11.9 acre-feet of natural storage west of SR-62. These conditions were used to calculate the peak flow through the 18-inch culvert outlet to the Section 8 detention basin. It was also determined that flow through the 18-inch culvert outlet was limited to approximately 12.83 CFS, and that flow would overtop SR-62 in the 25-year storm event and all larger events.

The EMH&T report provides a summary of the changes to the area west of SR-62 and the effects on the natural storage area and tributary acreage. It was determined that the natural storage area west of SR-62 decreased from 11.9 acre-feet to 10.76 acre-feet between the elevations of 864.0 and 867.0. This was calculated using updated topographic data in 2011 and by adjusting the extents of the natural storage due to new construction within this area. Additionally, EMH&T re-evaluated the tributary area to the culvert under SR-62 and determined the area decreased from 125.09 acres to 118.33 acres. This is primarily due to the construction of the Autumn Grove development north of Rensch Road, where flow is conveyed to the north across Rensch Rd instead of east towards SR-62.

Using the new areas and storage volumes provided in EMH&T's report, AECOM performed an initial evaluation of the drainage using a 2-D PCSWMM model. The model was developed using the Hoover Park storm design plans, 2007 lidar data provided by OGRIP to create the 2-D mesh layer, and data from the stormwater management plans and EMH&T's report. The first model evaluated was the previous conditions model prior to changes on the west-side of SR-62. **Figure 3-1** shows the results of the 10-year design storm model simulation. The model results show widespread flooding west of the railroad tracks near the Whitt's property, flooding at the church and church parking lot, overtopping of SR-62, and flooding in the backyards of houses along Williams Nook in the Hoover Park development.

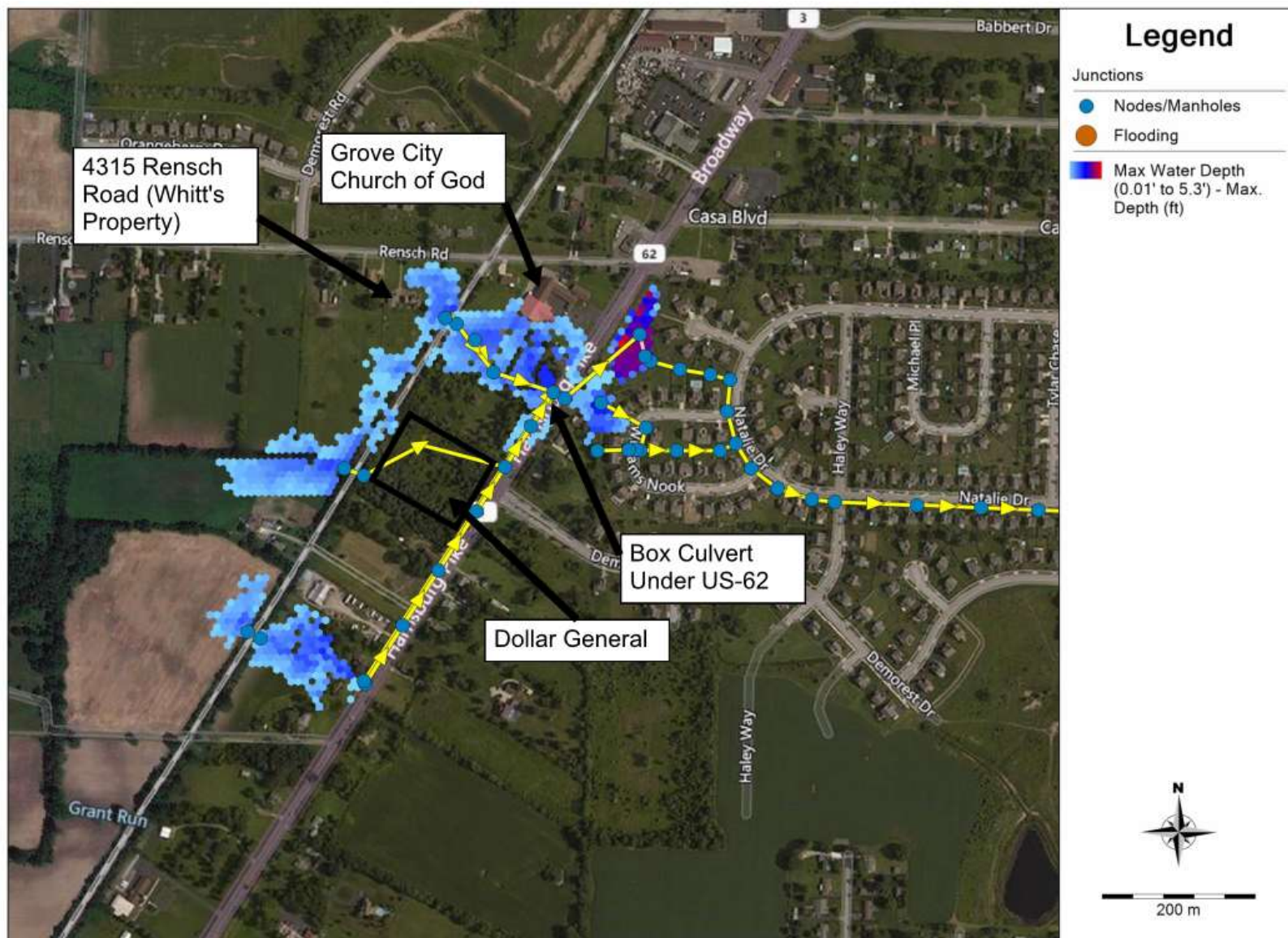
To determine the changes to flooding extents with the removal of the Autumn Grove area, installation of the 24-inch culvert under the railroad tracks, and reduction in storage/area west of SR-62, an existing model representing current conditions in the area was created. **Figure 3-2** shows the results of this model simulation for the 10-year design storm. As shown, the approximate flooding extents do not change, however additional flow through the 24-inch culvert under the railroad tracks does exacerbate flooding at the houses along Williams Nook in the Hoover Park development. The flooding extents and depths increased marginally from the previous conditions model to the existing conditions model. It should be noted that the model results show overtopping of SR-62 during the 5-year design storm under both previous and

existing conditions. The model was also simulated for the 1-, 2-, 5-, and 25-year design storms for both the existing conditions model, and the previous conditions model. These figures can be found in **Appendix B**.

Based on the evaluation of the Hoover Park Stormwater Management Plan and drainage design documents, as well as the results of the existing conditions model, AECOM determined that there is not adequate storage west of SR-62 to prevent water from overtopping SR-62 beginning in the 5-year design storm. Additionally, there is a 1.5-foot x 2-foot window opening on either end of the box culvert under SR-62 at an elevation of approximately 861.4 that was not referenced in the drainage design for the Hoover Park development. The existing conditions model shows significant flows through this window prior to overtopping of SR-62.

It was also determined that the natural storage area that was delineated east of the railroad during the drainage design is utilized during storm events. This results in significant ponding at the church property as well as residential properties on the west side of SR-62 between the church and the new Dollar General. The church and residential properties have documented significant flooding in the area.

The Whitt's property west of the railroad tracks is mainly affected by flow from the south and west of the railroad. A large portion of the area tributary to the culvert under SR-62 is on the west side of the railroad tracks and south of the Whitt's property (63.9 acres). The 15-inch tile/culvert under the railroad tracks at the Dollar General property was not located during the site inspection, and it is assumed to not be functioning properly. This flow is therefore collecting and infiltrating. In heavier events some of the water is diverted north along the railroad tracks to the Whitt's property where flooding has been shown to occur. The property owner has indicated that the new 24-inch culvert that was installed to mitigate flooding at their property has helped and conveys flow to the east allowing their property to drain the ponded water more quickly. However, due to the lower elevations at the Whitt's property and the restriction of flow through the culvert under SR-62 flooding still occurs on this property.



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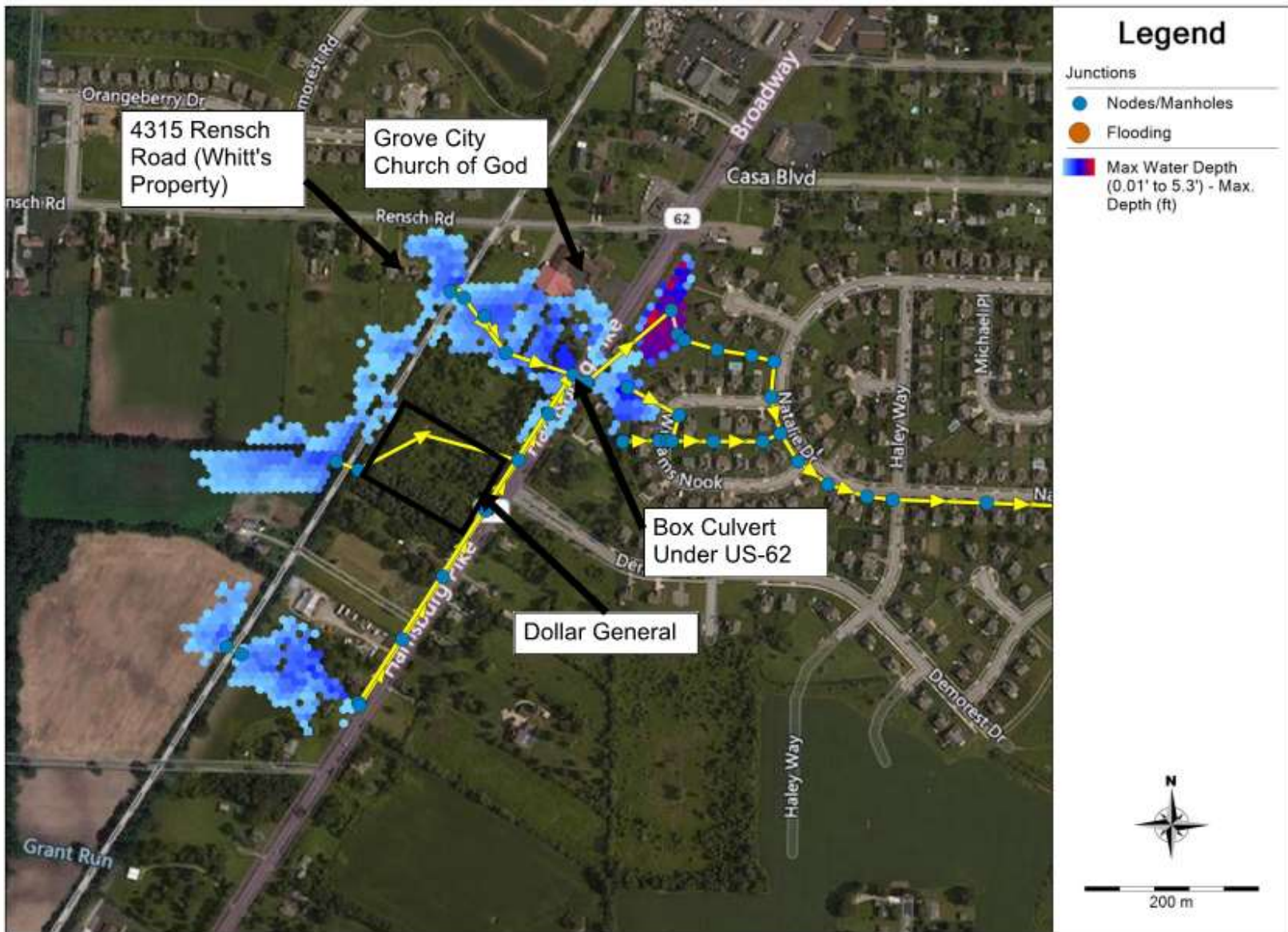


Figure 3-2: Existing Conditions (10-Year Design Storm)

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4. Conceptual Alternatives Analysis

Multiple conceptual alternatives were evaluated to reduce/mitigate flooding within the area. These included:

- Conveyance upgrades to allow more flow through the culvert under SR-62,
- Conveyance north across Rensch Road to the creek that crosses SR-62,
- Conveyance east of SR-62 to the Section 8 detention basin, and
- Storage west of SR-62.

Additionally, improvements to ditch lines and existing infrastructure was also evaluated. These options were evaluated using the 2-D PCSWMM model to determine the reduction in flood extents, and to verify there were no downstream effects.

Conveyance Upgrades Under SR-62 To Section 8 Detention Basin

AECOM evaluated upsizing the existing culvert under SR-62 and the existing 18-inch that conveys flow to the Section 8 detention basin without perpetuating the natural storage area. This option was modelled, and it was determined there was not enough capacity downstream during larger storm events to adequately convey the additional flow necessary to eliminate surface flooding west of SR-62 without overwhelming the downstream collection system.

During this analysis it was determined that there is not an issue with conveyance under SR-62, but there is an issue with how flow is being conveyed from the culvert to the detention basin. As shown in **Figure 3-2**, the existing conditions during the 10-year storm show ponding at lower elevations in the yards of residential properties along SR-62 and Williams Nook. The roadside ditch and grading immediately adjacent to the upper window outlet of the 4x4 culvert is not allowing the flow to release until it is nearly at the roadway level. The 2004 design model accounted for the lower 18" outlet pipe and for flow overtopping the roadway but did not account for the separate flow through the upper window but still below the roadway surface. Providing an appropriate drainage course for flow through the upper window to reach the Section 8 pond will reduce the severity and frequency of the flooding west of SR-62 and consequently will reduce the frequency of the flow overtopping the roadway. Additionally, the upstream window to the SR-62 culvert is prone to clogging, and alternatives to reduce clogging were evaluated. It was determined the need for maintenance of this culvert is crucial to adequately convey flow west of SR-62 under the roadway. Alternative inlet designs were considered; however, due to the forested areas upstream, any inlet will be prone to clogging.

Conveyance North to Ditch Along Casa Boulevard

Providing conveyance along the west side of SR-62 north across Rensch Rd to an existing ditch running along Casa Boulevard was also evaluated. By removing flow west of SR-62, there is a reduction in the amount of flow over topping the roadway during larger storm events. However, this option was determined to not be feasible due to the potential lack of capacity in the creek and the downstream creek conditions. The creek meanders through residential property front yards and eventually transitions to a ditch that runs under multiple driveways. Due to the number of homes potentially impacted by this additional flow, this option was not evaluated further.

Conveyance East of SR-62 To Section 8 Detention Basin

As discussed previously, there is an issue with how flow is conveyed east of SR-62 downstream of the existing culvert. The model shows significant flooding in this area, and anecdotal evidence of flooding in residents' yards along Williams Nook corroborates these findings. Installing a 24-inch storm sewer east of and parallel with SR-62 to convey additional flow to the Section 8 detention basin was modelled. The Section 8 detention basin is controlled by a 24-inch outlet pipe, and conveys flow east through the development. During larger rain events (>5-year), water begins to flow out of the upper window of the SR-62 culvert, and is not currently routed to the detention pond. The pond level is controlled by a 24" outlet pipe and an emergency spillway. Modelling results show the proposed 24-inch storm sewer will adequately convey additional flow to the detention basin where there is additional storage volume. **Figure 4-1** shows the results of the 10-year design storm with approximately 260 linear feet of new storm sewer east of SR-62 to the detention basin. As shown, flooding is mitigated in this area. By better controlling flow to the basin, the existing storm infrastructure along Williams Nook is able to convey the local storm runoff and reduce flooding in this area. Cover over the proposed 24-inch sewer may be limited due to the proximity of the roadside ditch and the specification of concrete pipe is anticipated. Additional figures showing the model results for the 1-, 2-, 5-, and 25-year design storms are provided in **Appendix C**. This option does not solve the flooding concerns west of SR-62, however it provides improvement to flooding east of SR-62 and reduces the frequency of flow overtopping SR-62. Additional evaluation and conceptual-level costs are provided in **Table 4-2**.

Storage Improvements West of SR-62

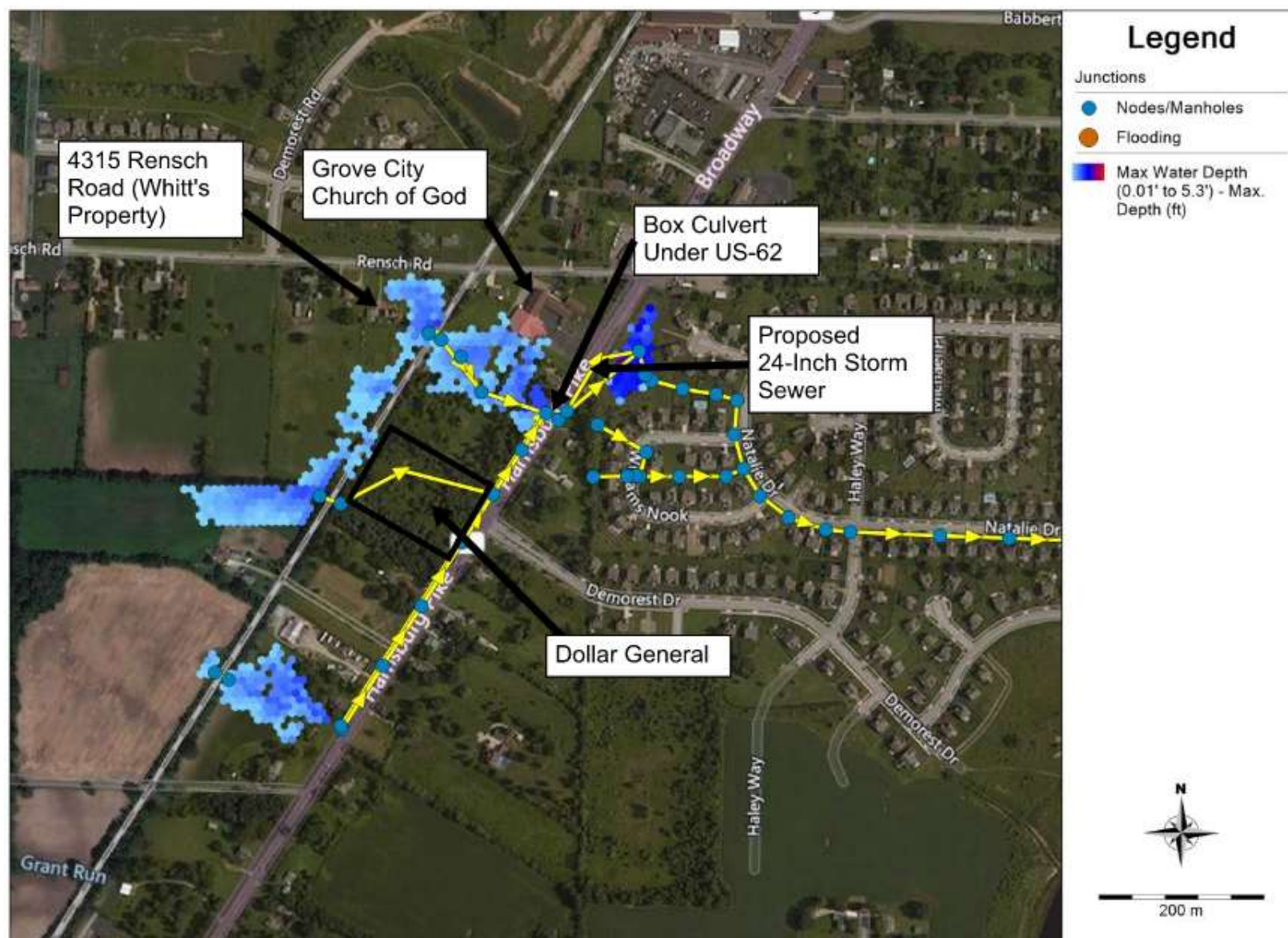
AECOM also evaluated storage improvements west of SR-62 to determine required storage necessary to reduce/mitigate flooding at the Whitt's property, the church, and the homes south of the church. The resulting storage option was determined to be the most feasible and would provide the greatest flood mitigation. **Table 4-1** below provides the total storage volumes necessary west of SR-62 for the 1-, 2-, 5-, 10-, and 25-year storms with the 10-year event being the desired minimum design event.

Table 4-1: Required Storage to Mitigate Flooding

Design Storm	Total Storage Required West of SR-62 (acre-feet)
1-Year	5.19
2-Year	7.08
5-Year	10.03
10-Year	12.67
25-Year	17.08

Multiple locations were evaluated for siting storage. These include the existing detention basin at the Dollar General, the Whitt's property, the church parking lot, south of the church parking lot, and at the inlet location of the box culvert under SR-62. **Figure 4-2** shows the results of the 10-year design storm with approximately 12.67 acre-feet of storage. As shown in **Figure 4-2**, flooding west of SR-62 is significantly reduced, and overtopping of SR-62 does not occur. Maximizing

storage west of SR-62 provides the most flood mitigation out of all options considered. Additional figures showing the results of total storage required for the 1-, 2-, 5-, and 25-year design storm are included in **Appendix C**. Additionally, only the 8.5 acre-feet was modelled to determine flood extents during the 25-year event. This is shown in **Figure 4-3**. The following section provides a conceptual level siting plan for storage at the Dollar General. Approximately 8.5 acre-feet of runoff west of the railroad could be stored at this location. The remaining 4.17 acre-feet of storage could be sited near the church as shown in **Appendix A**, at the Whitt's property or at the inlet location of the box culvert under SR-62 to provide flood mitigation during the 10-year design storm.



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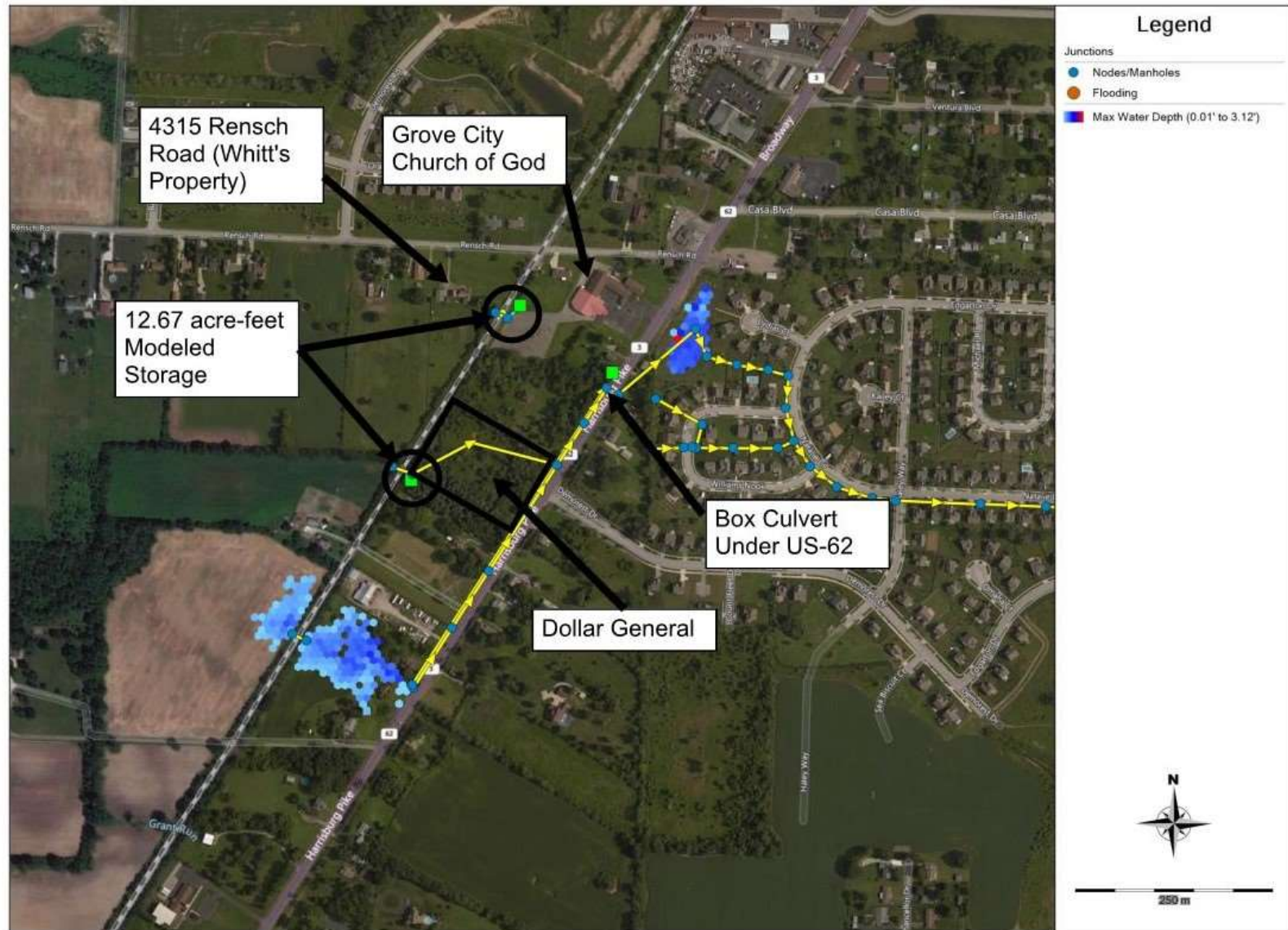
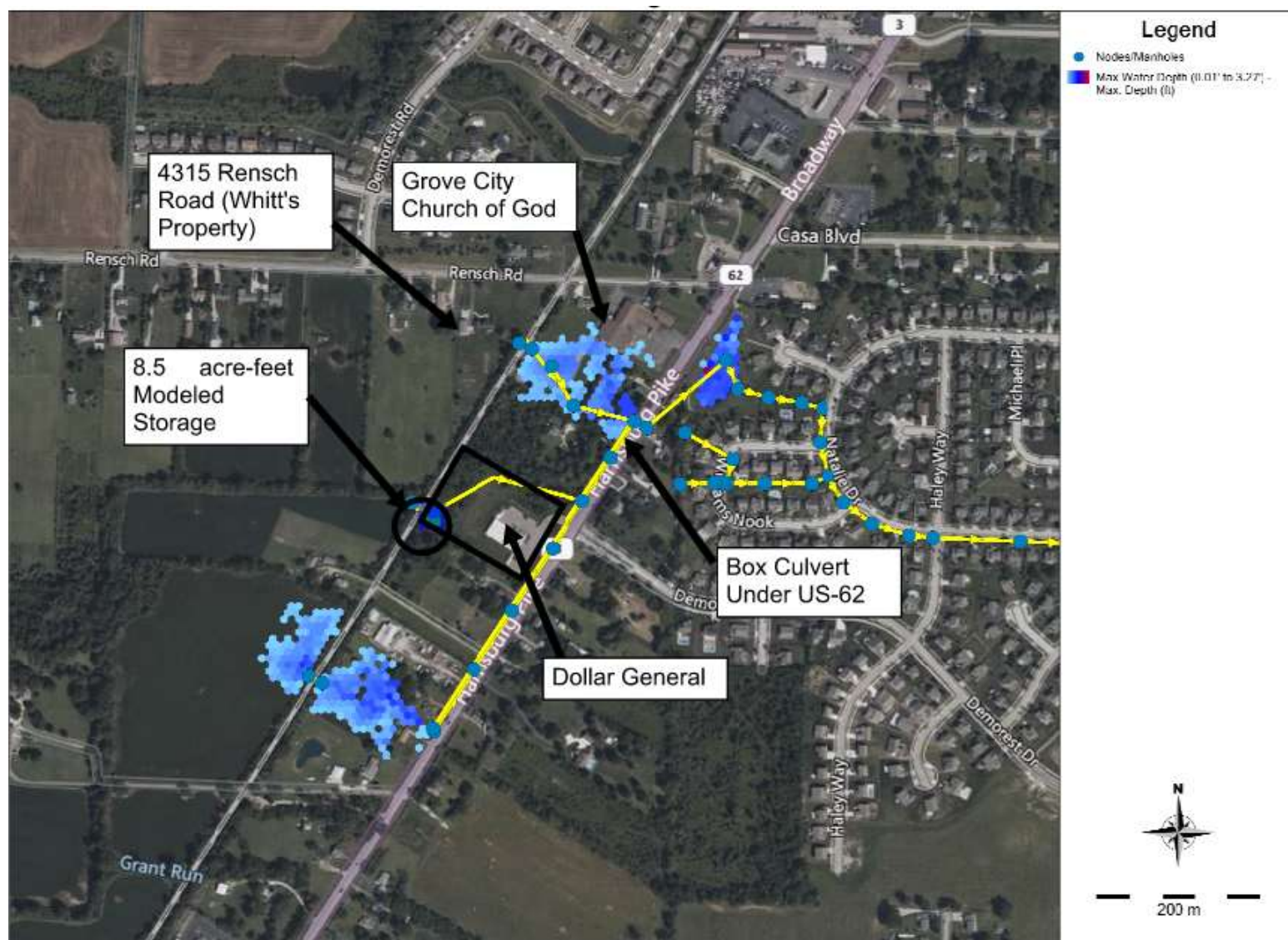


Figure 4-2: Proposed Storage - 12.67 acre-feet (10-Year Design Storm)

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Additional Storage at Dollar General

The Dollar General property offers additional space to expand the existing detention basin. It is estimated that approximately 8.5 acre-feet of storage can be detained by expanding this basin. The ground elevations west of the railroad tracks and dollar general are approximately 868-ft to 869-ft, which is higher than the max ponding level at the existing Dollar General detention basin. Additionally, the storm sewer downstream of the Dollar General detention pond outlet control structure is at approximately 860.76'. This allows for adequate ponding depths at the Dollar General site to storage the 8.5 acre-feet. As part of this potential solution, an 18-inch culvert under the railroad tracks west of the Dollar General would need to be installed to convey flow that currently ponds up and flows north along the railroad. There is an existing 15-inch culvert under the railroad tracks that was not found. It is recommended this be abandoned, and a new 18-inch culvert be installed and directed to the expanded detention basin. This would help to reduce flooding significantly at the Whitt's property, as it was determined a significant portion of that flooding is due to flow from the south along the west side of the railroad tracks. **Figure 4-4** shows a conceptual-level siting plan for the detention basin at the Dollar General property. A conceptual-level cost estimate for all recommended options is provided in **Table 4-2**.

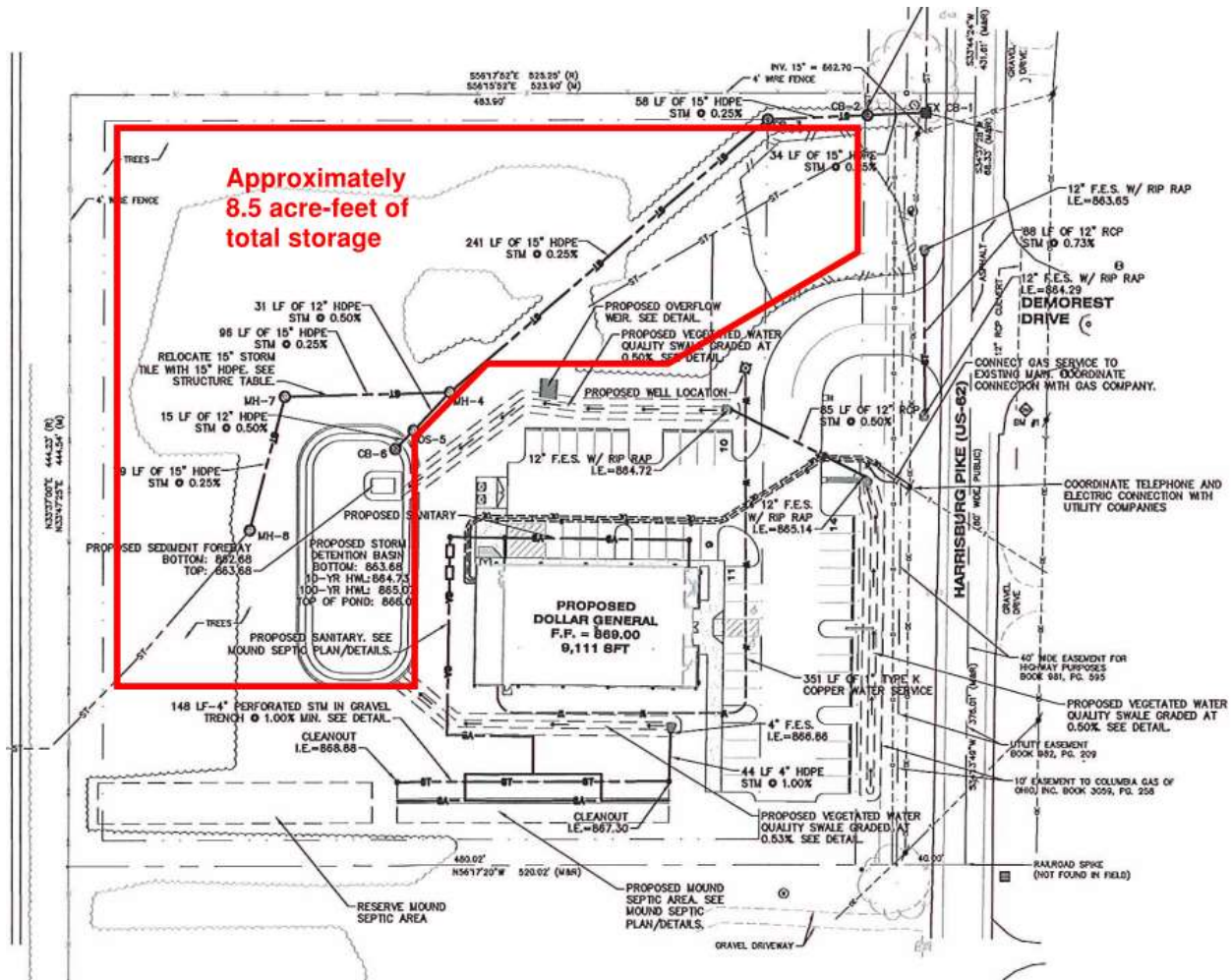


Figure 4-4: Conceptual Level Storage Location at Existing Dollar General

It is also recommended that the ditch line west of the railroad tracks and from the outlet of the 24-inch culvert are improved to reduce erosion and properly convey flow. A line item cost for ditch improvements is included in the high-level cost estimate in **Table 4-2**.

Alternative Additional Storage Locations

The conceptual storage was located and modelled at the Dollar General property because of its proximity to the flooding area that it would mitigate and because of its accessibility from SR-62 for construction and maintenance purposes. The City indicated their long-term plan for the placement of a connector roadway between Demorest Road and Demorest Drive (shown in **Appendix A**). The construction of this roadway would involve the redevelopment of at least several of the larger separately owned properties west of the railroad. A connector roadway would also impact the railroad and the Dollar General property thereby impacting the conceptual detention basin expansion in this report. The implementation of this roadway connector will require significant planning and coordination but would understandably be a desired part of the City's roadway connectivity plans. If this connector and development were to move forward it would impact the storage needs, siting criteria and site availability on both sides of the railroad property. For these reasons and since development plans are not known at this time, there would be risk involved in choosing a final location for the storage area at this time as it may limit the future options for layout of the development. There could be potential benefits of cost savings and land usage if the storage needs described in this report could be folded into the future development and roadway construction improvements. Potential cost sharing in these items by the City and/or County may enable the development to take place more readily and provide a win-win scenario for the drainage improvements in the watershed. It is recommended that the City and County consider delaying the implementation of the storage construction until the development plans and timeline are more fully known.

High-Level Cost Estimates and Recommended Timeline

A high-level cost estimate for the recommended options are provided in **Table 4-2**. Costs for storage were estimated on a per cubic foot basis. The costs for acquiring the necessary property are not included in this estimate.

Table 4-2: Rensch Road Drainage High-Level Cost Estimate - 10-Year LOS

Rensch Road Drainage Proposed Improvements High-Level Cost Estimate - 10 Year LOS				
Proposed Sewer Items	Unit	Unit Cost	Quantity	Total Cost
24-Inch HDPE Storm Sewer < 8' Deep, Medium Difficulty, East of SR-62	LF	\$329	260	\$85,514
Rip Rap	SY	\$107	3	\$321
18-Inch Storm Culvert with Inlet/Outlet Structures	LS	\$30,000	1	\$30,000
Ditch Improvement	LF	\$30	1,600	\$48,000
Storage (12.67 acre-feet of Detention)	CF	\$2	553,212	\$995,782
Subtotal Construction Cost				\$1,159,617
Mobilization		3%		\$34,789
Maintenance of Traffic		2%		\$23,192
Stormwater Pollution Prevention Plan		1%		\$11,596
Overhead & Profit		15%		\$173,943
Contingency		25%		\$289,904
Engineering Design & Construction Oversight		15%		\$173,943
TOTAL COST				\$1,866,983

Based on the substantial improvements necessary to reduce/mitigate flooding in the area, AECOM recommends focusing on improving conveyance east of SR-62 first, then determining feasible storage locations west of SR-62. The installation of a 24-inch storm sewer east of SR-62 provides relief to flooding for several properties and takes further advantage of the existing Section 8 detention basin. As discussed, a significant volume of storage could be accomplished by expanding the existing detention basin at the Dollar General property with potential additional storage near the church to more fully mitigate flooding in the area. The storage at Dollar General property would offer the greatest improvement to flooding concerns especially at the Whitt's property, and any additional storage west of SR-62 would further this improvement.

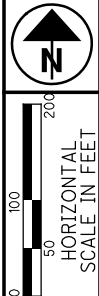
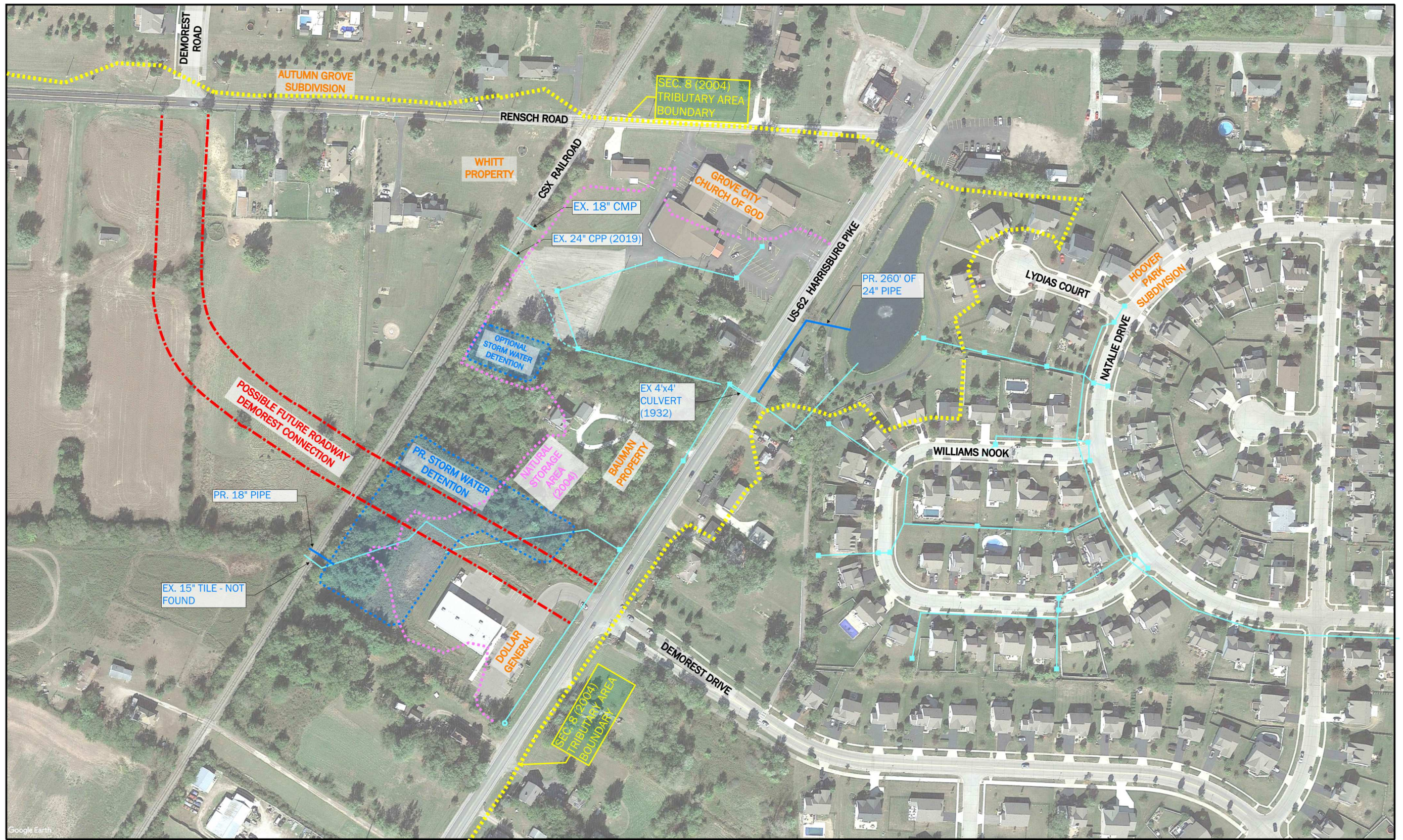
It should be noted that the proposed storage west of the SR-62 culvert reduces peak flows significantly, and results in flow not exiting the downstream upper window of the culvert for the modelled 25 year event. Although the 24" storm sewer is not needed in addition to the proposed storage to convey the flows from the 25-year event, it is still recommended as a connection for flow which may come through the upper window during larger rain events. Without establishing this connection from the upper window to the pond, any flow from the upper window would still flow into the back yards of the Williams Nook properties.

5. Summary

Significant flooding has been observed within the project tributary areas west of the railroad, west of SR-62, and east of SR-62, including flow overtopping the roadway. The land within the tributary area east of the railroad and north of Rensch Road has experienced some commercial and residential development over the past 25 years while the land west of the railroad and south of Rensch Road has remained as agricultural and rural residential use. AECOM has evaluated the existing drainage conditions and system and has identified improvements to the stormwater system that will help alleviate the frequency and severity of the flooding. The improvements are identified as near-term, mid-term and long-term recommendations to prioritize the construction of the less complex and more cost-effective measures.

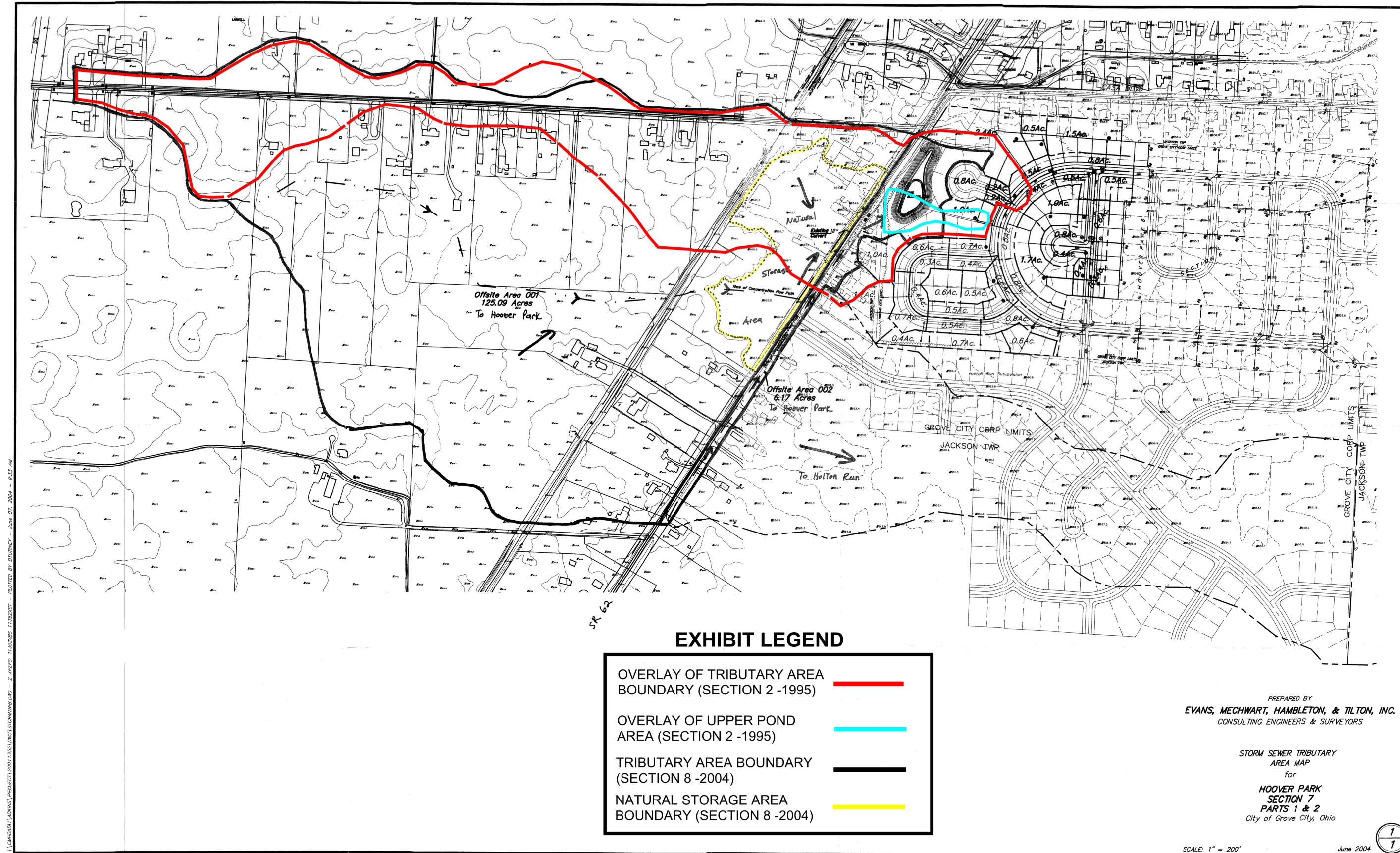
The near-term improvement is constructing a new 24-Inch storm pipe connecting the east end of the SR-62 culvert with the upper pond. The total cost for the new storm sewer is estimated to be **\$138,000** and is expected to be constructed within existing right of way and City / HOA owned property. This cost is comprised of the storm sewer per foot cost and approximately 10% of the general engineering costs. The second recommended improvement, mid-term, is located at the Dollar General property and includes re-establishing a culvert crossing the railroad with a new 18-Inch pipe culvert and constructing an additional storm water detention basin with a capacity of approximately 8.5 acre-feet on the unused portion of the property. Although this site is zoned commercial rather than residential or agricultural it is currently unused and partially impacted by the current flooding/natural storage area. The cost of the proposed culvert and detention basin is estimated to be **\$1,200,000**. This cost is comprised of the culvert and ditch cost and approximately 65% of the detention and general engineering costs. The third recommended improvement, long-term, is located at the Bauman property and includes constructing an additional storm water detention basin at the rear of the property adjacent to the church parking lot with a capacity of approximately 4 acre-feet on the property. This site is zoned residential and it is recommended that this improvement only be implemented if needed after the first two measures are constructed and evaluated for their effectiveness on mitigating the flooding issues. The cost of this proposed detention basin is estimated to be **\$529,000**. This cost is comprised of approximately 30% of the detention and general engineering costs. An exhibit was created to show the existing and proposed infrastructure within the drainage area, and is presented in **Appendix A**. The second and third recommended improvements, for additional detention areas,

are subject to the planning considerations for additional development and a Demorest roadway connector as discussed in the previous Alternative Additional Storage Locations section of this report. It is recommended that the City and County consider delaying the implementation of the storage construction until the development plans and timeline are more fully known.



**RENSCH ROAD
DRAINAGE STUDY EXHIBIT**

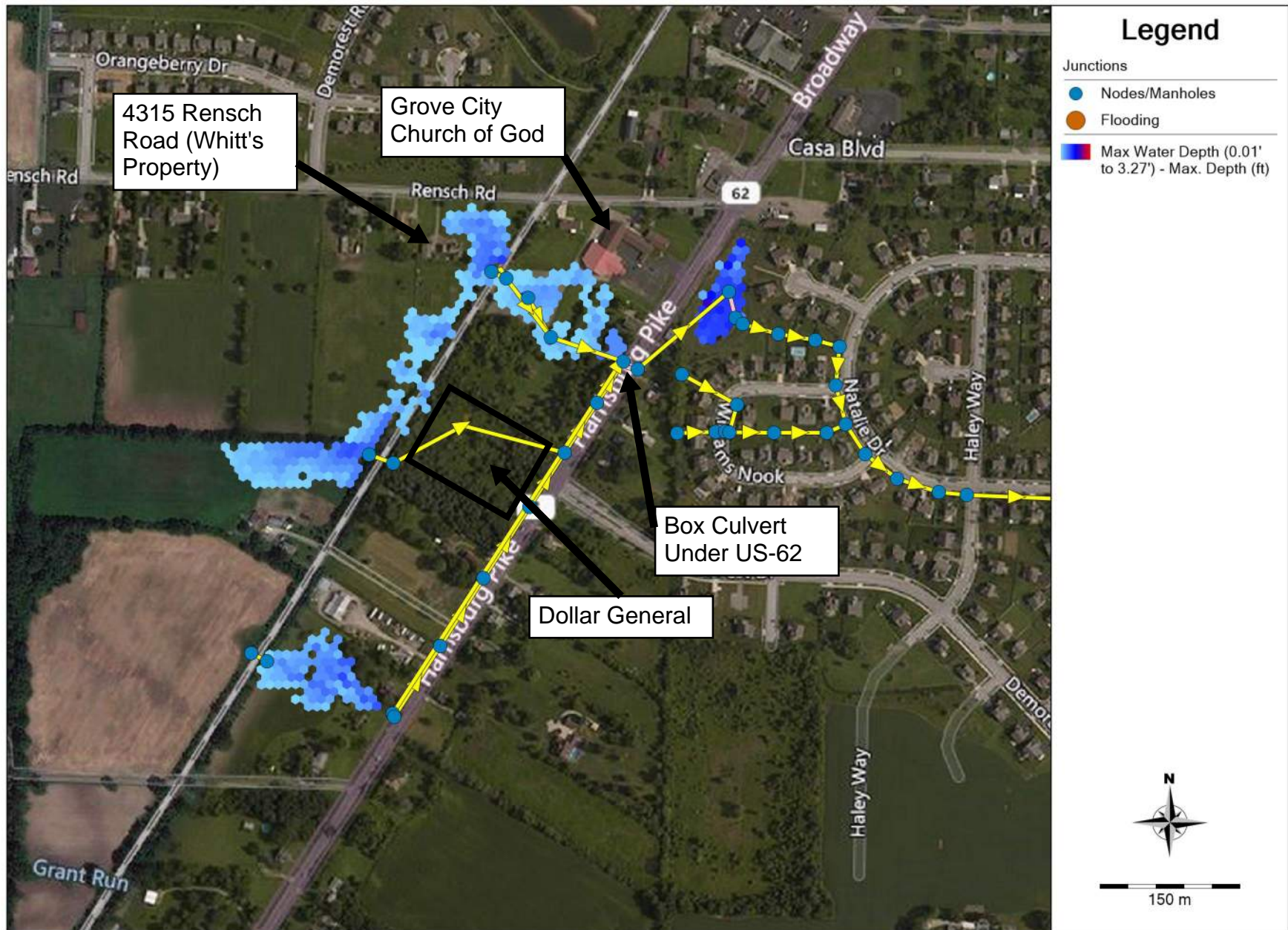
STUDY AREA REFERENCE MAP



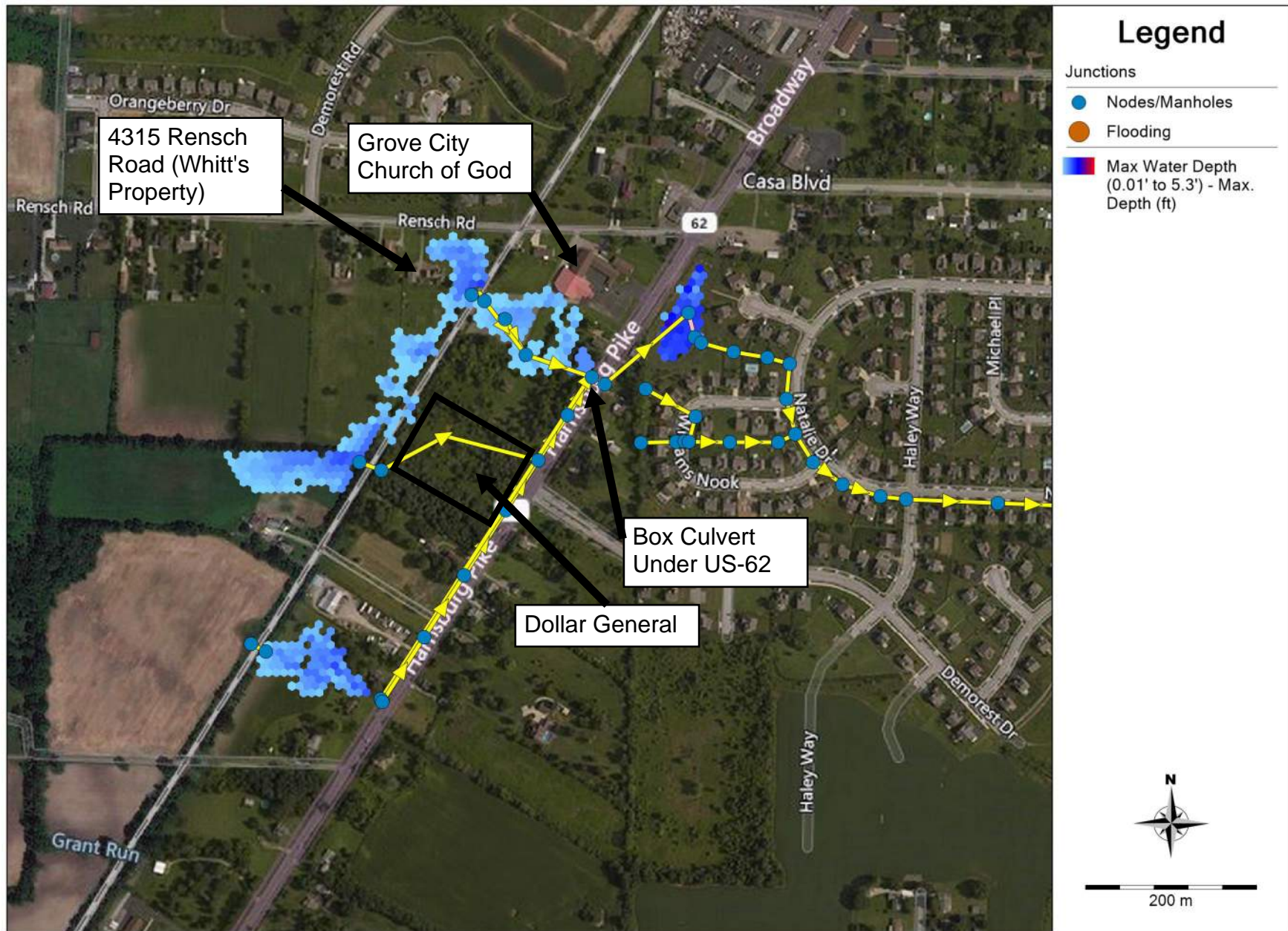
Appendix B

Existing and Previous Conditions Model Results

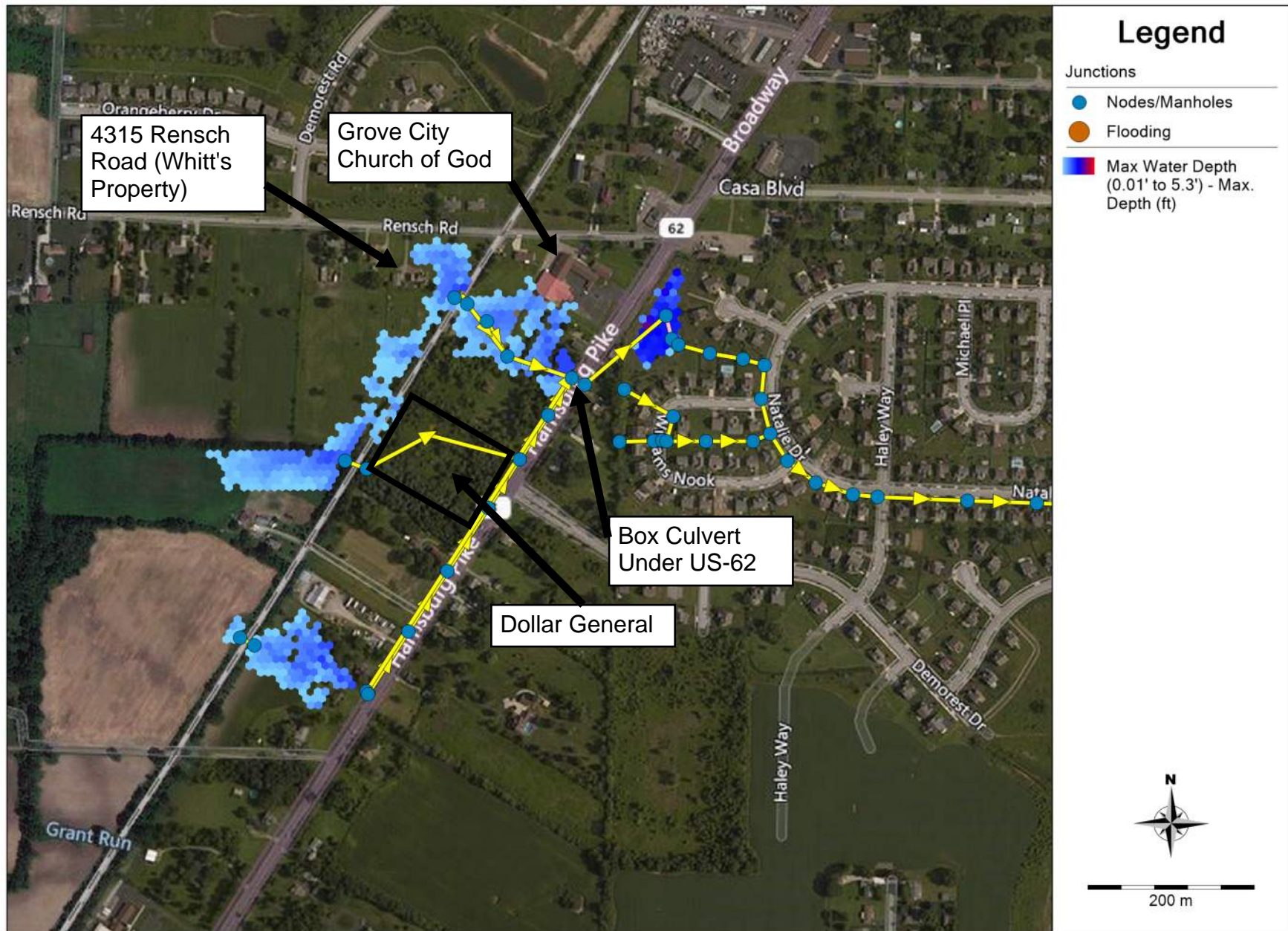
Existing Conditions: 1-Year Design Storm



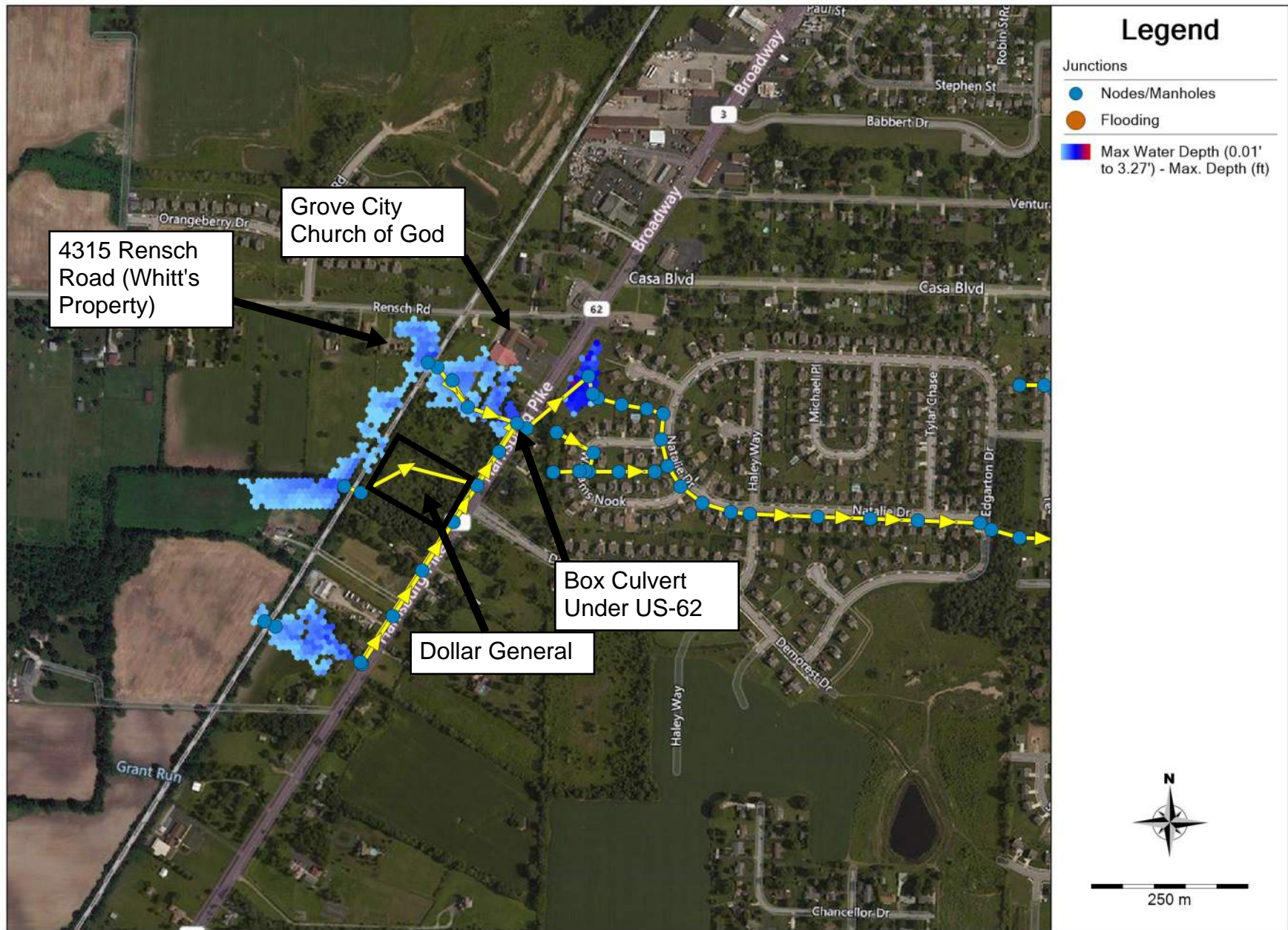
Previous Conditions: 1-Year Design Storm



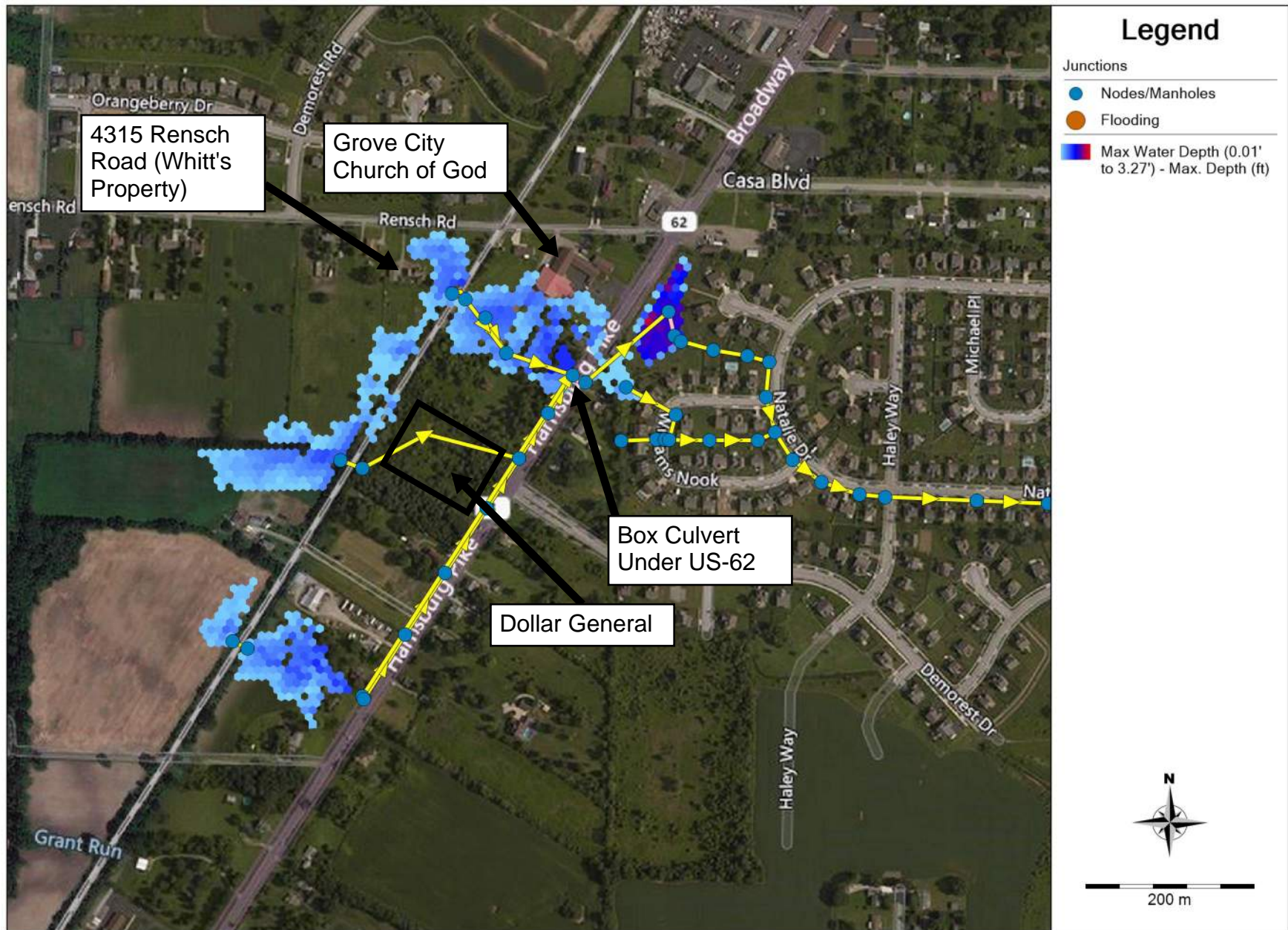
Existing Conditions: 2-Year Design Storm



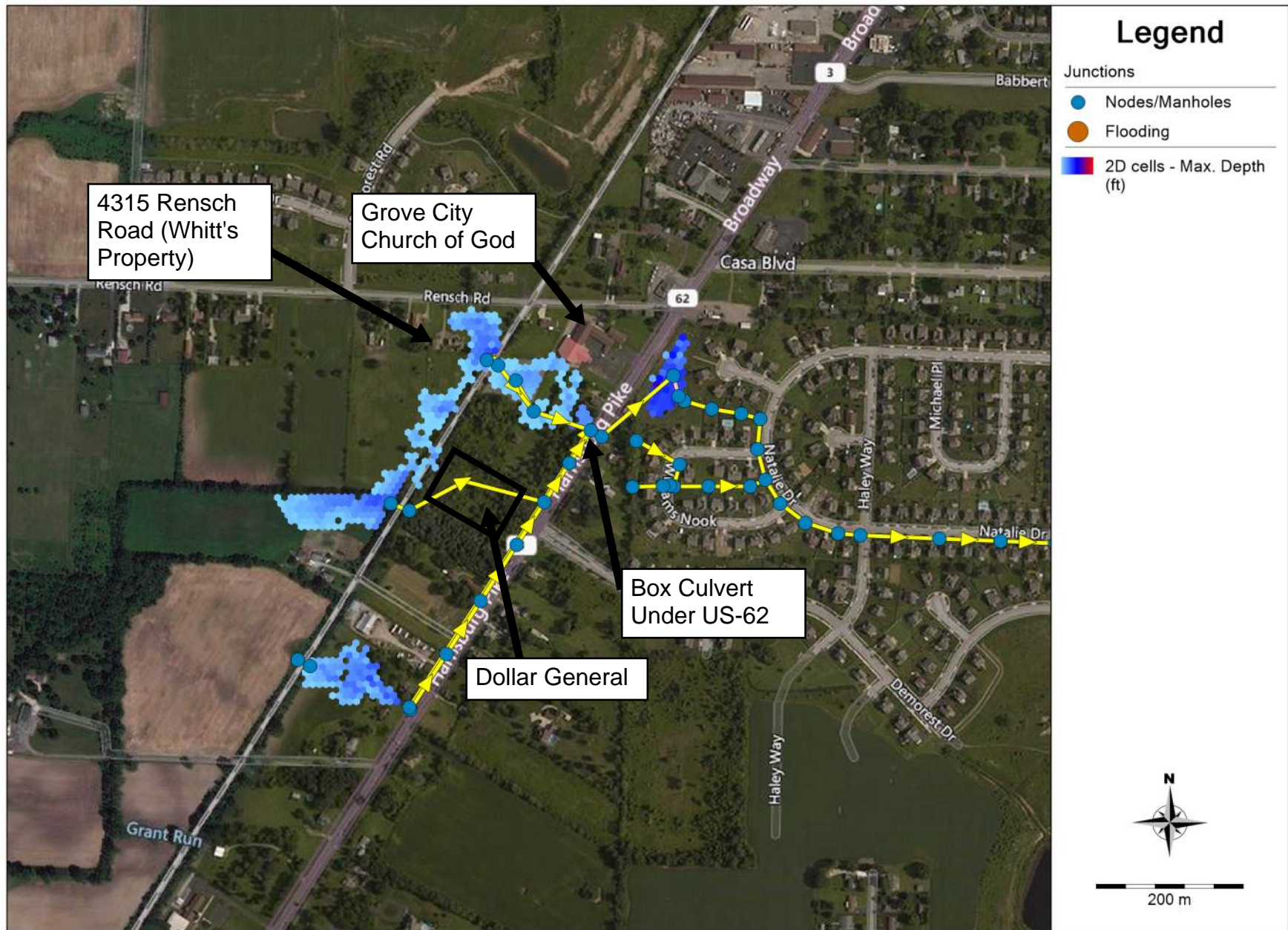
Previous Conditions: 2-Year Design Storm



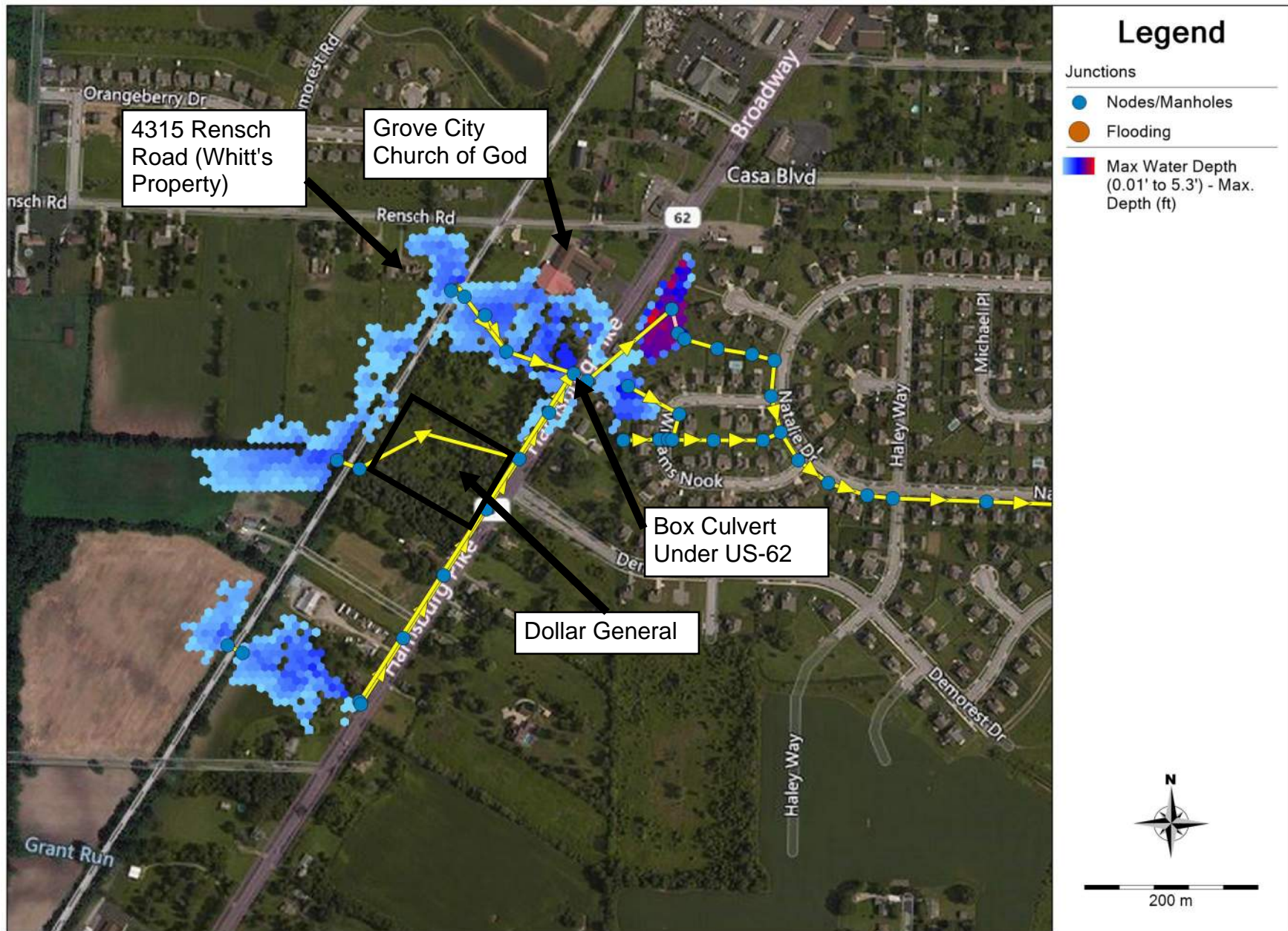
Existing Conditions: 5-Year Design Storm



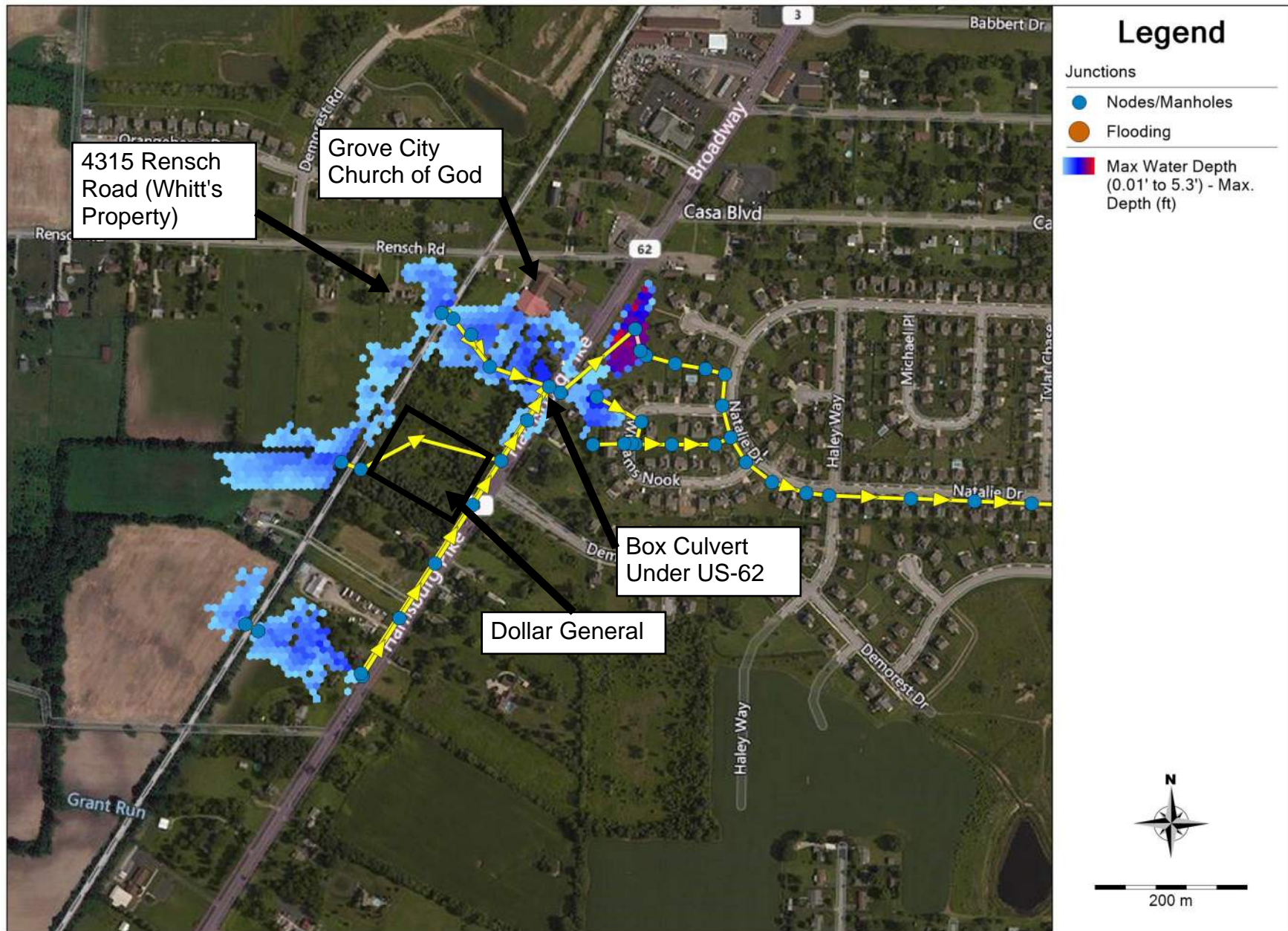
Previous Conditions: 5-Year Design Storm



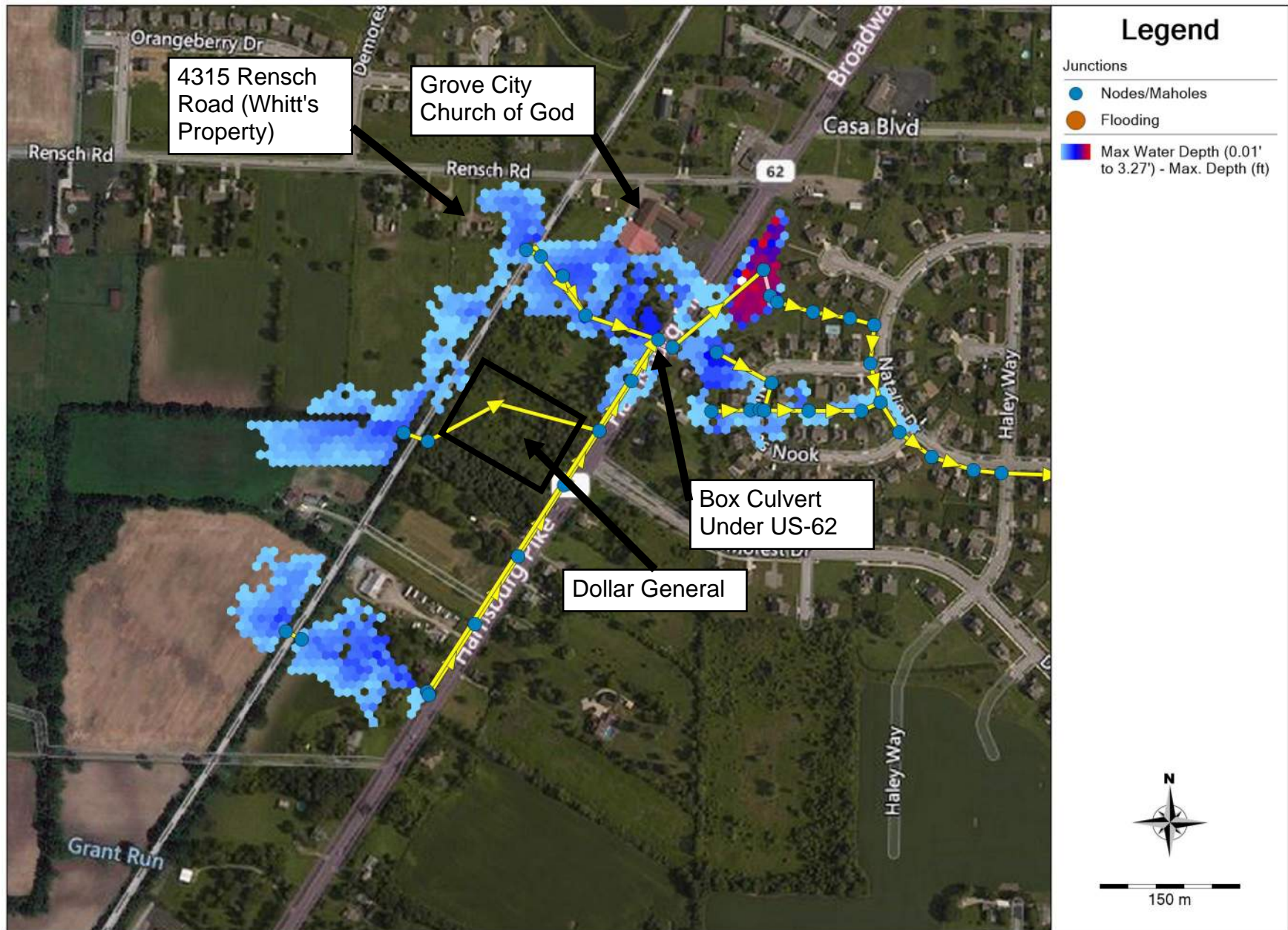
Existing Conditions: 10-Year Design Storm



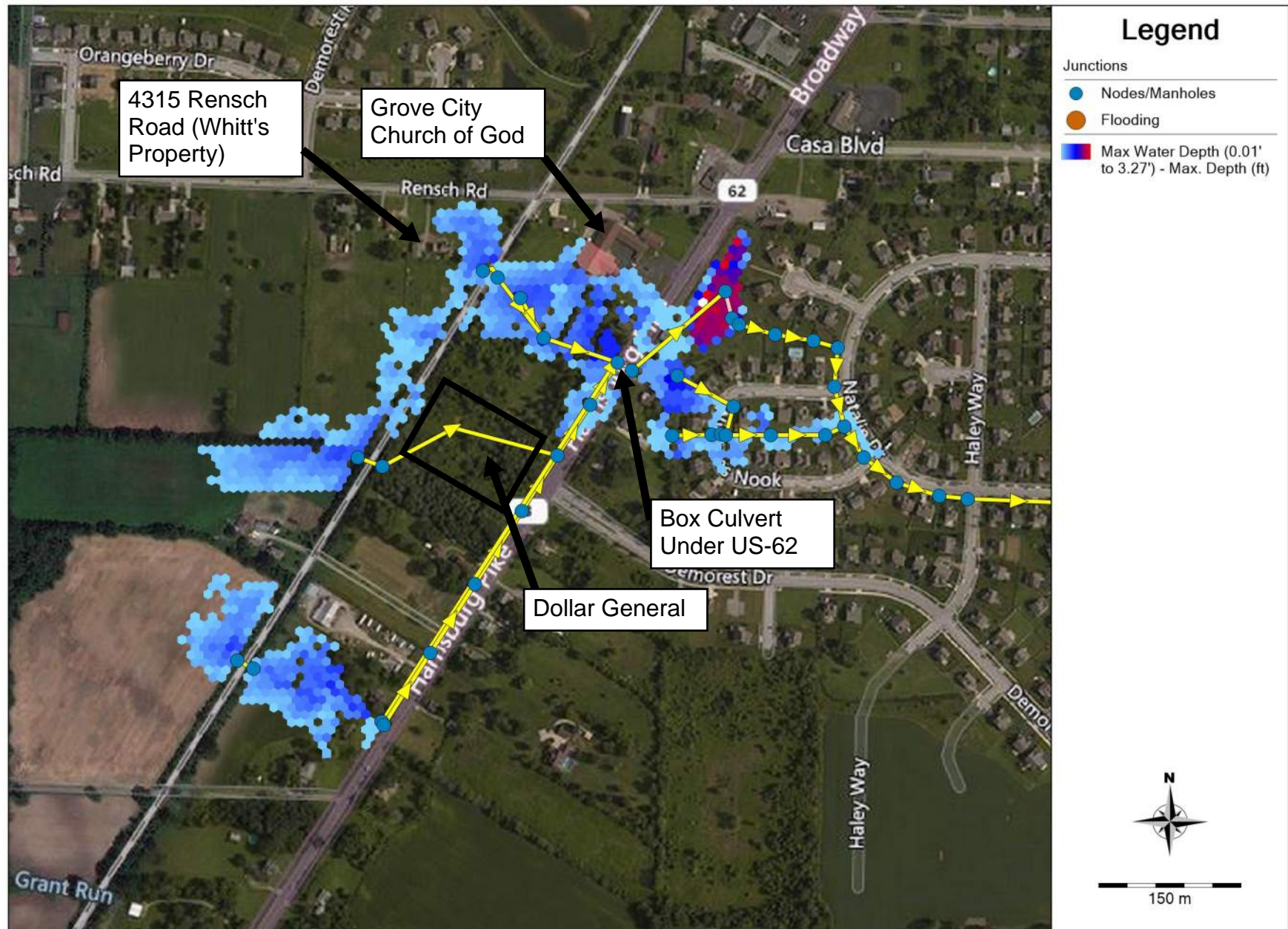
Previous Conditions: 10-Year Design Storm



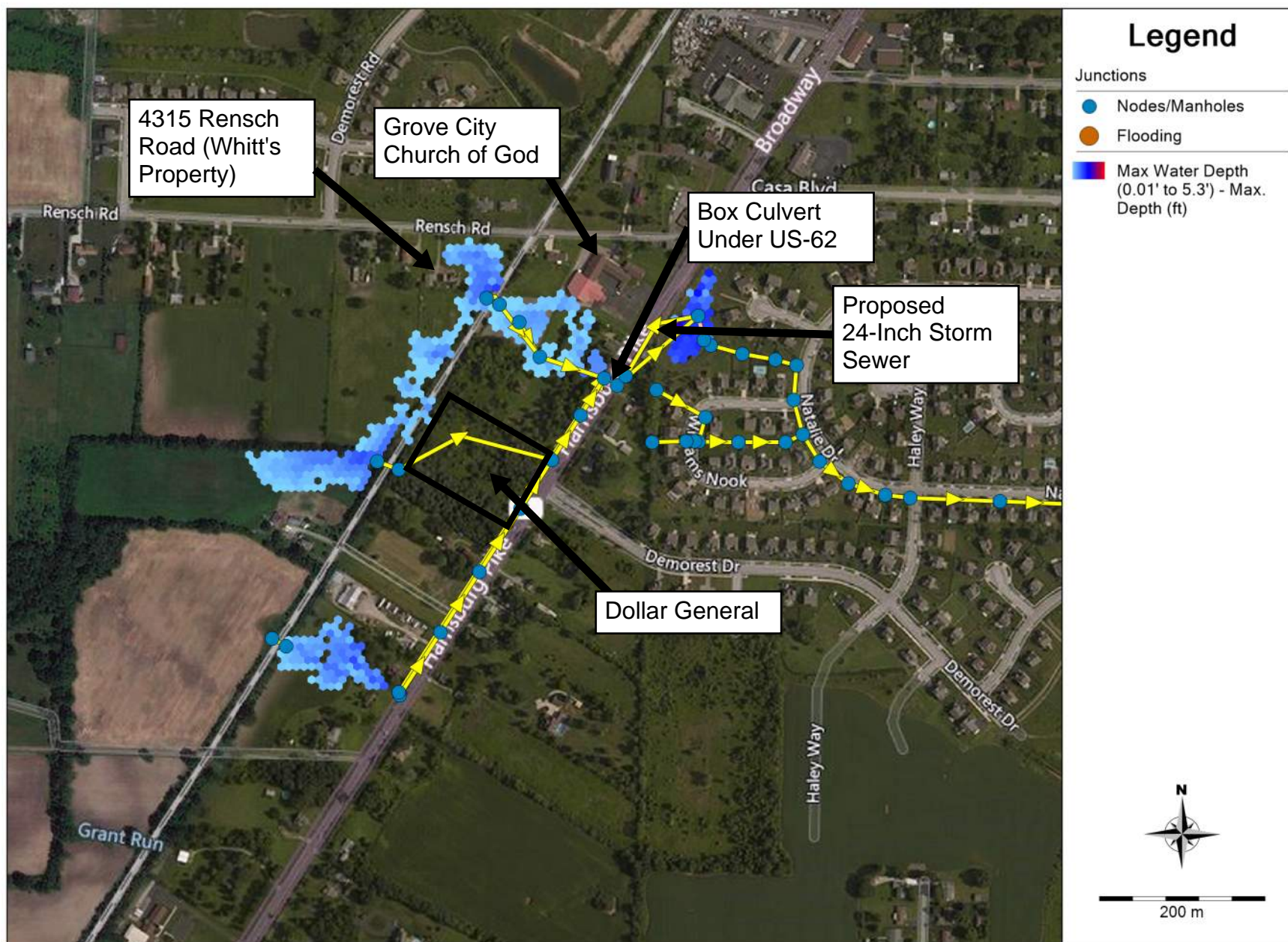
Existing Conditions: 25-Year Design Storm



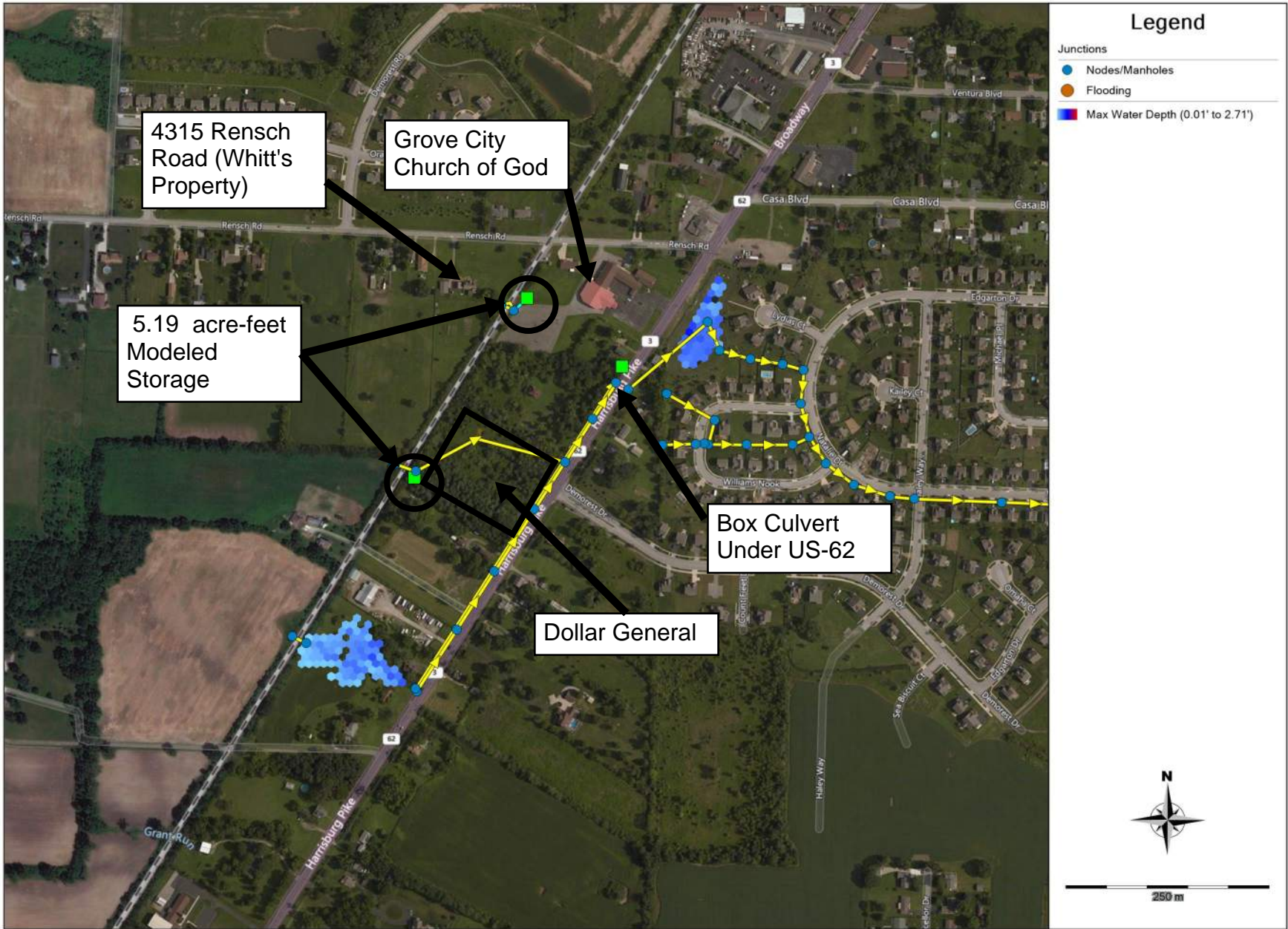
Previous Conditions: 25-Year Design Storm



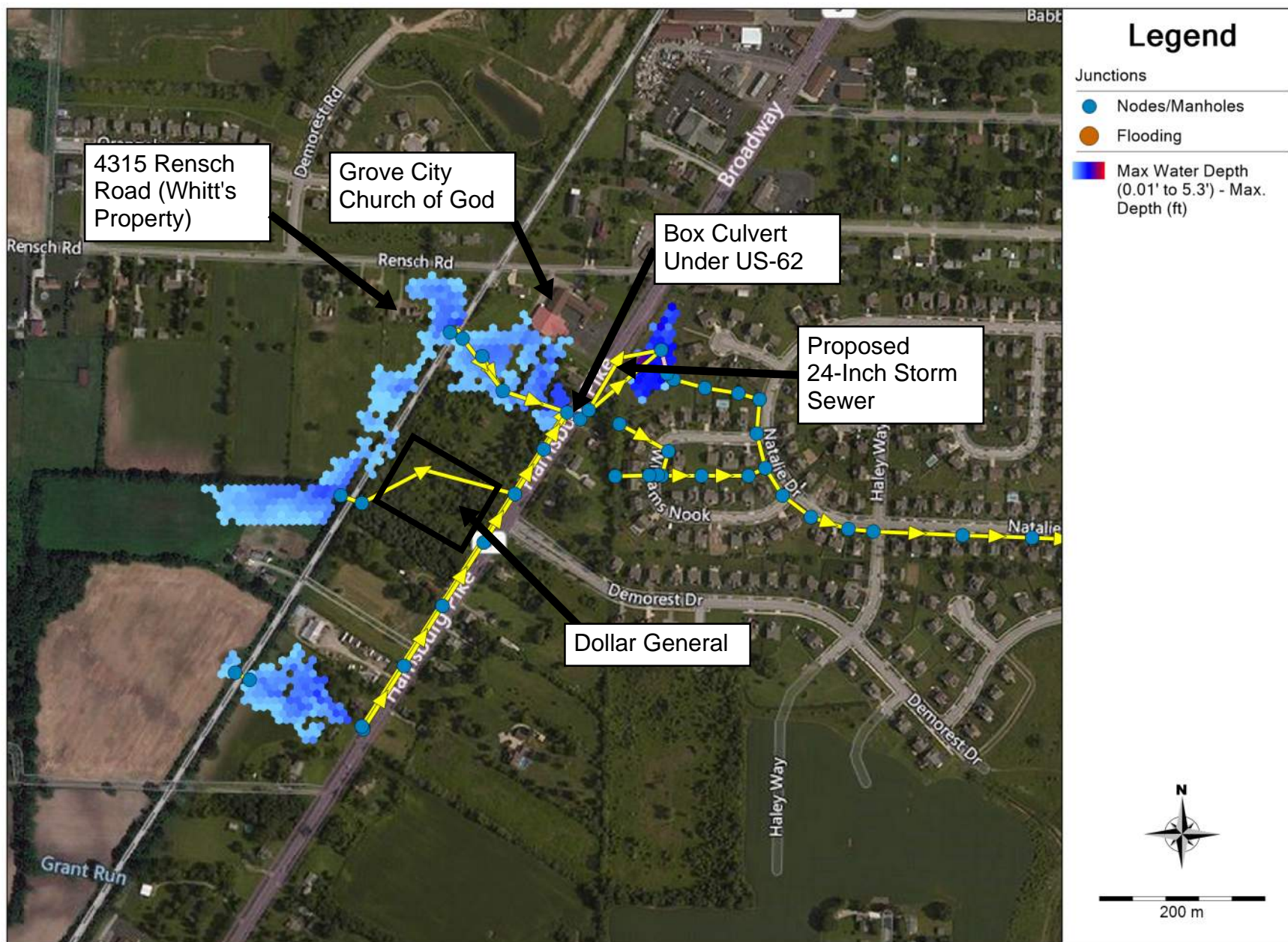
Proposed 24-Inch Storm Sewer East of SR-62: 1-Year Design Storm



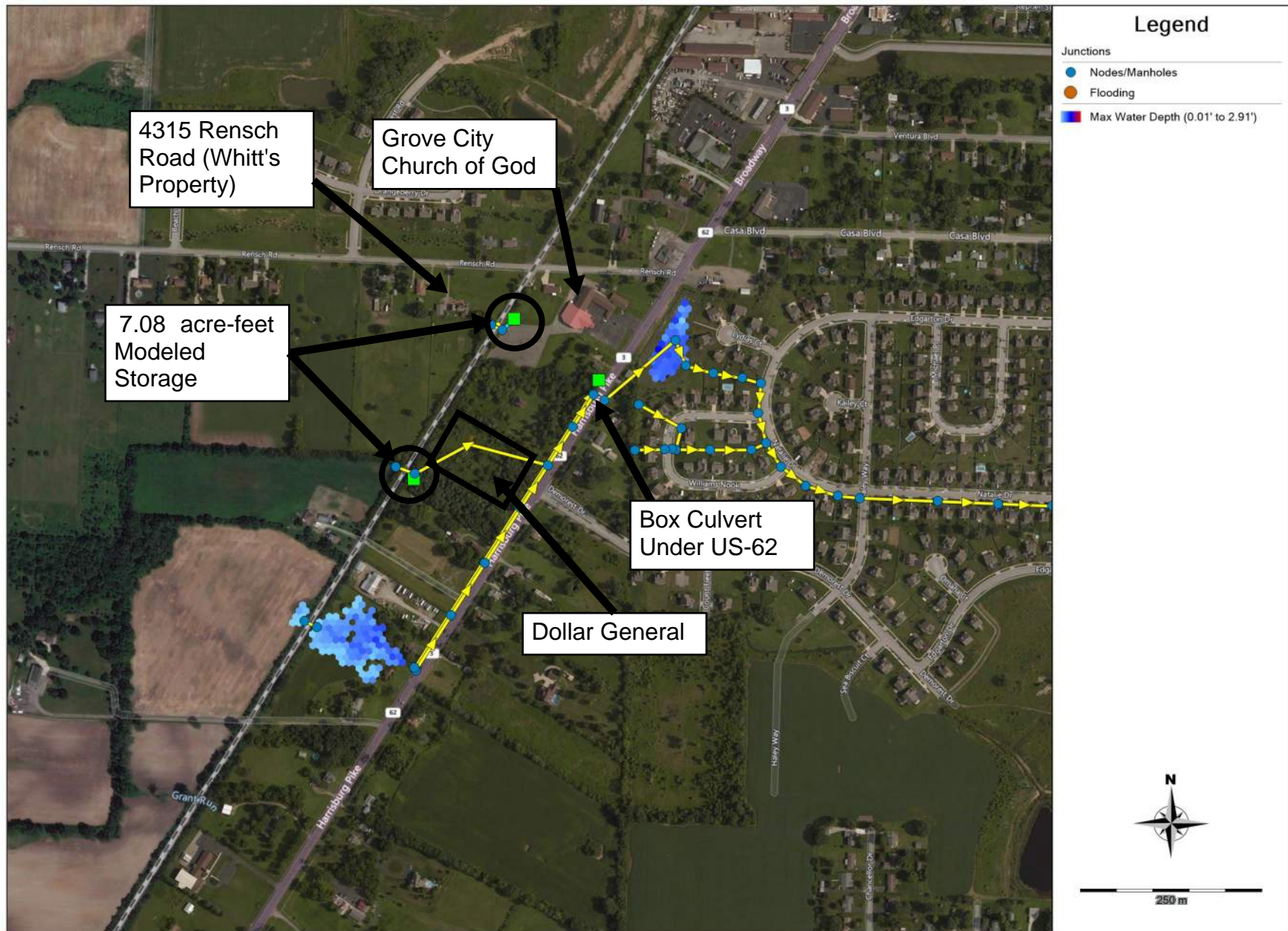
Proposed Storage West of SR-62: 1-Year Design Storm



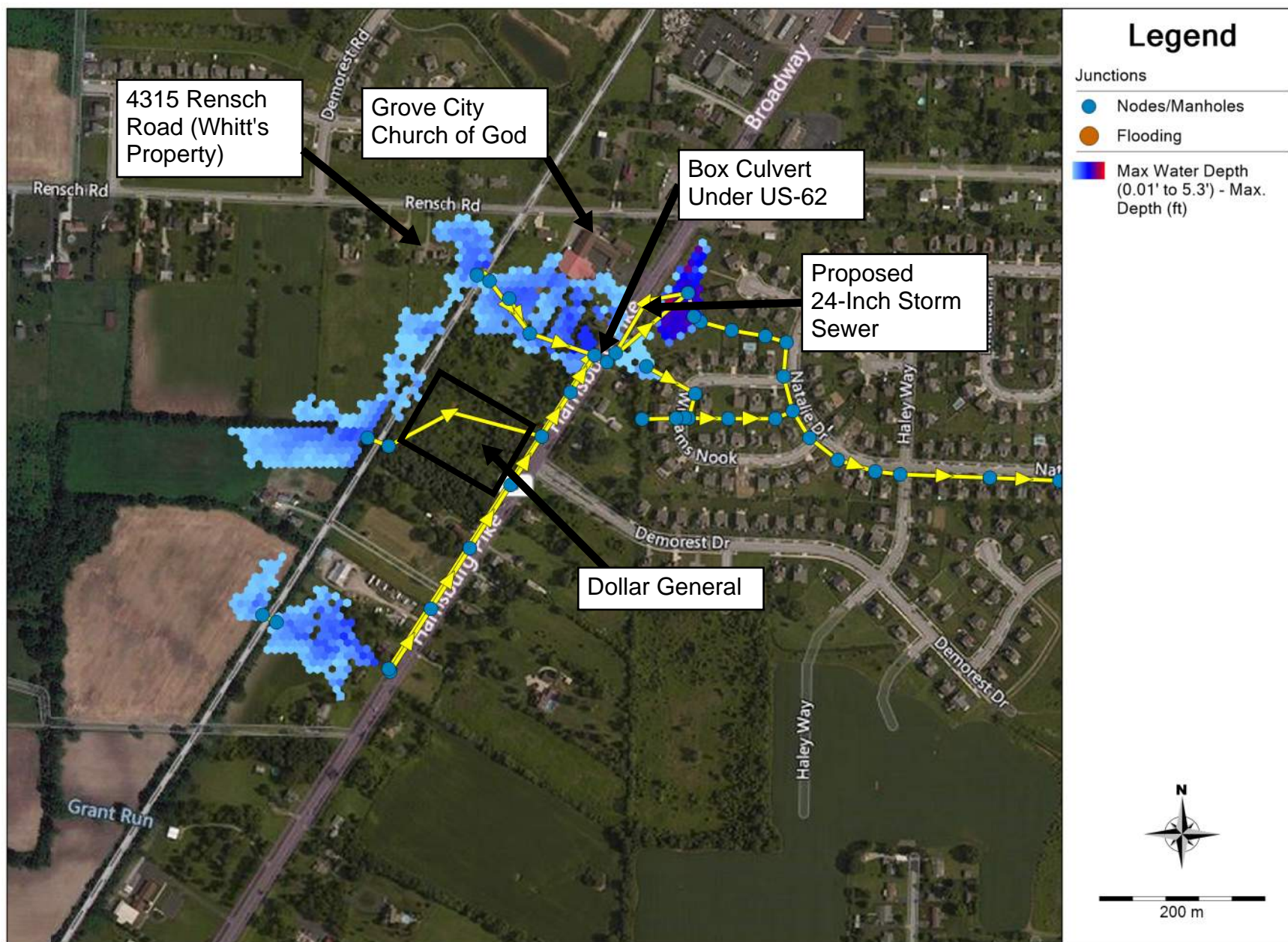
Proposed 24-Inch Storm Sewer East of SR-62: 2-Year Design Storm



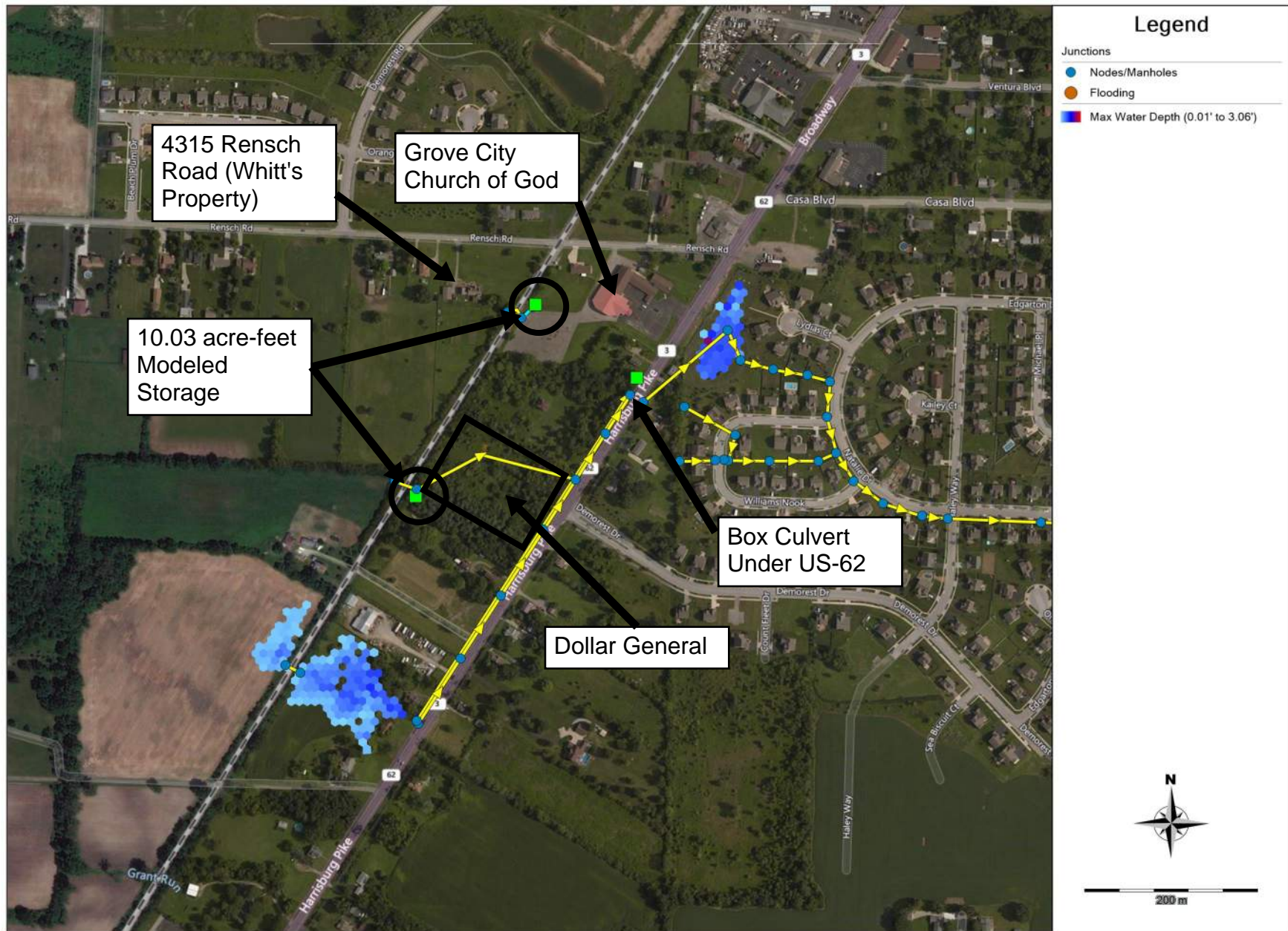
Proposed Storage West of SR-62: 2-Year Design Storm



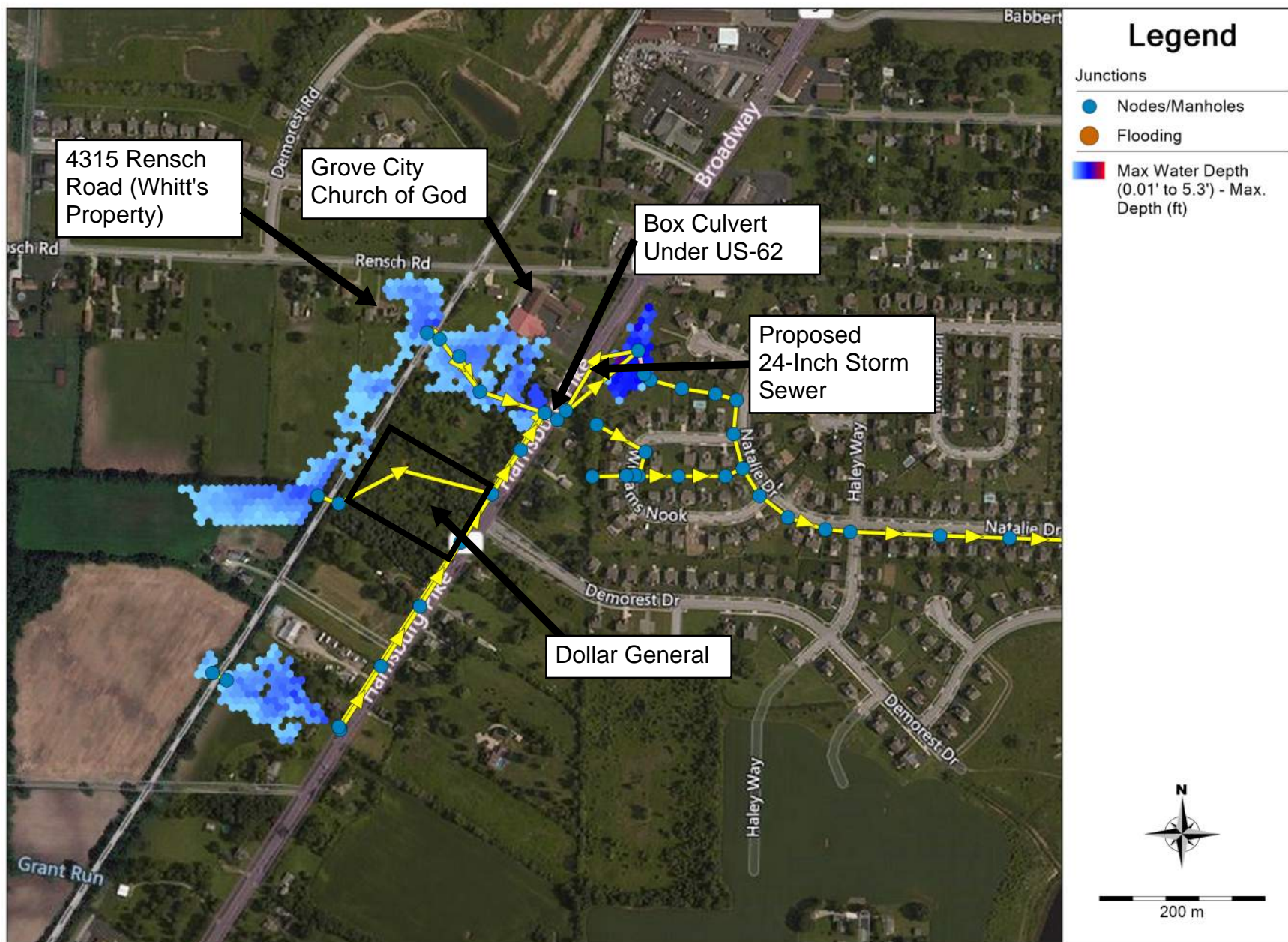
Proposed 24-Inch Storm Sewer East of SR-62: 5-Year Design Storm



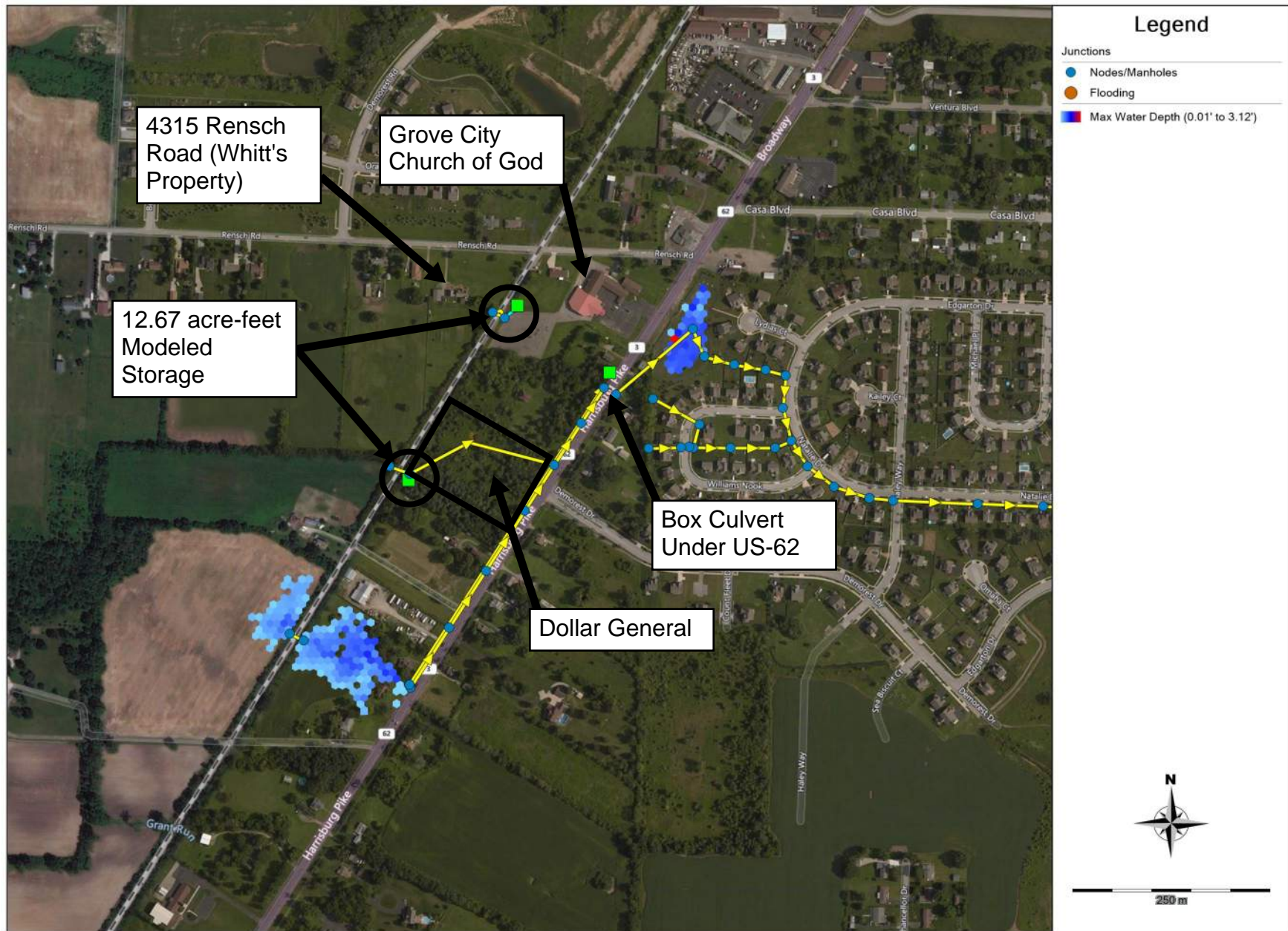
Proposed Storage West of SR-62: 5-Year Design Storm



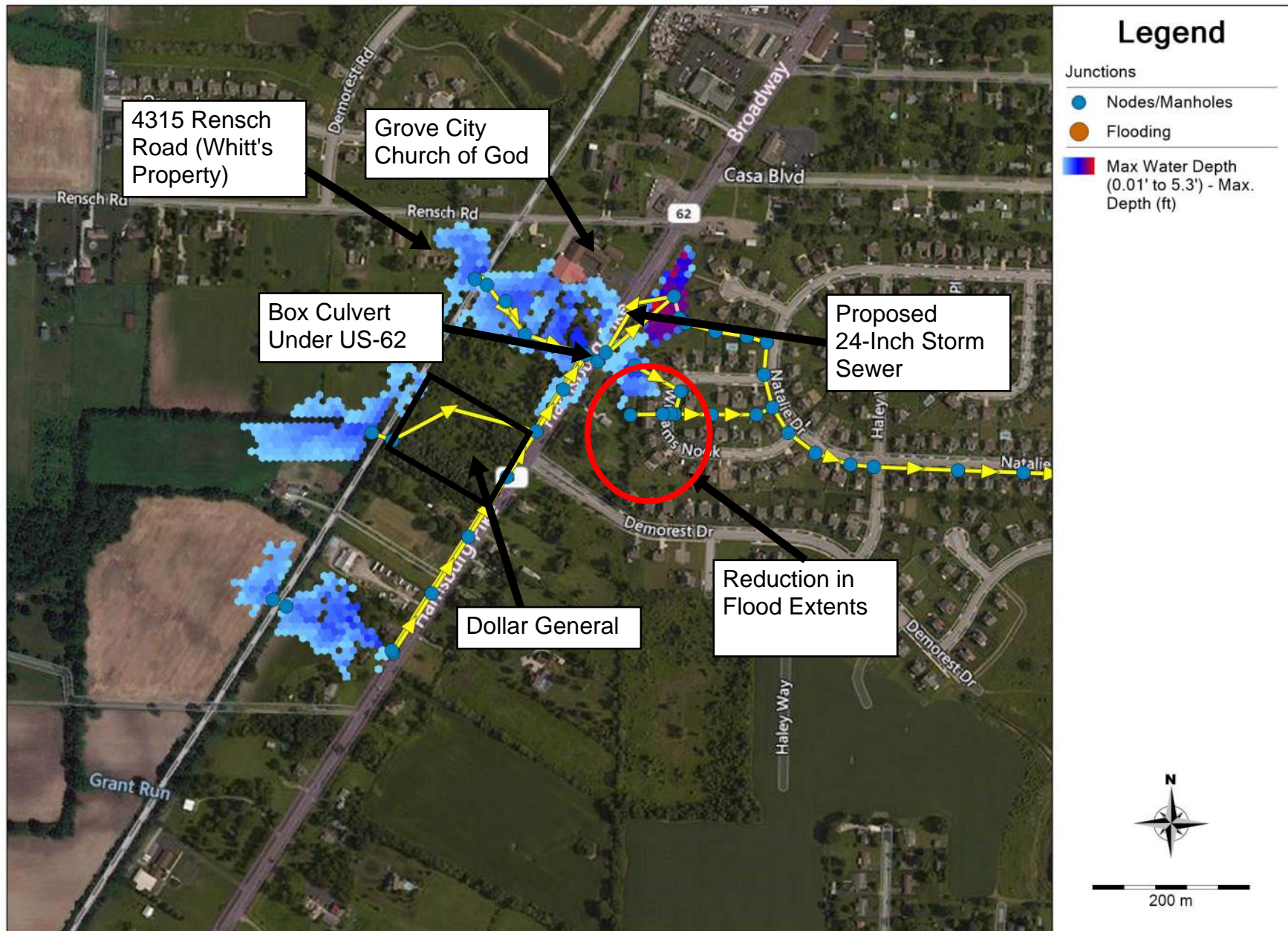
Proposed 24-Inch Storm Sewer East of SR-62: 10-Year Design Storm



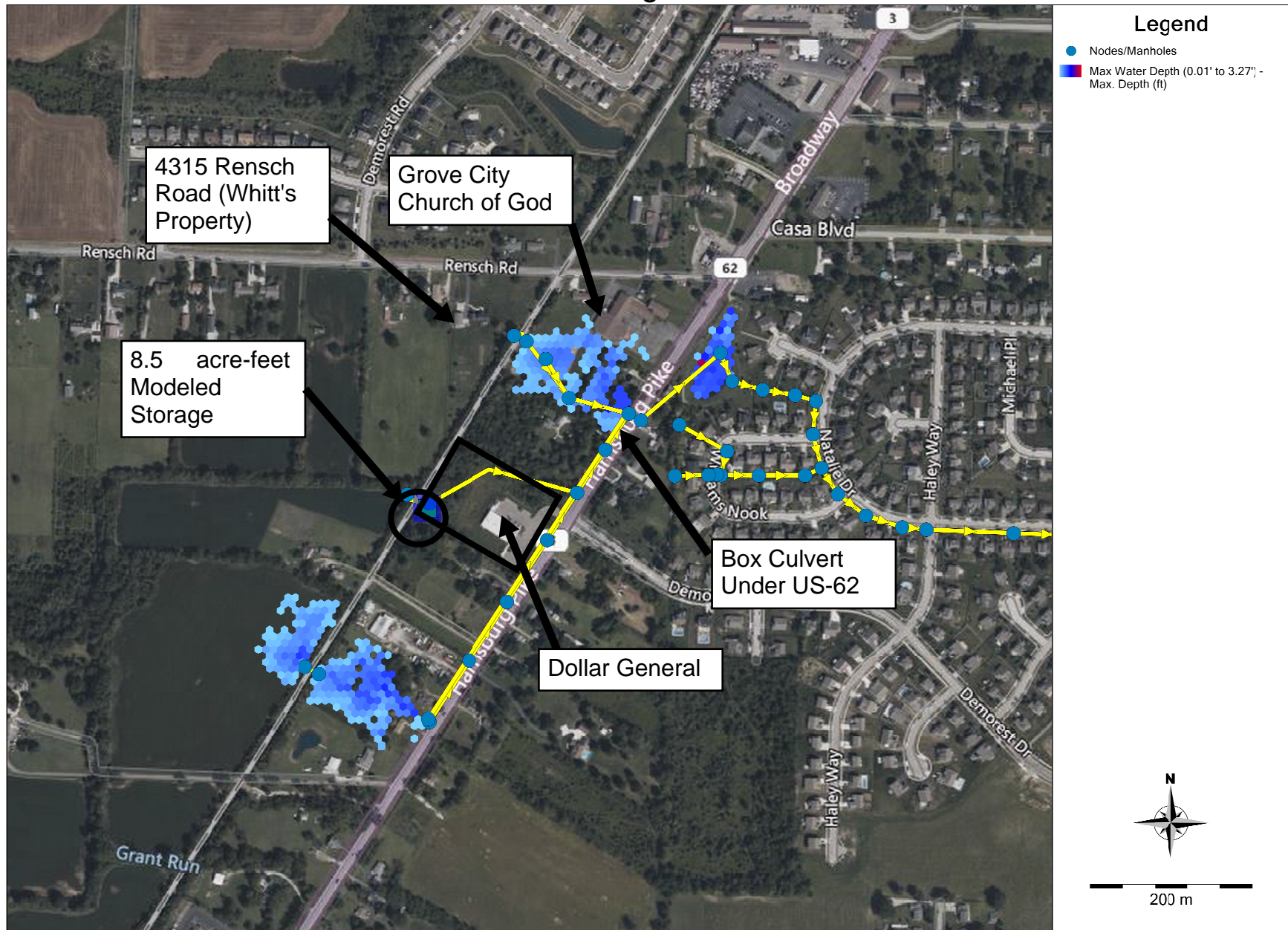
Proposed Storage West of SR-62: 10-Year Design Storm



Proposed 24-Inch Storm Sewer East of SR-62: 25-Year Design Storm



Proposed 8.5 Ac-ft of Storage West of SR-62: 25-Year Design Storm



Proposed Storage West of SR-62: 25-Year Design Storm

